

**PROACTIVE PERSONALITY: GENETIC INFLUENCES IN ITS RELATIONSHIPS  
WITH CAREER SUCCESS AND ENVIRONMENTAL IMPACTS ON ITS CHANGE**

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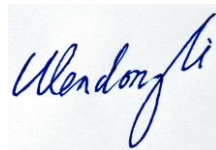
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## DECLARATION

I hereby declare that this thesis is my original work and it has been written by me in its entirety. I have duly acknowledged all the sources of information which have been used in the thesis.

This thesis has also not been submitted for any degree in any university previously.

A handwritten signature in blue ink, reading "Wendong LI", is centered on the page. The signature is written in a cursive style with a horizontal line underneath the name.

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Wendong LI

April 1, 2013

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I dedicate this dissertation to my family, my parents, my sister, and my wife, for their long-lasting support, which is indescribable in plain English.

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## SUMMARY

Proactive personality is defined as individuals' relatively enduring tendency to alter the environment. As an important form of human agency, proactive personality has received a great deal of research attention in the last two decades. In my dissertation, I undertake two studies to examine important issues which have not been fully addressed in the proactive personality literature. In the first study using a national U.S. twin sample, I draw upon evolutionary psychology and genetic research to investigate the genetic foundation of proactive personality and to probe the relative merits of genetic and environmental influences in the relationships between proactive personality and career success. In the second study based on three-wave longitudinal data, I adopt an interactionist perspective to study development of proactive personality as a result of individuals' work environments and further to examine a reciprocal relationship between proactive personality and work environments. Results of the first study demonstrate distinctive weights of genetic and environmental effects in shaping proactive personality and its relationships with various career success variables including income, job complexity, leadership, and psychological well-being. Findings of the second study show reciprocal relationships of proactive personality with job demands and job control. Together, my dissertation contributes to the proactive personality literature by documenting the genetic foundation of proactive personality, unpacking genetic and environmental effects in the proactive personality–career success relationships, and documenting that people are both producers and products of their work environments.

## Introduction

The past two decades have witnessed a proliferation of research on proactivity. This is partly because the increasing uncertainty and interdependence in the today's work (Howard, 1995) require organizations and employees to go beyond their formal job requirements and to take a more active approach in attacking work problems (Frese & Fay, 2001; Griffin, Neal, & Parker, 2007; Katz & Kahn, 1978). Researchers have generally devoted their research endeavors to two forms of proactivity: proactive behaviors and proactive personality (Crant, 2000; Frese & Fay, 2001; Grant & Ashford, 2008). Proactive personality is typically portrayed as a dispositional variable for individuals to engage in proactive behaviors. Thus it has garnered lots of research attention. It is defined as a "relatively stable tendency" that allows individuals to forecast future changes, plan ahead, and persevere to generate positive environmental changes (Bateman & Crant, 1993, p. 103). Indeed, three meta-analyses have demonstrated that proactive personality is a unique personality construct which is significantly related to employee job performance, proactive behaviors, favorable work characteristics, well-being, and overall career success (Fuller & Marler, 2009; Thomas, Whitman, & Viswesvaran, 2010; Tornau & Frese, 2013). For instance, in their most recent meta analysis, Tornau and Frese (2013) reported significant correlations (without correcting for unreliability) of proactive personality with supervisor-rated task performance (.15), taking charge (.35), job control (.19) and work social support (.19), job satisfaction (.27). and objective career success (e.g., salary, .13).

The development of the proactive personality literature notwithstanding, several critical questions remain not fully addressed. *First*, research on evolutionary psychology (Buss, 1995; Nicholson, 1997) and human agency (Bandura, 2001, 2006) has suggested that one critical impetus behind humans' propensity to change environments lies in their fundamental



nature—genetic architecture—developed and selected during human evolution. Given that genetic effects on human traits vary to different degrees (Bouchard, 2004), it would be informative to quantify the magnitude of genetic effects on proactive personality. Such an investigation can pave the way to examine more nuanced relationships among genetic/environmental influences, proactive personality, and outcomes.

*Second*, because genetic endowment may impact both proactive personality and work outcomes (Arvey, Bouchard, Segal, & Abraham, 1989; Taubman, 1976), an intriguing question arises: Could common (i.e., the same) genetic factors explain the proactive personality–outcome relationships? Given the pervasiveness of genetic effects, it seems tempting to attribute the proactive personality–outcome link partly or even predominantly to genetic effects; that is, the same genetic factors that engender proactive propensity can also help generate chances for people to succeed at work. In fact, recent research has shown that the relationships between the Big Five personality traits with entrepreneurship (Shane, Nicolaou, Cherkas, & Spector, 2010) and between core self-evaluations and work stress (Judge, Ilies, & Zhang, 2012) are mainly from genetic rather than environmental effects.

Does this mean that environmental factors play an inferior role in accounting for the proactive personality–outcome link? Interestingly, prior research has also reported that challenging work environments enhance proactive personality (Li, Frese, & Fay, 2013) and work outcomes (Berlew & Hall, 1966). As such, environmental factors seem indispensable in shaping proactive personality–outcome relationships, which calls for investigating the *relative* contributions of genetic and environmental influences in these relationships. A more accurate interpretation of the nature of these relationships would enable "a better understanding of how things work, that is, better theories" (Bouchard, 2004, p. 148).

*Third*, although Bateman and Crant (1993) initially defined proactive personality as a dispositional construct, they grounded their work in an interactionist perspective (e.g., Bandura, 1977; Schneider, 1983) and acknowledged that their work "does not longitudinally explore the development of the proactivity disposition or reciprocal causality among the person, behavior, and environment" (p. 115). Nevertheless, their propositions that work environments may foster the *development* of proactive personality and that there may be a reciprocal relationship between proactive personality and work environments have so far not yet been fully examined.

The aim of my dissertation is threefold. *First*, using a behavioral genetic approach capitalizing on the natural experiments of identical and fraternal twins (Plomin, DeFries, McClearn, & McGuffin, 2008), I quantify impacts of genetic and environmental factors on proactive personality. *Second*, I probe the relative merits of genetic and environmental factors in explaining bivariate relationships between proactive personality and outcomes. Unraveling the underlying reasons behind these relationships allows us to "distinguish selection [effects resulting from common genetic factors] from environmental causation [effects resulting from common environmental factors]" (W. Johnson, Turkheimer, Gottesman, & Bouchard, 2009, p. 218). If environmental factors play a major role in explaining the relationships, that finding would indicate a very different causal mechanism from what many researchers would assume (i.e., the "hard-wired" person plays a dominant role, see Shane et al., 2010).

Furthermore, I examine whether common genetic and environmental factors also explain the mediated relationships linking proactive personality to outcomes; that is, proactive personality → job complexity → income and psychological well-being. Prior research has suggested that more proactive people tend to achieve greater success by increasing their job complexity (Judge, Bono, & Locke, 2000; Parker, Williams, & Turner, 2006). Tracing the

sources of such mediated relationships to genetic and environmental underpinnings enriches our understanding of the commonly studied mediation relationships in applied psychology (Judge et al., 2012). If common genetic factors are found to influence the mediation relationships, the result indicates a selection mechanism (e.g., rooted in neurobiological mechanisms) for proactive personality's effects. In contrast, if common environmental effects underlie the relationships then environmental factors from family and work must play important roles. In the era of boundaryless careers (Arthur & Rousseau, 1996), such finer-grained knowledge has implications for employees to "remake themselves" (Mirvis & Hall, 1994, p. 367) in order to proactively manage their careers. From a managerial perspective, the findings also have implications for organizations to deal with the challenges imposed by employee boundaryless careers and to take efforts to cultivate employee proactivity to further promote their success and well-being.

*Third*, drawing upon the growing body of literature on personality development from an interactionist perspective (e.g., Caspi, Roberts, & Shiner, 2005; Roberts & Mroczek, 2008), I investigate whether work environments have lagged impacts on changes in proactive personality in a three-wave longitudinal study. Because personality traits have traditionally been assumed to affect work environments, I further examine a *reciprocal* relationship between proactive personality and work environments. That is, proactive personality may have lagged effects on changes in work environments that may then further mold proactive personality. In selecting candidate work environment variables, I focus on the work characteristics from the widely adopted job demand–control–support model (Karasek, 1979; Karasek et al., 1998), as well as organizational constraints, a variable widely studied in the work stress literature (e.g., LePine, LePine, & Jackson, 2004; Spector & Jex, 1998). Such work characteristics are pertinent to proactivity and capture a relatively comprehensive spectrum of work environments (e.g.,

pertaining to job, social relationship, and organization).

An investigation of reciprocal relationships between proactive personality and work environments sheds light on the development of proactive personality at work by pinpointing the work environment variables that change proactive personality. Moreover, by examining such reciprocal relationships, this study represents the first endeavor in the proactive personality literature to longitudinally assess whether people are both producers and products of their work environments (Bandura, 2001; Bell & Staw, 1989; Chatman, 1991; Roberts, Caspi, & Moffitt, 2003; Sutin & Costa, 2010).

To sum up, in this dissertation, I examine genetic and environmental underpinnings of proactive personality and the relationships between proactive personality and career success. Further, I also investigate environmental influences on development of proactive personality longitudinally, and probe lagged effects of proactive personality on changes in employee work environments. Together, the two studies enhance our understanding of the foundation, development, and function of proactive personality, a very important form of human agency (Bandura, 2001; Bateman & Crant, 1993). Accordingly, they also have important practical implications for organizations and employees to boost proactivity and manage career development respectively.

## **Chapter One: Why Does Proactive Personality Breed Career Success?**

### **Disentangling Genetic and Environmental Influences**

"The capacity to exercise control over the nature and quality of one's life is the essence of humanness."

— Albert Bandura, *Social cognitive theory: An agentic perspective*, p. 1, 2001

The purpose of this study is to examine genetic and environmental influences on proactive personality and in the relationships between proactive personality and career success, that is, bivariate relationships and mediated relationships (proactive personality → job complexity → income and psychological well-being).

### **Theoretical Development and Hypotheses**

#### **Proactive Personality and Career Success**

I examine both objective career accomplishments (income, leadership role occupancy, and job complexity) and subjective feelings of life achievements (psychological well-being, Baruch & Bozionelos, 2010; Judge, Cable, Boudreau, & Bretz, 1995) as outcomes of proactive personality. The selection of these four career success variables is consistent with career success research that has underscored the importance of both observable accomplishments and individuals' subjective feelings about their accomplishments (e.g., Baruch & Bozionelos, 2010; Seibert, Crant, & Krainer, 1999). Objective or extrinsic success has been frequently judged in terms of wealth and status (Baruch & Bozionelos, 2010), which is probably why *income* has been one of the most widely used indicators of objective success. I also include leadership role occupancy and objective job complexity as extrinsic indicators because they reflect the

attainment of occupation/job status. *Leadership role occupancy* refers to the extent to which individuals occupy leadership or supervisory roles (Arvey, Zhang, Avolio, & Krueger, 2007). In principle, obtaining higher leadership roles indicates higher organizational status; previous research has incorporated ascendancy into supervisory positions to indicate career achievements (e.g., Judge, Cable, Boudreau, & Bretz, 1995).

*Job complexity* is defined as the extent to which jobs are multifaceted and mentally challenging (Hackman & Oldham, 1980). High job complexity is an important characteristic of high-status occupations (Schmidt & Hunter, 2004; Wilk & Sackett, 1996). Researchers have suggested that objectively measured job complexity is an important indicator of objective success (Judge, Higgins, Thoresen, & Barrick, 1999, p. 627), and have used it as a critical constituent of occupational attainment (e.g., Roberts et al., 2003). Recognizing the importance of job complexity in occupation attainment, some researchers have used the Duncan Socioeconomic Index (SEI) to measure job complexity (Wilk & Sackett, 1996).

I use *psychological well-being* as an indicator of subjective career success. Psychological well-being represents a eudaimonic approach that is different from the hedonic approach to well-being (Keyes, Shmotkin, & Ryff, 2002; Ryan & Deci, 2000). The use of psychological well-being is consistent with recent developments in career success research. Recently, there has been some suggestion that the use of job and career satisfaction variables is too narrow (Heslin, 2005; Judge & Hurst, 2008; Nicholson & de Waal Andrews, 2005), and researchers have called for broader conceptualization of subjective career success. It has been suggested (Heslin, 2005; Nicholson & de Waal Andrews, 2005; Schein, 1990) that subjective work success should consider the following: people's different needs, life purpose, self-worth, social relationships, self autonomy, and personal growth. These suggested new components are largely captured in the six

elements of psychological well-being: personal growth, environmental mastery, autonomy in life, purpose in life, positive relations with others, and self acceptance (Ryff, 1989; Ryff & Keyes, 1995). Psychological well-being captures a relatively full gamut of positive human functioning and accentuates the realization of human potential (Ryff & Keyes, 1995). Thus, it is conceptually relevant to career success. Below I propose positive effects of proactive personality on the four career success variables.

**Proactive personality and income.** Previous research has documented that proactive personality is positively related to income, perhaps because proactive people generally improve their environments through a range of proactive behaviors. They also accumulate human and social capital and garner sufficient organizational sponsorship to achieve success (e.g., Seibert et al., 1999; Seibert, Kraimer, & Crant, 2001; Thompson, 2005).

**Proactive personality and leadership role occupancy.** The proactive personality literature has well established the relationship between proactive personality and leadership (Bateman & Crant, 1993; Crant & Bateman, 2000). In this study, I follow previous research (e.g., Arvey et al., 2007; Day, Sin, & Chen, 2004; Judge, Bono, Ilies, & Gerhardt, 2002), and examine proactive personality and leadership from a role occupancy perspective. Leadership role occupancy reflects the degree to which an individual holds a supervisory position (Arvey et al., 2007). I adopt this definition and measured it using the number of employees one supervised both directly and indirectly, following previous research (Li, Song, & Arvey, 2011). It is reasonable to expect that, in principle, the more subordinates one oversees, the greater the leadership responsibilities and capacities s/he has (Bass & Bass, 2008, p. 768). Methodologically, using number of employees supervised to indicate leadership can avoid potential bias inherent in leadership research using perceptions of leadership (e.g., subordinates' ratings of leadership

styles and supervisory ratings of leadership effectiveness, Yukl, 2006), because such biographically based measures can easily be verified and thus are less likely to be falsified (Cascio, 1991).

Proactive people are likely to occupy high leadership positions. They have long-term perspectives, plan ahead, take risks, and exhibit persistent actions until environmental changes are accomplished (Bateman & Crant, 1993; Frese & Fay, 2001). According to implicit leadership theories, such characteristics map well onto lay people's leadership prototypes (Lord & Emrich, 2000), and consequently increase the odds that more proactive people will be perceived as more leader-like and thus more likely to be promoted into supervisory positions. In addition, once taking a supervisory position, proactive people are likely to achieve further promotions into even higher ranking positions. This is because proactive people tend to be adept performers (Crant, 1995), develop more sophisticated skills and knowledge (Parker & Sprigg, 1999), and secure supportive relationships and sponsorships (Thompson, 2005). Empirical research has shown that peers are more likely to perceive proactive people as transformational leaders (Bateman & Crant, 1993), supervisors are more likely to rate them as displaying charismatic leadership behaviors (Crant & Bateman, 2000), and they are more likely to hold general management positions (uncorrected  $r = .18$ , Seibert et al., 1999).

**Proactive personality and job complexity.** Proactive people are well-suited to highly complex jobs, in keeping with the three key components of being proactive: self-initiation, anticipation, and persistence (Frese & Fay, 2001; Grant & Ashford, 2008). Proactive people forecast future work changes and prepare to meet demands for future career development by, for example, planning for the long term and taking initiative to learn new skills (Frese & Fay, 2001; Seibert et al., 2001). Furthermore, proactive people are likely to face setbacks and obstacles



executing environmental change. Thus they solicit sponsorship within organizations, seek feedback, and persevere in goal striving (Frese & Fay, 2001). All these are likely to increase proactive people's level of job complexity. Furthermore, proactive people tend to look for challenging jobs (Seibert et al., 2001), and organizations are likely to select them to fill complex positions (Frese & Fay, 2001). Empirical evidence has demonstrated that more proactive people are more confident in embracing more job responsibilities, and construe their roles more broadly (Parker et al., 2006).

**Proactive personality and psychological well-being.** Psychological well-being stresses the importance of positive human function and realizing human potential (Ryff & Keyes, 1995), which appears to be a natural consequence of being proactive. Proactive personality is likely to facilitate the six components of psychological well-being, personal growth, environmental mastery, autonomy in life, purpose in life, positive relations with others, and self acceptance. Proactive people tend to create positive environmental changes (Bateman & Crant, 1993), which could in turn produce high self-efficacy, achievement of self-concordant goals (Greguras & Diefendorff, 2010), strong personal growth, and self-acceptance. Positive changes in work environment also likely provide proactive people with a greater sense of environmental mastery and autonomy (Crant, 2000). Furthermore, proactive people are likely to establish good interpersonal relationships, especially with supervisors who are often needed to implement environmental changes (Thompson, 2005). A meta analysis reported that proactive personality correlates, on average .49, .24, .26, and .30, with learning goal orientation, perceived autonomy, leader-member exchange, and self-esteem, respectively, supporting its relationship with elements of psychological well-being (Fuller & Marler, 2009).

Given previous research has established the relationships between proactive personality

and some career success variables (e.g., income, job characteristics, leadership, and well-being), I do not propose the formal hypothesis for these bivariate relationships.

### **Genetic and Environmental Effects on Proactive Personality and in Bivariate Relationships between Proactive Personality and Career Success**

The genetic basis of proactive personality may have to do with potential evolutionary adaptive advantages associated with being proactive (Bandura, 2001, 2006). The evolutionary pressure caused during our ancestors' migration out of Africa, organization of gathering and hunting activities, and development of agriculture necessitates planning and persistence behaviors in bringing out positive environmental changes, which in turn enhance their likelihood for survival and reproduction (Buss, 1995; Nicholson, 1997). Accordingly, with time, surviving human beings may carry a genetic basis for proactive personality. As Bandura (2006) contended, "[genetic] endowment provides the very neuronal structures and mechanisms for the agentic attributes that are distinctly human" (p. 173). Most personality traits are heritable to different extents (Bouchard, 2004), so I expect significant genetic effects on proactive personality without developing a formal hypothesis.

Genetics have also been reported to account for significant variance in income (Taubman, 1976), leadership role occupancy (Arvey et al., 2007), job complexity (Li & Arvey, 2010), and psychological well-being (Kessler, Oilman, Thornton, & Kendler, 2004). Genetic effects on those work variables can be channeled via multiple pathways such as neurobiological factors, personality, and abilities (Arvey & Bouchard, 1994), among which proactive personality is an important mechanism. People with different individual characteristics gravitate to jobs with congruent attributes, leading to certain levels of person–job fit (Chatman, 1989; Holland, 1996; Kristof-Brown & Guay, 2010; McCormick, DeNisi, & Shaw, 1979; Schneider, 1987).

Given that genetics likely affect both proactive personality and outcome variables, I expect that genetics likely explain proactive personality–outcome relationships. That is, the same genetic endowments associated with proactive personality may also be related to outcome variables. This is not to say that the proactive personality–outcome link is spurious. Instead, it suggests that genetic factors related to proactive personality overlap with genetic effects on outcomes. Essentially, the argument is compatible with the notion that genetic makeup affects outcomes through proactive personality (Jocklin, McGue, & Lykken, 1996; Judge et al., 2012; Shane et al., 2010), in addition to other pathways. First, genetic factors most likely do not directly influence work outcomes (Arvey & Bouchard, 1994). Second, longitudinal research has established the effect of proactive personality on career outcomes (Seibert et al., 2001). Thus proactive personality may carry through the genetic influences on work outcomes via multiple processes of person–job fit, such as occupational and organizational selection and modification of work environments (Bateman & Crant, 1993; Chatman, 1989). Similar to this argument, prior research has found that common genetic factors account for the majority of the relationship of personality with entrepreneurship (Shane et al., 2010) and with work stress (Judge et al., 2012). Such genetic factors may include Dopamine D4 Receptor markers, which have been shown to relate to approach-related personality traits (Munafò, Yalcin, Willis-Owen, & Flint, 2008) and career success (Song, Li, & Arvey, 2011).

However, I do not expect that proactive personality–outcome relationships are *entirely* due to genetics. Behavioral genetics research has also shown that environmental factors explain more than 50% of the variances in human traits and behaviors (Bouchard, 2004). Challenging and nurturing work environments are apt to cultivate both proactivity and career success. For example, job challenge has been found to facilitate proactive personality development (Li, Frese

et al., 2013), and high levels of job performance (LePine, Podsakoff, & LePine, 2005).

Supportive work environments have been reported to enhance proactive personality (Li, Frese et al., 2013), and career success (Ng, Eby, Sorensen, & Feldman, 2005). Consequently, it seems that common environmental factors may also underlie the relationships between proactive personality and outcomes. Combining those observations, I predict:

*Hypothesis 1:* Common genetic factors relate to both proactive personality and outcome variables including income (H1a), leadership role occupancy (H1b), job complexity (H1c), and psychological well-being (H1d).

*Hypothesis 2:* Common environmental factors relate to both proactive personality and outcome variables including income (H2a), leadership role occupancy (H2b), job complexity (H2c), and psychological well-being (H2d).

Although previous research has provided little theoretical ground for an *a priori* hypothesis, I set out to examine the relative merits of genetic and environmental factors in the above relationships. Using the same approach, Shane et al. (2010) reported that genetic factors played a greater role (60% - 85%) than environmental factors (15% - 40%) in affecting the link between personality traits and entrepreneurship. As discussed above, I expect environmental factors may play an equal, if not greater, role in the proactive personality– outcome link.

### **Common Genetic and Environmental Influences in Mediated Relationships**

Proactive people tend to seek more complex jobs that, in turn, can provide higher income and increase their psychological well-being. I have argued that proactive personality likely relates to those three variables. Furthermore, research on career success and job design has treated job complexity as an important predictor of income and well-being (Hackman & Oldham, 1980; Judge, Klinger, & Simon, 2010). Greater job complexity means more job responsibilities,

which in turn yield higher levels of income (Glomb, Rotundo, & Kammeyer-Mueller, 2004).

High job complexity also tends to satisfy needs for autonomy, competence, and affiliation, which lead to greater psychological well-being (Ryan & Deci, 2001).

Given that genetics tend to modulate proactive personality and outcomes, coupled with the notion that job complexity may mediate proactive personality's relations with income and psychological well-being, I expect that common genetic factors underlie the mediated relationships (Judge et al., 2012). In other words, the same genetic factors related to proactive personality may also be associated with job complexity and income or well-being. Genetics research has suggested that genetic factors affect work outcomes via individual differences, which in turn may shape job activities and therefore work outcomes (Arvey & Bouchard, 1994; Plomin et al., 2008). In the case of proactive personality, neurobiological mechanisms related to neurotransmitter functions in the brain, for example, dopamine in the prefrontal cortex and nucleus accumbens, may play an important role. Research on personality neuroscience has long theorized that approach-related personality traits, such as agency and impulsivity, reflect individual differences in neurobiological functions associated with fundamental motivation and reward systems, such as baseline brain dopamine functions (Gray, 1970; Zuckerman, 1991). Empirical evidence has shown significant linkages between approach personality traits and dopamine functions (Depue & Collins, 1999; Tomer, Goldstein, Wang, Wong, & Volkow, 2008). Dopamine also plays a significant role in people's reward system to seek gratification and pleasure (Berridge & Robinson, 1998). Thus through approach-oriented dispositions, dopamine functions likely affect whether employees will seek stimulating and complex jobs and thereafter obtain work rewards such as income and happiness. As such, genetic factors associated with dopamine functions likely affect all three variables in the mediation models (Forbes et al., 2007).

Dopamine D4 receptor markers may be among such genetic variables, given their significant linkages to approach-related personality traits (Munafò et al., 2008), job characteristics (Li, Song, & Arvey, 2012), and career success (Song et al., 2011).

I also expect that common environmental factors affect all three variables in the mediation models. Such environmental factors may include challenging work experiences, because researchers have theorized and found work challenge to boost intrinsic motivation, personal growth, and, in turn, success at work (LePine et al., 2005). Furthermore, studies have also shown that work challenge significantly affects proactive personality development (Li, Song, & Arvey, 2013), job complexity (see Morgeson & Campion, 2003), and career outcomes (Berlew & Hall, 1966). In a similar vein, Judge et al. (2012) reported that common environmental factors explain why job satisfaction mediates the relationship between core self-evaluations and health. While acknowledging relatively thin empirical grounds, I hypothesize the following:

*Hypothesis 3:* Common genetic factors relate to all three variables in the mediation models in which proactive personality indirectly relates to income (H3a) and psychological well-being (H3b) through job complexity.

*Hypothesis 4:* Common environmental factors relate to all three variables in the mediation models in which proactive personality indirectly relates to income (H4a) and psychological well-being (H4b) through job complexity.

## **Method**

### **Participants and Procedures**

I used a national twin sample from the National Survey of Midlife Development in the United States (MIDUS, Kessler et al., 2004). The sample included 998 twin pairs reared together.

I selected same-sex twins with complete information on proactive personality, demographics, and at least one of the four outcomes. A further restriction of the sample to full-time working-for-pay participants yielded 488 twin pairs: 254 monozygotic (MZ, or identical) and 234 dizygotic (DZ, or fraternal) twin pairs. Demographically, 52.1% were male; 93.4% white; average age 41.98 ( $SD = 9.76$ ); 35.7% with high school education or less; 50.1% with some college; and 14.2% with bachelor's degrees or higher.

## Measures

**Proactive personality.** The MIDUS project was initiated (i.e., in 1990, Brim, 2000) before the first measure of proactive personality was devised (Bateman & Crant, 1993), so proactive personality was assessed by a 13-item instrument ( $\alpha = .85$ ). The items were selected to capture the core components of proactive personality: self-starting, anticipation, and persistence (Bindl & Parker, 2010; Crant, 2000; Frese & Fay, 2001). The measure includes three scales (Appendix A): agency (Rossi, 2001), self-directedness and planning (Prenda & Lachman, 2001), and persistence in goal striving (Wrosch, Heckhausen, & Lachman, 2000). All items had four Likert response options (1 = *A lot*, 4 = *Not at all*). Items were coded so that higher scores indicate higher levels of proactive personality (the same for the other variables). Confirmatory factor analyses (CFAs) showed that a three-factor model with a second-order factor yielded an adequate fit ( $\chi^2 = 316.20$ ,  $df = 62$ ,  $p < .001$ , CFI = .92, TLI = .89, RMSEA = .075, and SRMR = .058).

I conducted a validation study to demonstrate the convergent validity of this measure with the widely employed ten-item measure of proactive personality (Seibert et al., 1999). I administered to 502 undergraduate students the two measures with the Big Five personality traits (John, Donahue, & Kentle, 1991), positive and negative affectivity (Watson, Clark, & Tellegen, 1988), regulatory focus (Semin, Higgins, de Montes, Estourget, & Valencia, 2005), and life

satisfaction (Diener, Emmons, Larsen, & Griffin, 1985). The current measure of proactive personality correlated at  $r = .74$  (.85 after correcting for unreliability) with the ten-item measure. They also had very similar patterns of correlations with the other variables (see Table 1).

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Insert Table 1 about here  
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**Income.** Income was measured by an item asking participants to indicate their personal, before-tax earnings (only wages and stipends from employment) in the past 12 months. Responses were from 36 pre-defined categories, each designated with a letter, ranging from \$0 (A), \$9,000–\$9,999 (L), \$25,000–\$29,999 (Z), to \$1,000,000 or more (LL). I used the mean dollar value for a participant’s chosen range (e.g., \$9,500 for the option of L, \$9,000–\$9,999) as the measure of income for that person. It ranged from \$500 to \$125,000 (mean = \$35,152.08). To reduce skewness in the measure, I used its natural logarithm transformation in data analyses.

**Leadership role occupancy.** Following previous research (e.g., Arvey et al., 2007), leadership role occupancy was captured by two items. First participants indicated whether they supervised anyone at their current job. If so, they reported the number of employees supervised both directly and indirectly. I collapsed the responses into one leadership occupancy variable by assigning zero to those who supervised no one and using the number supervised for the others. This measure ranged from 0 to 398 (mean = 8.59). In other words, I captured leadership role occupancy by the number of employees supervised directly and indirectly. Natural logarithm transformation of this variable (after adding 1 to avoid the LN0 instance) was used in data analysis to reduce data skewness.



Prior leadership research has also applied similar approaches in assessing leadership role occupancy or leadership emergence by asking participants whether they hold supervisory roles (e.g., Arvey et al., 2007; Day et al., 2004; Judge et al., 2002). Two pieces of evidence supported the validity of this measure. First, it correlated .19 and .29 with job complexity and job control respectively in the MIDUS study, supporting the notion that occupying high leadership positions indicates more job responsibilities and more control (Li et al., 2011). Second, using the National Longitudinal Survey of Youth 1979 (NLSY79) database, I found that it correlated .24 and .25 with decision-making authority and income.

**Job complexity.** Following previous research (e.g., Judge et al., 2010), objective job complexity was measured using the *Dictionary of Occupational Titles* database (DOT, U.S. Department of Labor, 1991), the national occupational database used during the data collection of MIDUS. Each participant was assigned a job complexity score by linking their job codes based on their job titles and job responsibilities in MIDUS to DOT (mean = 8.04,  $SD = 2.63$ ).

**Psychological well-being.** Psychological well-being was measured using Ryff's (1989) 18-item scale with six dimensions (three items each). Participants rated the extent to which they agree or disagree with the items on a seven-point scale (1 = *strongly agree*, 7 = *strongly disagree*). Sample items are "For me, life has been a continuous process of learning, changing, and growth," and "When I look at the story of my life, I am pleased with how things have turned out so far." The average score across the six elements ( $\alpha = .81$ ) was employed in data analyses since they represent a single underlying construct (Ryff & Keyes, 1995).

**Control variables.** *Gender* and *age* were controlled because they are likely to affect career success (Ng et al., 2005) and the estimate of genetic impacts (McGue & Bouchard, 1984). I adjusted the study variables by having them regressed on age, gender, age-squared, age

×gender, and age-squared ×gender, and utilized the standard residuals in genetic modeling (e.g., W. Johnson & Krueger, 2006). Controlling for interaction and squared terms can partial out their influences more completely (M. McGue, personal communication, October 14, 2011). I also controlled for *Big Five personality traits* measured in MIDUS (Lachman & Weaver, 1997). In addition, I performed analyses with education as an additional control variable and obtained similar results.

### **Analytical Strategy**

I conducted conventional regression analyses to examine the relationships between proactive personality and outcomes and the mediating role of job complexity. Since co-twins of a twin pair are from the same family, I adopted a clustered sandwich estimator to obtain robust estimates (Rogers, 1993). In testing my hypotheses, I used standard behavioral genetic approaches (Plomin et al., 2008) to examine genetic and environmental influences. In univariate analyses, an observed variable, P, is modeled to be influenced by three factors: A (additive genetic factors), C (shared environmental factors between co-twins that cause similarity), and E (unique environmental influence making individuals different; see Appendix B). I employed Cholesky decomposition (Neale & Cardon, 1992) to examine common genetic and environmental factors related to proactive personality and outcomes in bivariate (H1 and H2, Appendix C) and mediated (H3 and H4) relationships.

## **Results**

### **Scale Validation**

I conducted CFAs to demonstrate the independence of the two measures of proactive personality and psychological well-being. A two-factor model (with the six dimensions as indicators for psychological well-being and the three subscales as indicators for proactive

personality) yielded an adequate fit ( $\chi^2 = 158.00$ ,  $df = 26$ ,  $p < .001$ , CFI = .92, TLI = .90, RMSEA = .084, and SRMR = .043), which was significantly better than a one-factor model ( $\Delta\chi^2 = 66.44$ ,  $\Delta df = 1$ ,  $p < .001$ ;  $\chi^2 = 224.44$ ,  $df = 27$ ,  $p < .001$ , CFI = .88, TLI = .84, RMSEA = .101, and SRMR = .051). This evidence suggests adequate discriminant validity of the two measures.

### **Tests of Hypotheses**

The descriptive statistics and correlations among study variables appear in Table 2. No significant differences appeared in the means and SDs of all the variables between MZ and DZ twins. Table 3 shows within-twin-pair correlations for the two twin groups. Within twin-pair correlations of all study variables (except leadership role occupancy) were larger for MZ than for DZ twins, suggesting significant genetic effects.

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Insert Table 2 and 3 about here  
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Regression analyses (Table 4) show that with all the control variables partialled out, proactive personality was positively related to income (Model 1), leadership role occupancy (Model 2), job complexity (Model 3), and psychological well-being (Model 4).

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Insert Table 4 about here  
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**Genetic effects on proactive personality.** When fitting an ACE model for proactive personality (Model 1, Table 5), the effect of C was not significant and thus was fixed to zero (W. Johnson & Krueger, 2006). The AE model fit the data best. Genetic factors explained 42.5% ( $a^2$  in the best fitting model) of the variance in proactive personality. AE models fit the data best for

all outcomes except leadership role occupancy (E model fit best).

**Common genetic and environmental effects in bivariate relationships. H1 (H2)**

predicted common genetic (environmental) factors to relate to proactive personality and outcomes. No significant genetic effect was found on leadership role occupancy, and thus H1b was not supported. Genetic factors associated with proactive personality significantly related to job complexity ( $a_{21} = .11, p < .05$ , Model 2, Table 6, H1c) and well-being ( $a_{21} = .24, p < .001$ , Model 4, H1d), but not to income ( $a_{21} = .06, p > .05$ , Model 3, H1a). Therefore, H1 was partially supported. Common environmental factors related to proactive personality also significantly predicted income ( $e_{21} = .14, p < .05$ , Model 3, H2a), and leadership ( $e_{21} = .12, p < .05$ , Model 1, H2b), but not job complexity ( $e_{21} = .02, p > .05$ , Model 2, H2c) nor well-being ( $e_{21} = .06, p > .05$ , Model 4, H2d). Thus, H2 was partially supported.

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Insert Table 5 about here  
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The genetic and environmental effects underlying the observed correlations (i.e.,  $a_{11} \times a_{21}$  and  $e_{11} \times e_{21}$ , respectively) were also estimated (the right portion of Table 6). Table 7 shows that common genetic factors explained most of the link of proactive personality with job complexity (80.7%) and well-being (76.9%). In contrast, common environmental factors accounted for the majority of the relationships with leadership (100%) and income (72.1%).

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Insert Tables 6 and 7 about here  
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**Common genetic and environmental effects in mediated relationships. I also**

predicted common genetic and environmental factors in the mediated relationships (H3 and H4). Regression analyses (Table 4) showed that when job complexity was entered into the equations, it significantly predicted the dependent variables, and the impact of proactive personality on income and psychological well-being dropped from 0.22 to 0.18 and from 0.53 to 0.51, respectively. Those results suggest that job complexity partially mediated the relationships. Results of bootstrapping (Preacher & Hayes, 2004) further demonstrated the significance of the indirect effects via job complexity (95% CIs were [0.01, 0.09] and [0.01, 0.04] for income and psychological well-being respectively).

The model of multivariate genetic analyses fit the data well ( $\chi^2 = 61.71$ ,  $df = 64$ ,  $p > .10$ , CFI = 1.00, TLI = 1.01, RMSEA = .000, SRMR = .081, and AIC = 7788.62; for path coefficients see Figure 1). Genetic factor A1 significantly affected proactive personality, job complexity, and psychological well-being. Coupled with regression results, the evidence suggests that common genetic factors underlie the indirect effect of proactive personality on psychological well-being via job complexity (H3b). No common genetic factors were found to influence income (H3a). Therefore, H3 was partially supported. I found no common environmental factors that accounted for the mediated relationship. Thus H4 was not supported.

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Insert Figure 1 about here  
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### **Discussion**

Findings of this study show that genetics and environments play different roles in shaping the relationships of proactive personality with outcomes, thus providing a balanced view of the contributions of nature and nurture.

### **Theoretical Contribution**

Drawing upon genetic research and evolutionary psychology, this study extends the landscape of proactive personality research by examining genetic and environmental effects in proactive personality – outcome relationships. It enriches our understanding of why proactive personality relates to career success and well-being, and thus makes important theoretical contributions to the proactive personality literature (Bouchard, 2004; Judge et al., 2012).

I found that 42.5% of individual differences in proactive personality can be attributed to genetic variations. This is close to the lower boundary of the typical range of 40% to 60% for genetic effects on personality traits (Bouchard, 2004). Environmental factors seem to play a more important role (57.5%) in shaping proactive personality. This is consistent with Bandura's (2001) statement that environmental pressure can facilitate biological changes in human agency. Although not examining self-efficacy per se, I place this study under the broader context of human agency (Bandura, 2001; Bateman & Crant, 1993). Note that I also tested whether family socioeconomic status moderates genetic influences on proactive personality (Purcell, 2002). Results show no significant moderation effect.

The analyses revealed that nature and nurture exert different weights in influencing the relationships of proactive personality with outcomes. Genetic contributions in these relationships are independent of genetic effects on either proactive personality or any outcome separately (Plomin & Spinath, 2002), because proactive personality is only one mechanism through which genetics affect outcomes. I found that the majority of the link of proactive personality with job complexity and psychological well-being was genetic. Genetic factors also underlie job complexity's mediating role in the relationship between proactive personality and well-being. Thus a major reason for the relationships is that genetic variations produce differences in

proactive propensities that, in turn, lead to various levels of job complexity and thereafter psychological well-being. Such genetic effects may be reflected through dopamine functions, because dopamine is very important in motivation and reward systems (Gray, 1970; Zuckerman, 1991). This is an important direction for future personality neuroscience research. Coupled with previous research (Judge et al., 2012; Shane et al., 2010), the findings of this study underscore the importance of the person in shaping the environment to achieve career and life success.

Environmental factors accounted for the majority of the relationships of proactive personality with leadership and income. Those findings align with Judge et al. (2012), who found that environmental factors mainly explained the link between core self-evaluations and health. Neurobiological motivation and reward systems may drive proactive people to modify job complexity and increase well-being on their own, but the results suggest that environments may more strongly encourage them to seek leadership positions and high income, such as through various requirements/challenges from supervisors, organizations, and industry (Cascio, 2005). Those contrasting results merit future research endeavors to differentiate various neurobiological versus social mechanisms underlying relationships between proactivity and career outcomes.

I observed no significant effects of shared environmental factors on any study variable. This does not mean that family environments have no effect (e.g., Loehlin, 2007). Children in the same family can experience or interpret family environments differently (Hoffman, 1991; Plomin, 1994), which makes family a non-shared environmental factor. Family environments may also partially reflect genetic influences in that genetic factors impact parents' education, occupation, and personality (Bouchard, 2004).

Diverging from previous research (e.g., Arvey et al., 2007), I found no significant genetic influences on leadership role occupancy, perhaps because of the operationalization of this

measure. I used number of subordinates participants supervised at their current job, a "state" measure. In contrast, Arvey et al. (2007) adopted a "bio-history" measure using current and past managerial positions to compile trait scores of leadership role occupancy. "Trait" measures reflect more stable individual characteristics across various situations and time frames, and are thus more likely to be influenced by genetic factors (Fleeson, 2004).

### **Practical Implications**

This study has important implications for employees and organizations in their efforts to promote proactivity and work success, particularly in the context of boundaryless careers whereby employees are becoming more independent of conventional career arrangements in single organizations (Arthur & Rousseau, 1996). Environmental factors mainly explain the relationships of proactive personality with leadership and income. To promote career success, employees may actively engage in developmental assignments and training to increase their proactive personality by changing patterns of proactive behaviors (Raabe, Frese, & Beehr, 2007). If organizations want to generate sustainable changes in proactive behaviors, they may stimulate proactivity through suitable work challenges (Fritz & Sonnentag, 2009; Li, Frese et al., 2013).

The relationships between proactive personality and job complexity and well-being are mainly genetic. This does not necessarily mean that proactivity interventions are fruitless. However, this finding suggests that managers and organizations should be more aware of individual characteristics in designing work assignments (Kulik, Oldham, & Hackman, 1987). Employees are important stakeholders and they can proactively modify their work to fit their individual characteristics (Wrzesniewski & Dutton, 2001). The notion is consistent with the concept of tailored work characteristics (Judge et al., 2012), idiosyncratic deals (Rousseau, Ho, & Greenberg, 2006), and individualized organization (Lawler, 1974; Lawler & Finegold, 2000).



### **Study Strength, Limitations, and Future Research**

This study shows strengths in its twin study design using a natural experiment that allows us to examine relative influences of nature and nurture. I obtained multi-source data (e.g., self-report questionnaires and an occupational database) from a national twin sample and controlled for the Big Five personality traits. These strengths add confidence to the conclusions of this study. However, the results of this study should also be interpreted with consideration of its limitations. The first limitation concerns the casual relationship between proactive personality and work variables. It is often assumed that personality affects job characteristics, which in turn influence work outcomes (e.g., Judge et al., 2000). However, Bandura's *reciprocal determinism* (1997) suggests that people both influence and are influenced by their environment. Thus proactive personality and work variables show a possible reciprocal relationship that merits future research. Second, although I used a national sample of U.S. twins, the results should be explained as reflecting the current sample under specific cultural and economic contexts. It may be fruitful to examine genetic influences on proactivity under different conditions, especially other cultural contexts. Third, as with all behavioral genetics research, I was unable to pinpoint genetic (e.g., dopamine DNA markers) and concrete environmental factors related to proactive personality. Fourth, genetic factors related to proactive personality and well-being might also be associated with other individual differences, although intelligence and the Big Five personality traits do not seem to be among them (Crant, 1995). Fifth, the measure of leadership role occupancy may have different meanings across occupations. Sixth, I did not include job and career satisfaction, although recent developments in career success research (Hall & Chandler, 2005; Heslin, 2005) show that psychological well-being may be a more inclusive construct indicating subjective career success. Future research can examine whether similar results hold

for job and career satisfaction. I hope that future research can advance theoretical development in proactivity by incorporating a genetic perspective and tackling more nuanced relationships among the person, the environment, and the intersection between them from the lens of human agency (Bandura, 2001).

**Chapter Two: Reciprocal Relationship between Proactive Personality and Work Environments: A Latent Change Score Analysis**

"In these agentic transactions, people are producers as well as products of social systems."

— Albert Bandura, *Social cognitive theory: An agentic perspective*, p. 1, 2001

In this study, I investigate reciprocal relationships between proactive personality and work environments, that is, lagged effects of proactive personality on changes of work characteristics and lagged influences of work characteristics on proactive personality development.

To date, extant research on proactive personality has predominantly focused on one side of the proposed reciprocal relationship, that is, on how proactive personality impacts work environments, but not vice-versa. Furthermore, recent meta analyses (Fuller & Marler, 2009; Tornau & Frese, 2013) show that most studies have provided only cross-sectional tests of this relationship and have rarely rigorously examined proactive personality's capacity to alter work environments (see Seibert et al., 2001, for a notable exception).

As such, the other side of the proposed reciprocal relationship, the effect of work environments on proactive personality development has, to my knowledge, yet to be studied. One possible reason is that many organizational researchers still subscribe to the notion that adult personality traits are "fixed" (e.g., Fugate, Prussia, & Kinicki, 2012, p. 894), "exogenous" to environmental influences (e.g., Antonakis, Bendahan, Jacquart, & Lalive, 2010, p. 1090), and "not easily open to development and change" (e.g., Luthans, Avolio, Walumbwa, & Li, 2005, p.

251). Although personality psychologists tend not to believe that personality can change dramatically under normal circumstances, there is an increasing acceptance of the idea that personality is only *moderately* consistent and is also moderately *malleable* even well into late adulthood (Baltes, 1997; Caspi et al., 2005; Helson, Kwan, John, & Jones, 2002; Scollon & Diener, 2006; Terracciano, McCrae, Brant, & Costa, 2005). Moreover, accumulating evidence documents the pivotal role of work environments in shaping personality changes over the lifespan (e.g., Kohn & Schooler, 1982; Roberts et al., 2003; Sutin & Costa, 2010). Yet, whether work environments can modify proactive personality remains unresolved. As discussed below, addressing this issue contributes to the literature of proactive personality and offer important implications for work design research and practices to enhance employee–organization fit (Judge, 2007).

### **Theories of Personality Development**

Three theoretical approaches to understanding personality development are predominant in personality psychology (e.g., Roberts et al., 2003). The classical trait model (e.g., McCrae et al., 2000) postulates that personality development is governed mainly by genetic factors independent of environments; after individuals reach maturity, their personality traits are highly stable (Terracciano, Costa, & McCrae, 2006). Organizational research adopting this perspective typically focuses on selection (Holland, 1996; Schneider, 1987) and crafting effects of personality in work and careers (Bell & Staw, 1989; Wrzesniewski & Dutton, 2001). Extant proactive personality research has predominantly assumed this perspective.

The second model, the contextualist perspective, underscores environmental effects such as life and work experiences on personality development (e.g., James, 1975; Lewis, 1999). This perspective appears to be mostly embraced by sociologists who, while acknowledging selection

effects of personality, seem more interested in examining how socioeconomic variables shape personality change (e.g., Kohn & Schooler, 1982).

The third approach, the interactionist model, emphasizes transactions between the person and the environment. Among these models is the corresposive principle (Roberts et al., 2003; Roberts, Wood, & Caspi, 2008), which posits that the personality characteristics that lead to validating or rewarding experiences in a given life domain will be strengthened over time by those experiences. It reconciles the selection and crafting effects of personalities and the socialization effects of life experiences. Put differently, as individuals change work environments, they gain opportunities to express and further develop relevant skills and motives, which in turn may reinforce the traits that led them to such experiences in the first place (Ackerman & Heggstad, 1997; Jackson, Hill, Payne, Roberts, & Stine-Morrow, 2012; Lent, Brown, & Hackett, 1994). Evidence for the this principle has been accumulating in personality psychology for some time (Caspi et al., 2005; Roberts & Mroczek, 2008; Scollon & Diener, 2006; Sutin & Costa, 2010), but has only begun to emerge in organizational research recently (e.g., Wu & Griffin, 2012).

The interactionist approach views personality as *relatively* enduring patterns of behaviors, thoughts, or feelings (J. A. Johnson, 1997; Roberts et al., 2008), but also susceptible to influences from life experiences throughout the whole period of adulthood (Baltes, 1997). I adopt this approach in studying proactive personality and work environments as they affect each other.

## **Theoretical Development and Hypotheses**

### **Selection of Work Environment Variables**

Work environments are multidimensional in nature (Johns, 2006), I thus focused on work

characteristics that (a) are pertinent to proactivity and (b) capture a relatively comprehensive spectrum of work environments (e.g., pertaining to job, social relationship, and organization).

Work design research has shown that work features related to job tasks and work social support profoundly affect employee job performance and well-being (Hackman & Oldham, 1975; Humphrey, Nahrgang, & Morgeson, 2007). Hence, I included work features from the widely adopted job demand–control–support model (Karasek, 1979; Karasek et al., 1998).

Organizational constraints, a variable widely studied in the work stress literature (e.g., LePine et al., 2004; Spector & Jex, 1998), were also included, because this variable encompasses various aspects of work hindrance in organizations.

More important, those work features provide trait-relevant situations that allow proactive personality to be expressed (Tett & Burnett, 2003; Tett & Guterman, 2000). Consequently, proactive people are likely to engage in such environments that, in turn, may strengthen their proactive propensity over time. Briefly, job demands and organizational constraints may signal the need for positive changes (Bateman & Crant, 1993; Frese & Fay, 2001). Job control and support from supervisors and coworkers provide necessary resources to generate positive work changes (Grant & Ashford, 2008; Parker et al., 2006, see hypothesis development below for details).

### **Proactive Personality and Changes in Work Environments: Selection and Crafting Effects**

The first component of the proposed reciprocal relationship I look at is the effect of proactive personality on changes of work environments. Proactive people seek and are selected into jobs and organizations that have compatible characteristics (Holland, 1996; Schneider, 1987; Schneider, Goldstein, & Smith, 1995). They can further craft their jobs to match their proactive personalities (Bell & Staw, 1989; Wrzesniewski & Dutton, 2001) and, consequently, are likely to

increase their person-job fit over time (Bateman & Crant, 1993; Bindl & Parker, 2010; Erdogan & Bauer, 2005). I am aware, however, of only one study finding that proactive personality related to positive work changes (e.g., salary progression and promotion) across a two-year period (Seibert et al., (2001).

**Proactive personality and changes in job demands, job control, and work social support.** Proactive people “scan for opportunities, show initiative, take action, and persevere until they reach closure by bringing about change” (Bateman & Crant, 1993, p. 104). Among the work features in the job demand–control–support model (Karasek, 1979; Karasek et al., 1998), job control seems most likely to be affected by proactive personality. *Job control*, also called job autonomy, indicates the amount of latitude to make decisions at work (Grant, Fried, & Juillerat, 2010; Hackman & Oldham, 1975). Proactive people have an innate need to manipulate and control their surroundings (Bateman & Crant, 1993). They are willing and able to carry out positive work changes through various proactive behaviors. As such, they tend to increase their job control. Further, meta-analytic evidence showed a corrected correlation of .28 between proactive personality and job control (Fuller & Marler, 2009). Consequently, I expect that proactive personality will be related to increases in job control over time.

*Hypothesis 5a:* Proactive personality is positively related to increases in job control (H5a).

The relationship between proactive personality and changes in job demands appears complex. *Job demands* were originally defined as psychological demands experienced at work, such as workload and time pressure (Karasek, 1979). On the one hand, proactive people may make their jobs increasingly demanding in terms of workload and intellectual stimulation by planning ahead, identifying opportunities, leveraging resources, and overcoming obstacles

(Bateman & Crant, 1993; Grant & Ashford, 2008; Parker, Bindl, & Strauss, 2010). In addition, they are generally competent and more likely to be assigned to difficult tasks. On the other hand, research on work stress and work design has suggested that high job demands may threaten employees' sense of control and well-being (Humphrey et al., 2007; Maslach, Schaufeli, & Leiter, 2001). Hence, proactive people may make their work less demanding, for example by streamlining work procedures. Those two counteracting mechanisms render the overall effects of proactive personality inconclusive. Accordingly, I propose no formal hypothesis on the relationship between proactive personality and changes in job demands.

*Work social support* pertains to helpful assistance from supervisors and coworkers (Karasek & Theorell, 1990). I included both types of support in this study, expecting that proactive personality will increase *supervisory support* in particular. Implementing positive work changes is typically risky and requires resources and support from other organizational stakeholders (Bateman & Crant, 1993; Frese & Fay, 2001; Grant & Ashford, 2008). Supervisors usually possess more resources than coworkers do, and thus such upper-level authorities are the best sources of support for proactive people to seek (Ashford, Rothbard, Piderit, & Dutton, 1998; Morrison & Phelps, 1999). Furthermore, supervisors may grant proactive people more resources and sponsorship in reward for superior performance (Crant, 2000; Seibert et al., 1999).

I expect, however, that proactive people are less likely to seek *coworker support*, which may also be important for implementing positive environmental changes, but may be in general less important than supervisory support. Moreover, coworkers may disdain proactive behaviors because such change-oriented behaviors often rock the boat (Frese & Fay, 2001). Indeed, innovative behavior has been shown to be positively related to coworker conflict (Janssen, (2003). Cross-sectional data provide preliminary evidence for the proposed relationship between



proactive personality and supervisory support (Ohly, Sonnentag, & Pluntke, 2006). To my knowledge, previous studies have not yet compared proactive personality's relationships with supervisory and coworker support. However, meta-analytic research has documented that supervisory support is more important for job attitudes and job performance. For instance, perceived supervisory support was shown to be more strongly related to job satisfaction, affective commitment, turnover intention (Ng & Sorensen, 2008) and organization-directed citizenship behavior (OCBO, Chiaburu & Harrison, 2008) compared with perceived coworker support. Some coworker-support relationships were even nonsignificant. Furthermore, supervisory support was found to be more strongly related than coworker support to objective job performance (Baruch-Feldman, Brondolo, Ben-Dayana, & Schwartz, 2002). I thus propose the following hypothesis:

*Hypothesis 5b:* Proactive personality is positively related to increases in supervisory support (H5b).

**Proactive personality and changes in organizational constraints.** Based on the literature covered in the preceding sections, it seems likely that proactive personality is associated with decreased organizational constraints over time. Proactive people will react to restrictive environments by seeking opportunities and resources to remove obstacles, making constructive suggestions, and persisting until they create positive changes (Bateman & Crant, 1993; Frese & Fay, 2001; Grant & Ashford, 2008). A recent meta-analytic review showed that proactive personality significantly related to numerous proactive behaviors for improving organizational functions, such as taking charge and voice (corrected correlations are .35 and .28 respectively, Tornau & Frese, 2013). Proactive people are also likely to negotiate with their managers and organizations to modify their work arrangements to better suit their work

schedules and training needs (Hornung, Rousseau, & Glaser, 2008). Considering that such proactive behaviors are likely to remove organizational constraints, I predict the following:

*Hypothesis 6:* Proactive personality is positively related to decreases in organizational constraints.

### **Work Environments and Changes in Proactive Personality: Socialization Effects**

**Job demands, job control, and work social support with proactive personality change.** The second component of the proposed reciprocal relationship is the effect of work environments on changes in proactive personality. Research on personality development (e.g., Caspi et al., 2005; Kohn & Schooler, 1982; Roberts et al., 2008) has proposed several mechanisms through which work environments shape proactive personality development. First, work provides opportunities, resources, and rewards that promote proactive behaviors. Thus, as proactive people successfully alter their environments, the repeated proactive behaviors tend to be consolidated, generalized, and habituated, which over time may heighten their general tendencies toward proactivity (Caspi et al., 2005; Deci & Ryan, 1990; Kohn & Schooler, 1973).

Second, neurobiological mechanisms may be operative (Roberts & Jackson, 2008). Specifically, work environments (e.g., demanding tasks) may directly influence hippocampus and hormonal activities (e.g., cortisol and epinephrine, McEwen, 2007), which play pivotal roles in human reward and approach systems (McEwen, 2007). Moreover, such neurobiological activities have been theorized and found to underlie personality traits such as agency and impulse control (Depue & Collins, 1999; Gray, 1970; Zuckerman, 1991), which are somewhat related to proactive personality. Thus it seems likely that work environments can alter those neurobiological activities, which may further prompt changes in proactive propensity over time.

The extant literature has relatively less emphasized a third mechanism, that is, work

environments may change personality through skill development. As people deal with challenging tasks, they acquire new knowledge and develop new skills (DeRue & Wellman, 2009; Dragoni, Tesluk, Russell, & Oh, 2009). As knowledge and skills accrue, personality changes may follow because people come to see themselves differently (Ackerman & Heggestad, 1997; Jackson et al., 2012; Lent et al., 1994). In addition, boosted skills over time can further enhance the propensity to seek more difficult tasks such as changing the work environment (Bandura, 1997; Locke & Latham, 1990, 2006). Note that the three mechanisms, consolidation of proactive behaviors, neurobiological functions, and skill development, are not necessarily mutually exclusive.

I expect job demands may affect proactive personality change through all the three mechanisms. Job demands such as high workload and time pressure indicate suboptimal work environments that need positive change (Fay & Sonnentag, 2002). Indeed, proactivity research showed that job demands positively impact proactive behaviors (Fay & Sonnentag, 2002; Ohly & Fritz, 2010). In addition, job demands may change cortisol and epinephrine levels and hippocampus activities (Kunz-Ebrecht, Kirschbaum, & Steptoe, 2004; McEwen, 2007), one of the biological reward and approach systems that may be related to human agency (Zuckerman, 1991). High job demands also provide challenges to stretch employees' skills (Ohlott, 2004) and cause them to develop their various competencies (DeRue & Wellman, 2009; Dragoni et al., 2009). The above reasoning and analyses lead to the following hypothesis:

*Hypothesis 7a:* Job demands are positively related to increases in proactive personality over time (H7a).

By the same token, I expect job control and work social support from supervisors and coworkers to increase proactive personality longitudinally. Regarding the consolidation of

proactive behaviors, high level of job control makes people feel responsible and grants them ample freedom to engage in proactive behaviors (Grant & Ashford, 2008; Hackman & Oldham, 1976; Parker et al., 2006). Similarly, supporting relationships with supervisors and coworkers can bring about necessary resources to successfully implement positive environmental changes (Frese & Fay, 2001; Grant & Ashford, 2008; Van Dyne, Kamdar, & Joireman, 2008).

Although empirical evidence directly supporting the other two mechanisms, neurobiological functions and skill development in the relationships of job control and work social support with proactive personality changes, is relatively thin, a number of related studies are suggestive. Job control was found to be negatively related with males' levels of cortisol, a stress hormone (Kunz-Ebrecht et al., 2004) and was also reported to facilitate acquisition of knowledge related to work task and organization (Parker & Axtell, 2001; Wall, Jackson, & Davids, 1992), which may further boost skill development. A work-stress study found that social support from friends and families reduced allostatic load, a physiological stress reaction (Seeman, Singer, Ryff, Love, & Levy-Storms, 2002) and cortisol levels (Heinrichs, Baumgartner, Kirschbaum, & Ehlert, 2003). A study on performance feedback found that supportive supervisors and organizations following 360-degree feedback increased employees' management skills (Hazucha, Hezlett, & Schneider, 2006).

Thus job control, supervisory support, and coworker support tend to encourage more proactive behaviors, to change neurobiological functions, and to stimulate skill development. Over time, those changes may increase proactive personality. Personality development research has indirectly supported such effects for job control. Mortimer and Lorence (1979) reported that job control was related to increased competence orientation over a ten-year period. Likewise, Roberts et al. (2003) found that job control was associated with increased agentic traits of social

potency and achievement across a period of six years. I thus hypothesize the following:

*Hypothesis 7b, 7c, and 7d:* Job control (H7b), supervisory support (H7c), and coworker support (H7d) are positively related to increases in proactive personality over time.

**Organizational constraints and proactive personality change.** The effects of organizational constraints on proactive personality changes do not appear straightforward. On the one hand, constraints interfering with organizational functioning may indicate unsatisfactory work environments, thus calling for proactive work changes (Fay & Sonnentag, 2002). As such organizational constraints may spur proactive people to remove hindrances preventing efficient organizational performance. In support of this notion, the creativity literature has shown that job dissatisfaction indicates a need for change that can indeed be realized (e.g., when organization commitment and organization support are high, Zhou & George, 2001). On the other hand, organizational constraints such as problems with equipment and production are likely to hinder intrinsic motivation, prohibit learning, and prevent goal achievement (Cavanaugh, Boswell, Roehling, & Boudreau, 2000; LePine et al., 2004). The two competing mechanisms prevent a directional hypothesis.

### **Reciprocal Relationship between Proactive Personality and Work Environments**

Thus far, I have delineated the selection and crafting effects of proactive personality on changes in work environments and socialization effect of work environments on proactive personality development. According to the corresponsive principle, I expect that the work environments which can be modified by proactive personality are the same variables which may further cultivate proactive personality development (Roberts et al., 2003; Roberts et al., 2008), essentially a positive *reciprocal* relationship. Combining Hypotheses 5, 6 and 7, reciprocal relationships may occur for job control and supervisory support. Stated differently, the reciprocal

relationships entail *simultaneous* support of the following relationships: proactive personality is positively related to increases in job control (H5a) and supervisory support (H5b); job control (H7b) and supervisory support (H7c) are in turn related to increases in proactive personality.

The reciprocal relationships between the person and the environment has been germane to research on person–environment transaction from an interactionist perspective. For example, Bandura's (1978, 2001) *reciprocal determinism* states that people influence and are influenced by their surroundings. Similarly, Chatman (1991) theorized and found evidence for the selection effect of individual characteristics and the socialization effect of work contexts in a longitudinal study on person-organization fit. Such reciprocal relationships have long been studied by sociologists as well (e.g., Kohn & Schooler, 1978; Kohn & Schooler, 1982). Recently, personality psychologists have shown increased interests in such relationships. One notable study by Roberts et al. (2003) observed reciprocal relationships between work autonomy and social potency in a two-wave longitudinal study. OB researchers have just begun to examine such reciprocal relationships. For example, Frese et al. (2007) found reciprocal relationships between work characteristics and control orientations. More recently, Wu and Griffin (2012) reported a reciprocal relationship between job satisfaction and core-self evaluations. Proactive personality seems to be a pertinent individual characteristic for studying reciprocal relationships between the person and the environment, because by definition, it essentially captures the transactions between the agentic person and the environment.

*Hypothesis 8:* Over time, there are reciprocal relationships of proactive personality with job control (H8a) and supervisory support (H8b).

## **Method**

### **Participants and Procedures**

I tested this set of hypotheses by conducting a secondary analysis of three-wave data from a longitudinal study undertaken in East Germany shortly after the East and West reunification in 1990 (Frese et al., 2007; Garst, Frese, & Molenaar, 2000).<sup>1</sup> The three-wave data were collected in 1992, 1993, and 1995. The changing socioeconomic and cultural context provided an appropriate opportunity to study personality change (George, Helson, & John, 2011).

For this study, I included only participants with complete information on demographics (e.g., age and gender), proactive personality, and at least one work variable. Including participants with both complete and incomplete information on study variables is a suggested practice in longitudinal research, because it can produce results which are not affected by participant attrition (McArdle, 2009). This purpose was achieved by using full information maximum likelihood (FIML) estimation in Mplus 6.12, which uses all available information (Muthen & Muthen, 1998-2011). The sample was restricted to 458 individuals: 239 (52.2%) were male; their average age at Time 1 was 40.25 ( $SD = 10.74$ ); 76.2% had at least 10 years of education; 40.3% were blue-collar workers, 13.6 % were lower-level white-collar workers (e.g., clerk), and 40.4% were managers and professionals.

## Measures

**Proactive personality.** Because the project of longitudinal study was launched (i.e., in

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<sup>1</sup> This project includes six-waves of data collection and has produced nine separate studies and had three objectives: first, to provide a psychohistorical account of the changes in East Germany after reunification; second, to examine stress and well-being; and third, to study personality initiative behavior and its development. Prior publications on personal initiative behavior using the database have investigated the validity of personality initiative behavior and personality measures (Fay & Frese, 2001; Frese, Fay, Hilburger, Leng, & Tag, 1997) and control aspiration measures (Frese, Erbe-Heinbokel, Grefe, Ryowiak, & Weike, 1994), differences of personal initiative behavior between East and West Germany (Frese, Kring, Soose, & Zempel, 1996), relationships between personal initiative behavior and age (Warr & Fay, 2001) and conservatism (Fay & Frese, 2000a), the function of self-efficacy for the development of personal initiative behavior (Speier & Frese, 1997), work stressors and personal initiative behavior (Fay & Sonnentag, 2002), work stressors and strain (Garst et al., 2000), and reciprocal relationship among work characteristics (only job control and complexity), control orientation, and personal initiative behavior (Frese et al., 2007). The current study uses the last three waves of data of the project. It investigates research questions which are essentially distinguished from those examined in previous studies: the lagged effects of proactive personality on changes in work experiences, the lagged effects of work experiences on changes in proactive personality, and reciprocal relationships between proactive personality and work experiences. Furthermore, no substantive analyses on proactive personality have been published from this dataset.

1990) before the development of the Proactive Personality Scale (Bateman & Crant, 1993), it included no direct measure of proactive personality. I employed the self-report measure of personal initiative (Frese et al., 1997) to capture people's enduring tendency to engage in proactive behaviors ( $\alpha = .84, .88, \text{ and } .86$  for the three waves). Participants indicated the extent to which they agree or disagree on seven items using a five-point scale (1 = *Strongly disagree*, 5 = *Strongly agree*). Sample items include "I use opportunities quickly in order to attain my goals" and "I actively attack problems."

Although the behavioral manifestation of personal initiative is defined and measured distinctly from proactive personality, the self-report personal initiative measure essentially captures the same personality construct as do scales of proactive personality. Indeed, Fay and Frese (2001) reported a corrected correlation of .96 between the two personality measures. In a recent meta-analysis, Tornau and Frese (2013) reported a corrected correlation of .71 across five studies. In this meta-analysis, the two measures of proactive personality have very similar patterns of correlations with various variables including the Big Five personality traits, intelligence, role-breadth self-efficacy, job satisfaction, and job performance. Thus I concur with Frese and Fay (2001) that in terms of construct measurement "both personality measures are essentially identical" (p. 158). See Appendix D for a comparison of items in the two proactive personality measures.

Furthermore, research has shown that the self-report personality measure used in the current study has low to moderate correlations (from .11 to .29) with behavioral measures of personal initiative (Frese et al., 1997). A corrected correlation of .17 between the two measures was reported in a meta analysis (Tornau & Frese, 2013). The above evidence indicates the two constructs are distinct from each other.



**Job demands, job control, and work social support.** All work variables were captured by scales widely used in Germany. Job demands and job control were measured by instruments devised by Semmer (1982) and Zapf (1993) on a scale from 1 (*Not true at all*) to 5 (*Completely true*), which have also been used by other researchers (e.g., Fay & Sonnentag, 2012; Sonnentag & Zijlstra, 2006). The *job demands* measure includes five items ( $\alpha = .76, .70,$  and  $.70$  respectively for the three waves) tapping into job aspects of workload, time pressure, and concentration demands on a five-point scale (1 = *Rarely*, 5 = *Very often*). The *job control* scale is composed of four items ( $\alpha = .82, .81,$  and  $.83$  respectively) capturing decision-making freedom in planning work, choosing material, and so forth. Sample items are "How often are you under time pressure?" (job demands) and "Can you decide yourself the way you work?" (job control).

*Supervisor and coworker support* were assessed using scales adapted from Caplan, Cobb, French, van Harrison, and Pinneau (1975) with sufficient reliability and validity (Frese, 1999). Participants rated on a four-point scale (1 = *Not at all*, 4 = *Absolutely*) the following three questions with references to supervisors and colleagues respectively: "How much is ... helpful for you to get your job done?" "How much is ... willing to listen to your work-related problems?" "How much can ... be relied on when things get tough at work?" The two scales have sufficient reliabilities for all three waves (for supervisory support,  $\alpha = .87, .86,$  and  $.85$ ; for coworker support,  $\alpha = .82, .83,$  and  $.81$ ).

**Organizational constraints.** *Organizational constraints* was assessed using an eight-item instrument of situational constraints interfering with job performance in organization ( $\alpha = .83, .85,$  and  $.85$  respectively) developed by Semmer (1982) and Zapf (1993). This is also consistent with the definition and conceptualization used in other studies (e.g., Spector & Jex, 1998). Participants evaluated how frequently they encountered problems with equipment, tools,

materials, and production on a five-point scale (1 = *Rarely*, 5 = *Very often*). One sample item is "How often is there a lack of supplies at your workplace?"

**Control variables.** I included gender and age as control variables because they may influence personality development (Caspi et al., 2005; Roberts & Mroczek, 2008). Including educational levels as an additional control was inappropriate because proactive people tend to pursue higher educational levels as a form of proactive behavior, which may in turn affect their work experiences (Frese & Fay, 2001). Thus controlling for education would partial out the substantive effects I examine (Spector & Brannick, 2011; Spector, Zapf, Chen, & Frese, 2000).<sup>2</sup>

### **Analytical Strategy**

I adopted *latent change score* (LCS) models (Ferrer & McArdle, 2010; McArdle, 2001, 2009; McArdle & Hamagami, 2001) to test the hypotheses. Initially termed latent difference score model, LCS model is appropriate to test lagged and reciprocal effects and is suitable for my purposes. Figure 2 presents a path diagram of a latent change score model with two factors: proactive personality and a work environment variable.

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Insert Figure 2 about here  
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LCS models are characterized by the following features. First, measurement invariance of the two constructs across measurement occasions is assumed. Second, each of the two variables at Time  $n+1$  (e.g., Personality T2) is modeled to be predicted by the same variable at Time  $n$  (e.g., Personality T1) and a latent change score variable from Time  $n$  to Time  $n+1$  (e.g.,  $\Delta$  Personality, T1-T2). Third, latent intercept and slope for a variable (e.g., Intercept 1 and Slope 1

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<sup>2</sup> I also performed analyses with education controlled and obtained very similar results.

for proactive personality) are constructed as affecting respectively the variable at the first occasion (e.g., Personality T1) and latent change score variables (e.g.,  $\Delta$  Personality, T1-T2 and  $\Delta$  Personality, T2-T3). Fourth and accordingly, latent change score variables (e.g.,  $\Delta$  Personality, T1-T2) are modeled as being affected by two parts of changes: a linear constant change from the slope (e.g., Slope 1) and a proportional change from the construct at a previous occasion (e.g., Personality T1), which allows for nonlinear trajectories. Fifth, when modeling relationships between two repeatedly assessed variables, LCS models permit examining whether changes in one variable (e.g.,  $\Delta$  Personality, T1-T2) are affected by the other variable measured at a previous occasion (e.g., Work Variable T1) and vice versa. As such, reciprocal relationships can be tested. Path coefficient  $\gamma_1$  represents lagged effects of work variables on changes in proactive personality, thus relevant in testing Hypothesis 7. Likewise,  $\gamma_2$  is important in testing Hypothesis 5 and Hypothesis 6. Whether the two path coefficients  $\gamma_1$  and  $\gamma_2$  are *both* significant is used to test Hypothesis 8 on reciprocal relationships.

Note that LCS models are more generalized than are latent growth curve and cross-lagged models (McArdle, 2009). By fixing effects of intercepts and slopes to zero, LCS models become the same as cross-lagged models. Similarly, latent growth models can be fitted by eliminating autoregressive influences (e.g., from personality T1 to change in personality T1-T2) and cross-predictions between the two variables. A unique advantage of LCS models is that they enable us to investigate "cross-lagged dynamic coupling of key factors over time" (McArdle, 2009, p. 597), which is appropriate to test my hypotheses. Researchers have begun to use LCS models to study personality change (Jackson et al., 2012) and dynamics in organizational behavior (Toker & Biron, 2012).

## Results

### **Confirmatory Factor Analyses**

CFAs were conducted to demonstrate that study variables measured at each of the three occasions are different from each other. Given the relatively large number of items (30) compared with the sample size (from 330 to 458), item parcels were used in CFAs (not in longitudinal analyses) to reduce number of estimated parameters (R. J. Hall, Snell, & Foust, 1999; Landis, Beal, & Tesluk, 2000; Little, Cunningham, Shahar, & Widaman, 2002; Mathieu, Gilson, & Ruddy, 2006). Four item parcels were created for the three study variables respectively: job demands, organizational constraints, and proactive personality, by randomly assigning items to composites (Landis et al., 2000). No item parcels were needed for job control, supervisory support, and coworker support because their measures are composed of only four or three items. Results show that a six-factor model (with job demands, job control, supervisory support, coworker support, organizational constraints, and proactive personality) yielded an adequate fit to the Time 1 data ( $\chi^2 = 413.69$ ,  $df = 191$ ,  $p < .001$ , CFI = .95, TLI = .93, RMSEA = .052, and SRMR = .055). This model fit data significantly better than an alternative model with a five-factor structure combining the two work social support variables ( $\Delta\chi^2 = 354.57$ ,  $\Delta df = 5$ ,  $p < .001$ ;  $\chi^2 = 768.26$ ,  $df = 196$ ,  $p < .001$ , CFI = .86, TLI = .84, RMSEA = .082, and SRMR = .073) and a one-factor structure combining all the six variables ( $\Delta\chi^2 = 2745.61$ ,  $\Delta df = 37$ ,  $p < .001$ ;  $\chi^2 = 3159.30$ ,  $df = 228$ ,  $p < .001$ , CFI = .32, TLI = .24, RMSEA = .172, and SRMR = .182). Similar results were obtained for data collected at the other two waves (for Time 2,  $\chi^2 = 471.00$ ,  $df = 191$ ,  $p < .001$ , CFI = .93, TLI = .92, RMSEA = .059, and SRMR = .062; for Time 3,  $\chi^2 = 468.35$ ,  $df = 191$ ,  $p < .001$ , CFI = .93, TLI = .92, RMSEA = .058, and SRMR = .060). The evidence indicates the measures of this study were distinct from each other for all three occasions.

### **Measurement Equivalence**

I further examined metric equivalence (i.e., factor loading invariance) of all the measures across the three waves of data collection again using item parcels (Vandenberg & Lance, 2000). CFA results showed sufficient invariance of the measures across time ( $\chi^2 = 3301.34$ ,  $df = 1921$ ,  $p < .001$ , CFI = .91, TLI = .90, RMSEA = .040, and SRMR = .061).

### Tests of Hypotheses

Table 8 displays the means, standard deviations, and zero-order correlations among variables of this study. I calculated rank-order and mean-level change in proactive personality and work variables for the sample as a whole (Caspi et al., 2005). Rank-order changes are typically indicated by correlations of variables at different occasions. As displayed in Table 8, for proactive personality, the correlations were .68 between T1 and T2, .71 between T2 and T3, and .73 between T1 and T3, suggesting moderate stability (which is typical for other personality traits, see Roberts & DelVecchio, 2000). The correlations for work variables ranged from .42 to .71, indicating that these variables were also moderately stable across time.

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Insert Table 8 about here  
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Regarding mean-level change, participants' proactive personality slightly increased (Cohen's  $d = .19$ ,  $t = 3.48$ ,  $p < .001$ ) from T1 to T2, but did not change significantly from T2 to T3 (Cohen's  $d = .07$ ,  $t = 1.42$ ,  $p > .10$ ). With respect to work environment variables, only organizational constraints experienced a decrease from T1 to T2 (Cohen's  $d = -.18$ ,  $t = -2.93$ ,  $p < .01$ ), which is in line with previous research (Fay & Frese, 2000b). As indicators of change and stability of the entire sample, mean-level and rank-order stabilities do not prevent further examination of reciprocal relationships, because such inquiry taps into individual differences in

change (Caspi et al., 2005; Roberts & Mroczek, 2008; Roberts et al., 2008).

**Lagged effects of proactive personality on changes in work environments.**

Hypothesis 5 predicted that proactive personality is related to positive changes in job control (H5a) and supervisory support (H5b). Results of fitting five bivariate latent change score models (with measurement models based on original items) are depicted in Table 9. Results (Model 2) showed that with age and gender controlled for, proactive personality was significantly related to increases in job control ( $\gamma_2 = .30, p < .001$ ), providing support for H5a. Likewise, in support of H5b, proactive personality also had positive lagged effects on increases in supervisory support ( $\gamma_2 = .14, p < .05$ , Model 3). Results also showed that means for slope (Slope 1) and intercept (Intercept 1) of proactive personality across time were positive ( $= 3.29, p < .01$ , and  $3.50, p < .01$ ) respectively, suggesting a positive trajectory after correcting for effects of demographics.

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Insert Table 9 about here  
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Hypothesis 6 focused on the lagged effects of proactive personality on changes in organizational constraints. LCS analyses provided support by showing a negative relationship of proactive personality with increase in organizational constraints ( $\gamma_2 = -.13, p < .01$ , Model 5). While the relationship between proactive personality and changes in coworker support was not significant ( $\gamma_2 = .07, p > .05$ , Model 4), a significant relationship between proactive personality and increases in job demands was observed ( $\gamma_2 = .11, p < .01$ , Model 1).

**Lagged effects of work environments on changes in proactive personality.**

Hypothesis 7 stated that job demands (H7a), job control (H7b), supervisory support (H7c), and coworker support (H7d) have lagged effect on changes in proactive personality. My analyses

revealed significant effects for job demands ( $\gamma_1 = .07, p < .05$ , Model 1) and job control ( $\gamma_1 = .05, p < .05$ , Model 2) but not for the two support variables (for supervisory support,  $\gamma_1 = .04, p > .10$ , Model 3; for coworker support,  $\gamma_1 = .01, p > .10$ , Model 4). The results supported only H7a and H7b.

### **Reciprocal relationships between proactive personality and work environments.**

Hypothesis 8 predicted reciprocal relationships of proactive personality with job control (H8a) and supervisory support (H8b). As discussed above, proactive personality had lagged effects on increases in job control (H5a); increased job control also enhanced proactive personality (H7b). Thus H8a was supported. Supervisory support did not relate to increases in proactive personality, leading no support to H8b. Together, Hypothesis 8 received partial support.

## **Discussion**

Researchers adopting an interactionist approach have long theorized a reciprocal relationship between the person and the environment (e.g., Bandura, 1977; Bell & Staw, 1989; Chatman, 1991; D. T. Hall, 1971; Schneider, 1983; Terborg, 1981). Drawing upon recent research on personality development rooted in this approach (e.g., Caspi et al., 2005; Roberts & Mroczek, 2008), I investigated in a three-wave longitudinal study whether proactive personality can bring about changes in work environments that, in turn, further affect proactive personality development. This study has important implications for research and practice on proactive personality and proactivity in general.

### **Theoretical Implications**

**Proactive personality and changes in work environments.** In this study, I examined a core characteristic of proactive personality, that is, producing meaningful and positive changes in the workplace (Bateman & Crant, 1993). The findings suggest that proactive personality can

improve positive work aspects such as job control and supervisory support and reduce inhibiting aspects such as organizational constraints. Consistent with prior research showing that proactive people define their roles more broadly (Parker et al., 2006), I found that proactive personality led to increases in job demands despite the potential threat that demanding work may inhibit job control and well-being (Humphrey et al., 2007). Future research need examine this relationship in greater depth, for instance, to test well-being-related outcomes of increased job demands.

**Work environments and proactive personality change.** My results show that job demands over time stimulated positive changes in proactive personality. That finding aligns with previous proactivity research showing that job demands spur proactive behaviors (Fay & Sonnentag, 2002; Ohly & Fritz, 2010). The results also resonate with the leader development literature documenting influences of challenging work assignments on development of leadership capabilities (e.g., DeRue & Wellman, 2009; Dragoni et al., 2009; Ohlott, 2004). Similarly, in line with prior research on proactive behaviors (Parker et al., 2006), I also observed beneficial effects of job control on enhancing proactive propensity. The effects of work environments on proactive personality development have been recognized since Bateman and Crant's (1993) seminal research which was grounded in the interactionist view of psychology. Taken together, the results of this study echo personality development research stating that investment in and successful fulfillment of work roles drive personality development, in both sociology (e.g., Elder, 1969; Kohn & Schooler, 1978; Mortimer & Lorence, 1979) and personality psychology (Caspi et al., 2005; Helson et al., 2002; Roberts & Mroczek, 2008; Sutin & Costa, 2010). Similarly, the social investment principle (Roberts, Wood, & Smith, 2005) and the learning-generalization model (Kohn & Schooler, 1973) postulate that as people acquire greater work responsibilities they internalize their work experiences to the self, leading to personality



changes.

**Reciprocal relationships between proactive personality and work environments.** My analyses revealed significant reciprocal relationships between proactive personality and job control. Proactive people tend to garner more control at work, which in turn contributes to further advancement of proactive personality over time. Previous longitudinal research reported similar findings between work environments and individual characteristics. In addition to findings described in the introduction (Chatman, 1991; Frese et al., 2007; Roberts et al., 2003; Wu & Griffin, 2012), Kohn and Schooler (1978, 1982) observed that people with high levels of ideational flexibility (similar to openness) increased their job complexity and self-direction over a period of 10 years. Job complexity and self-direction also increased ideational flexibility. Those findings support the corresponive principle that the personality traits that draw people to certain work experiences may be further cultivated by those same work experiences (Roberts et al., 2003; Roberts et al., 2008).

According to the corresponive principle, mutual reinforcement of personality and work environments will generate positive feedback loops over time. Although the results suggest such a trend between proactive personality and job control, I do not know how long the mutually reinforcing process endures. One major reason for being proactive is to gain personal mastery over the environment (Bateman & Crant, 1993). If people believe that they have already achieved high levels of control, the ensuing positive affect may signal that they no longer need to be proactive (Carver & Scheier, 1998). Indeed, Roberts and Robins (2004) found that high levels of person–environment fit (e.g., need fulfillment) were related to less personality malleability or more consistency. Similarly, Chatman, Wong, and Joyce (2008) and Schneider (1987) point out that misfits may drive both individual and organizational change respectively. Although

supervisory support facilitates short-term proactive behaviors (Van Dyne et al., 2008), it was not observed to fuel long-term proactive personality development in the current study.

Job challenge seems a necessary catalyst for instigating individual change and development. In fact, the results show a reciprocal relationship between job demands, a form of job challenge, and proactive personality. Job demands, however, may breed job stress and hinder well-being (e.g., Humphrey et al., 2007; Maslach et al., 2001). The tension evoked by job challenge between enabling development and reducing well-being deserves future research attention.

Note that I also tested the active learning hypothesis (Karasek, 1979; Karasek & Theorell, 1990) because one might argue that strong job demands combined with high levels of job control or work support likely result in employee learning and development, and thereafter instigate change in proactive personality. I examined two-way interactions of Time 1 (Time 2) job demands with job control, supervisory support, or coworker support, and three-way interactions among job demands, job control, and supervisory support or coworker support on Time 2 (Time 3) proactive personality with Time 1 (Time 2) proactive personality controlled. The interactive effects were statistically nonsignificant, consistent with review research concluding that the active learning hypothesis has received mixed or weak support (Häusser, Mojzisch, Niesel, & Schulz-Hardt, 2010; Van Der Doef & Maes, 1999). Future research can further use commensurate measures of job demands and job control or social support (Häusser et al., 2010).

I found no significant lagged effects of coworker support on changes in proactive personality, nor vice versa. Proactive behaviors may be discouraged at work, because they may hurt coworkers' interests and cause conflicts (Frese & Fay, 2001; Janssen, 2003). In addition, individuals with high cognitive ability and high agentic characteristics are more likely to be

bullied in the workplace (E. Kim & Glomb, 2010). Proactive behaviors may be rewarded only for employees with high levels of prosocial motives and low levels of negative affect (Grant, Parker, & Collins, 2009). Future research may explore coworkers' attribution and the interaction between proactive people and their coworkers in initiating environmental change.

### **Practical Implications**

This study has implications for employees in managing their career transactions and for organizations in dealing with challenges posed by proactive employees. With increasing employee mobility across organizations, employees are finding it more important to act proactively to maintain their jobs and remain employable (Arthur & Rousseau, 1996). The positive lagged effect of job control on proactive personality development suggests that employees may actively seek organizations that offer more discretion in decision-making, to make themselves more proactive, because a proactive propensity can grant long-term career benefits. Managers can provide more autonomous job tasks to appeal to and retain proactive employees. Such empowerment practices align with McGregor's (1960) theory Y of management. Furthermore, the findings that proactive people can increase their job control and supervisory support over time suggest that organizations must consider employees' proactivity for customizing their jobs, formally or informally (Wrzesniewski & Dutton, 2001). If proactive employees fail to obtain optimal levels of person–organization fit, they may be dissatisfied (Erdogan & Bauer, 2005) or even quit.

### **Study Strengths, Limitations, and Future Research**

This study has a number of strengths. I use latent change score modeling (Ferrer & McArdle, 2010; McArdle, 2001, 2009; McArdle & Hamagami, 2001) based on three waves of longitudinal data to examine dynamic reciprocal relationships of proactive personality with an

array of work environment variables. Moreover, the study represents the first longitudinal assessment of the reciprocal relationship between work characteristics and proactive personality.

Nevertheless, the study also has several limitations. First, the measures of work environments are self-reported. Self-reported measures of work characteristics, especially those related to job content, are considered valid and reliable (e.g., Frese & Zapf, 1999; Liu, Spector, & Jex, 2005; Spector & Jex, 1991). The use of LCS models to capture changes reduces concerns about potential common method problems. Nevertheless, future research can utilize both self-reported and other-rated work environments that may offer different perspectives (Atwater, Ostroff, Yammarino, & Fleenor, 1998; H. Kim & Yukl, 1995).

Second, I examined only a limited number of work environment variables. Future research should examine other types of work experiences such as income (Sutin, Costa Jr, Miech, & Eaton, 2009), promotions (Roberts et al., 2003), and challenging assignments (Ohlott, 2004). Further, it would be worth investigating the impact of life experiences on proactive personality before joining the workforce, such as transitions from school to adult life (Bleidorn, 2012).

Third, the results may also reflect personality change under the specific economic and cultural context of Germany reunification during the three years this study examined. Many studies on personality change examined longer time intervals. The relationship between time and change is rather complex and may be over-simplified in this study. Future research needs more sophisticated designs to gain a deeper understanding of various types of change (Collins, 2006).

Fourth, LCS models typically assume equal time intervals between adjacent occasions to simplify model specifications (e.g., presuming effects of time are similar across different occasions). Like many previous studies using this methodology in studying development of individual characteristics (e.g., Jackson et al., 2012; Sargent-Cox, Anstey, & Luszcz, 2012) and

in organizational psychology (e.g., Toker & Biron, 2012), the time intervals of this study were uneven. However, this concern may be alleviated as reunification effects may decay over time (Fay & Sonnentag, 2002).

Fifth, I did not examine the three mechanisms for the effects of work environments on proactive personality changes. Although the literature has increasingly demonstrated the impact of life events on personality development, researchers have rarely explicitly studied the causal mechanisms by which personality changes occur in response to the environment. Most researchers in personality psychology assume that personality changes take place when positive behaviors are reinforced and negative behaviors are punished through social forces (e.g. praise or scorn, Hudson, Roberts, & Lodi-Smith, 2012; Roberts et al., 2008). More recently, researchers have offered sociogenomic explanations for changes in personality in response to environments (Roberts & Jackson, 2008), highlighting the importance of generalization of behaviors and neurobiological functions. A third mechanism, skill development, seems to be relatively less stressed. The educational literature often attributes changes in personality traits to the development of skills that make various tasks and behaviors easier to perform (e.g., Lent et al., 1994). Recent research in personality development has just started to tackle this mechanism (Jackson et al., 2012; Mõttus, Johnson, Starr, & Deary, 2012). Future interdisciplinary research initiatives are needed to examine the distinct mediating mechanisms.

## **General Discussion**

In their seminal paper, Bateman and Crant (1993) defined proactive personality as individuals' propensity to modify their environment. The core characteristics of proactive personality, including self initiation, anticipation, and perseverance in goal striving, resonate well with the key features of human agency forwarded by Bandura (2001): intentionality/planfulness, forethought, self-reactiveness/self regulation, and self-reflectiveness. In his article, Bandura (2001) extended his social cognitive theory to a broader theory of human agency and elucidated emergence, functions, and changes in human agency from a perspective of biosocial coevolution. Given proactive personality is a very important form of human agency, I situate the general discussion of this dissertation in the literature on proactivity, human agency, and an interactionist perspective to organization research.

### **Genetic and Environmental Influences on Proactive Personality and in Its Relationships with Career Success**

Research on evolutionary psychology suggests that psychological and physiological dispositions which engender advantages for survival and reproduction are likely to be selected and maintained during the extended processes of human evolution (Buss, 1995; Nicholson, 1997). Being proactive, as documented in recent meta analyses, is related to high levels of job performance, well-being, and careers success (Fuller & Marler, 2009; Thomas et al., 2010; Tornau & Frese, 2013), thus seems likely to grant edges for individuals' survival and reproduction. Bandura (2001) also acknowledged that "[genetic] endowments enabled an organism to manipulate, alter, and construct new environmental conditions" (p. 20). Results in the first study show that a substantial amount of individual differences in proactive personality is attributable to differences in people's genetic architecture, while environmental factors seems to

account more variance in the proactive propensity.

Given that genetic factors affect both proactive personality and career success variables, it seems likely that common genetic factors may account for the observed relationships between proactive personality and career success. Existence of such common genetic factors indicates a neurobiological mechanism underlying these relationships, that is, neurobiological factors (e.g., genetics and dopamine functions) relate to proactive propensity, which in turn, is associated with high levels of career success. Such neurobiological mechanisms seems especially important in the relationships of proactive personality with job complexity and psychological well-being. Moreover, a neurobiological mechanism seems also play a major role in explaining the mediated relationship in which proactive personality is related to psychological well-being through job complexity.

By the same token, existence of common environmental factors related to both proactive personality and career success indicates the importance of environmental causation. Such an environmental mechanism is especially important in accounting for the relationships of proactive personality with leadership role occupancy and income. As other behavioral genetic research, this study did not examine such specific environmental factors. The literatures on proactivity, work stress, and career success suggest that such common environmental factors may encompass supportive and challenging environment (e.g., Berlew & Hall, 1966; LePine et al., 2005). Such issues were explored in the second study.

Findings of the first study point to a balanced view of the significance of nature *and* nurture in shaping proactive personality and its relationships with career success. Future research can examine specific genetic and specific environmental factors related to proactive personality. Pinpointing specific DNA and other neurobiological functions related to personality traits is a

very important trend in personality psychology (e.g., McCrae, Scally, Terracciano, Abecasis, & Costa Jr, 2010). Important candidates are dopamine and serotonin related DNA markers. Meta analysis (Munafò et al., 2008) showed that a dopamine receptor marker D4 (DRD4) is reliably associated with approach-related personality traits, such as sensation/novelty seeking, which is somewhat related to proactive personality. Proactive personality may also be related to serotonin system genetic markers. For instance, Carver, Johnson, Joormann, Kim, and Nam (2011) found that serotonin transporter gene, 5HTT<sub>PPR</sub>, was related to impulsivity (e.g., lack of self control) with participants with childhood adversity. Identifying specific DNA markers can also contribute to the investigation of common genetic factors related to both proactive personality and career success variables.

### **Development of Proactive Personality**

Based on findings of the first study that environmental influences also affect proactive personality, in the second study I probed impacts of important environmental factors, i.e., work characteristics, on proactive personality development. Results show that having high levels of job demands and job control enhance individuals' proactive personality over time. Personality traits are conventionally conceived as relatively stable and very difficult to change at adulthood in psychology and seems more so in organization research (e.g., Antonakis et al., 2010; Fugate et al., 2012; Luthans et al., 2005). However, accumulating empirical evidence has documented that adult personality traits are only moderately stable; they are also moderately malleable (for reviews, see Caspi et al., 2005; Roberts & Mroczek, 2008). Those evidence are consistent with an interactionist perspective on personality development (Roberts et al., 2008) contending that there is a positive feedback loop between personality traits and congruent life environments. That is, people with certain personality characteristics may gravitate into environments with



compatible features due to selection, which in turn, may further heighten their individual characteristics as a result of socialization effect (Roberts et al., 2003). Indeed, results of the second study also demonstrate significant lagged effects of proactive personality on changes in work environments (see the following section for more).

### **Longitudinal Effects of Proactive Personality**

Results of my second study revealed that being proactive had lagged effects on increases in job demands, job control, and supervisory support. By its definition, proactive personality represents individuals' disposition to alter the environment (Bateman & Crant, 1993). Investigating such an effect provides a direct examination of a core component of proactive personality: changing environments. It also sheds light on a causal relationship from proactive personality to work outcomes.

### **Biological and Developmental Approaches to Organization Research and their Theoretical Contributions**

**Biological approaches to organization research.** A biological perspective has been increasingly embraced in organization research (e.g., Arvey & Bouchard, 1994; Heaphy & Dutton, 2008; Ilies, Arvey, & Bouchard, 2006; Senior, Lee, & Butler, 2011; Shane, 2009). Different streams of research have highlighted the critical role of human body in shaping individuals' thoughts, feelings, and behaviors, as well as in moderating environmental influences on individuals' behaviors. For instance, Arvey et al. (1989) introduced behavioral genetics approaches in studying job satisfaction. Recently researchers identified specific genetic markers responsible for such a significant genetic effect on job satisfaction (Song et al., 2011). Furthermore, an emerging area of organizational cognitive neuroscience (Senior et al., 2011) has outlined the benefits and methods researchers can adopt to link brain functions to organizational

behavior. Indeed, Waldman, Balthazard, and Peterson (2011) reported significant relationships between brain activities and inspirational leadership using quantitative electroencephalogram methods. The field of work stress has long applied stress hormones (e.g., cortisol) as indicators of physiological reactions to stressors (e.g., Xie & Schaubroeck, 2001). By unpacking the role of human body in organizational behavior, a biological approach enhances our understanding of the foundation, development, and function of constructs in organization behavior, thus making important theoretical contributions to organization research (Whetten, 1989).

In the era of molecular genetic research, behavioral genetics research using twin study designs still has its unique contributions (W. Johnson et al., 2009). Univariate behavioral genetic research establishing main effects of genetic factors has its usefulness in demonstrating the important role of the person in shaping variables of interests. For example, we found significant genetic effects on perceived and objective work characteristics (Li & Arvey, 2010), which have traditionally been assumed to be primarily determined by the work environments (e.g., by managers and organizations, Hackman and Oldham, 1980). In fact, behavioral genetics research has documented that genetics have appreciable influences, on not only human traits such as abilities and personalities (Bouchard, 2004), but also *measured environments* (Plomin & Bergeman, 1991). Furthermore, multivariate genetic research has further underscored that the *person* plays an indispensable role in relationships between measured environments and outcome variables, for example, by gravitating to compatible situations. This contradicts and also complements the often-assumed *environmental* causation due to, for example, family or organization effects (e.g., affected by family or organizational influences, W. Johnson et al., 2009). Interestingly, genetic research provides the "best available evidence" for environmental influences, because it can control genetic effects and thus help determine the relative importance

of genetics and environments (Plomin, Owen, & McGuffin, 1994, p. 1735).

**Developmental approaches to organization research.** Effects of many constructs (e.g., personality traits and work characteristics) studied in organization research unfold over time. Thus it is pivotal to take a developmental approach to study these constructs longitudinally. With the changing nature of work, the issue of time has been becoming more and more important in organization research (Frese & Zapf, 1988; Mitchell & James, 2001; Sonnentag, 2012). Theoretical relationships among studied variables may take many forms when examined from a temporal perspective (Mitchell & James, 2001). The simplest form seems to be the case in which effects of an independent variable X on dependent variable Y change over time (e.g., as reflected in changes of Y), as studied in work design research (Wall, Kemp, Jackson, & Clegg, 1986). A more complex form would be a reciprocal relationship in which X causes changes in Y, which in turn further enhances or diminishes X. As such, taking a temporal perspective can add more precision in our theory. More advanced methodologies (e.g., latent growth modeling and latent change score modeling) are needed to empirically test more nuanced relationships longitudinally. Theoretical developments and methodological advancements may work in tandem in facilitating each other.

### **Practical Implications: Toward an Individualized Organization?**

Adopting a biological perspective and recognizing impacts of genetic factors do not mean genetic determinism at all. Instead, researchers embracing such approaches recognize the interdependence of genetic and environmental factors in driving human behavior: Without environmental influences, it is very difficult for biological factors to exert their impacts. Then what are managerial implications of such research for organizations and managers? Previous research (Judge et al., 2012; Lawler, 1974; Rousseau, 2005) suggests that individualized

organization and customized work may be useful alternatives to traditional standardized management approaches. Specifically, this alternative approach acknowledges that individuals are distinct from each other in terms of abilities, interests, needs, and personality traits. Although through occupational and organizational selection, individuals may achieve some levels of fit between their individual characteristics and work environments, organizations can further enhance their person-job fit by providing more tailored work arrangements. Such customized work arrangements may include idiosyncratic deals in terms of employment development and work schedules (Rousseau, 2005) for example, specifically tailored to satisfy individual employee's needs.

A critical reason why organizations may need tailor their management practices is that if employees' needs are not satisfied, they may craft their job, formally or informally, to make their work better fit with their individual characteristics (Wrzesniewski & Dutton, 2001). This is especially the case in the era of boundaryless careers. Employees tend to seek organizations, jobs, or work assignments which may provide them with best fit; otherwise, they could seek better alternatives in other organizations. Given that customized informal job redesign practices or turnover may potentially pose threat to interests of organizations, it is important to have a formal channel for employees to negotiate such individualized arrangement with managers and organizations (Rousseau, 2005).

The notion of customized work arrangements is echoed by the movement of *individualized medicine* (Evans & Relling, 2004) in medical research. Due to the fact that different people react differently to the same medical treatment (e.g., some people exhibit positive reactions while others negative reactions to the same drug), medical researchers have been investigating individual characteristics responsible for individual differences in drug

responses. One line of research specifically focus on genetic factors (e.g., DNA polymorphisms). Furthermore, researchers also study different ways to translate such research findings into clinical practices. Although it may take some time to get fully implemented in clinical practices, the notion is clear: We may be able to generate distinctive medical treatments customized specifically to different subpopulations.

### **Conclusions**

As an important form of human agency, proactive personality is rooted in individuals' genetic architecture, which may be traced back to human evolution. Environmental factors, such work environments, play significant roles in shaping this proactive propensity as well. The two studies of this dissertation lay the ground for future research to examine more nuanced relationships among the person, agentic actions, and the environment.

## References

- Ackerman, P. L., & Heggestad, E. D. (1997). Intelligence, personality, and interests: evidence for overlapping traits. *Psychological Bulletin*, *121*(2), 219-245.
- Antonakis, J., Bendahan, S., Jacquart, P., & Lalive, R. (2010). On making causal claims: A review and recommendations. *The Leadership Quarterly*, *21*(6), 1086-1120.
- Arthur, M. B., & Rousseau, D. M. (1996). *The boundaryless career: A new employment principle for a new organizational era*. New York, NY: Oxford University Press.
- Arvey, R. D., & Bouchard, T. J. (1994). Genetics, twins, and organizational behavior. *Research in Organizational Behavior*, *16*, 47-82.
- Arvey, R. D., Bouchard, T. J., Segal, N. L., & Abraham, L. M. (1989). Job satisfaction: Environmental and genetic components. *Journal of Applied Psychology*, *74*(2), 187-192.
- Arvey, R. D., Zhang, Z., Avolio, B. J., & Krueger, R. F. (2007). Developmental and genetic determinants of leadership role occupancy among women. *Journal of Applied Psychology*, *92*(3), 693-706.
- Ashford, S. J., Rothbard, N. P., Piderit, S. K., & Dutton, J. E. (1998). Out on a limb: The role of context and impression management in selling gender-equity issues. *Administrative Science Quarterly*, *23*-57.
- Atwater, L. E., Ostroff, C., Yammarino, F. J., & Fleenor, J. W. (1998). Self-other agreement: does it really matter? *Personnel Psychology*, *51*(3), 577-598.
- Baltes, P. B. (1997). On the incomplete architecture of human ontogeny: Selection, optimization, and compensation as foundation of developmental theory. *American psychologist*, *52*(4), 366-380.
- Bandura, A. (1977). *Social Learning Theory*. Englewood Cliffs, NJ: Prentice Hall.

- Bandura, A. (1978). The self system in reciprocal determinism. *American psychologist*, 33(4), 344-358.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Freeman.
- Bandura, A. (2001). Social cognitive theory: An agentic perspective. *Annual review of psychology*, 52(1), 1-26.
- Bandura, A. (2006). Toward a psychology of human agency. *Perspectives on Psychological Science*, 1(2), 164-180.
- Baruch-Feldman, C., Brondolo, E., Ben-Dayana, D., & Schwartz, J. (2002). Sources of social support and burnout, job satisfaction, and productivity. *Journal of Occupational Health Psychology*, 7(1), 84-93.
- Baruch, Y., & Bozionelos, N. (2010). Career issues. In S. Zedeck (Ed.), *APA handbook of industrial and organizational psychology* (Vol. 2, pp. 67-113). Washington, DC: American Psychological Association.
- Bass, B. M., & Bass, R. (2008). *The Bass handbook of leadership: Theory, research, and managerial applications* (4th ed.). New York: Free Press.
- Bateman, T. S., & Crant, J. M. (1993). The proactive component of organizational behavior: A measure and correlates. *Journal of Organizational Behavior*, 14(2), 103-118.
- Bell, N. E., & Staw, B. M. (1989). People as sculptors versus sculpture: The roles of personality and personal control in organizations. In M. B. Arthur, T. H. Douglas & B. S. Lawrence (Eds.), *Handbook of Career Theory*, (pp. 232-251). Cambridge, English: Cambridge University Press.
- Berlew, D. E., & Hall, D. T. (1966). The socialization of managers: Effects of expectations on performance. *Administrative Science Quarterly*, 11(2), 207-223.

- Berridge, K. C., & Robinson, T. E. (1998). What is the role of dopamine in reward: hedonic impact, reward learning, or incentive salience? *Brain Research Reviews*, 28(3), 309-369.
- Bindl, U. K., & Parker, S. K. (2010). Proactive work behavior: Forward-thinking and change-oriented action in organizations. In S. Zedeck (Ed.), *APA handbook of industrial and organizational psychology* (Vol. 2, pp. 567-598). Washington, DC: American Psychological Association.
- Bleidorn, W. (2012). Hitting the road to adulthood: Short-term personality development during a major life transition. *Personality and Social Psychology Bulletin*, 38(12), 1594-1608.
- Bouchard, T. J. (2004). Genetic influence on human psychological traits. *Current Directions in Psychological Science*, 13(4), 148-151.
- Brim, O. D. (2000). MacArthur Foundation study of successful midlife development. *ICPSR Bulletin*, 20(4), 1-5.
- Buss, D. M. (1995). Evolutionary psychology: A new paradigm for psychological science. *Psychological Inquiry*, 6(1), 1-30.
- Caplan, R. D., Cobb, S., French, J. R. P., van Harrison, R., & Pinneau, S. R. (1975). *Job demands and worker health*. Washington: National Institute of Occupational Safety and Health.
- Carver, C. S., Johnson, S. L., Joormann, J., Kim, Y., & Nam, J. Y. (2011). Serotonin transporter polymorphism interacts with childhood adversity to predict aspects of impulsivity. *Psychological Science*, 22(5), 589-595.
- Carver, C. S., & Scheier, M. F. (1998). *On the self-regulation of behavior*. New York: Cambridge University Press.
- Cascio, W. F. (1991). *Applied psychology in personnel management*. (4th ed.). Englewood Cliffs, NJ: Prentice-Hall.



- Cascio, W. F. (2005). *Managing human resources: Productivity, quality of work life, profits* (7th ed.). Burr Ridge, IL: Irwin/McGraw-Hill.
- Caspi, A., Roberts, B. W., & Shiner, R. L. (2005). Personality development: Stability and change. *Annual Review of Psychology, 56*, 453-484.
- Cavanaugh, M. A., Boswell, W. R., Roehling, M. V., & Boudreau, J. W. (2000). An empirical examination of self-reported work stress among US managers. *Journal of Applied Psychology, 85*(1), 65-74.
- Chatman, J. A. (1989). Improving interactional organizational research: A model of person-organization fit. *Academy of management Review, 14*(3), 333-349.
- Chatman, J. A. (1991). Matching people and organizations: Selection and socialization in public accounting firms. *Administrative Science Quarterly, 36*(3), 459-484.
- Chatman, J. A., Wong, E., & Joyce, C. K. (2008). When do people make the place?: considering the interactionist foundations of the attraction-selection-attrition model. In B. Smith (Ed.), *A Festschrift to Benjamin Schneider* (pp. 65-88). Mahwah, NJ: Erlbaum.
- Chiaburu, D. S., & Harrison, D. A. (2008). Do peers make the place? Conceptual synthesis and meta-analysis of coworker effects on perceptions, attitudes, OCBs, and performance. *Journal of Applied Psychology, 93*(5), 1082-1103.
- Collins, L. M. (2006). Analysis of longitudinal data: The integration of theoretical model, temporal design, and statistical model. *Annu. Rev. Psychol., 57*, 505-528.
- Crant, J. M. (1995). The Proactive Personality Scale and objective job performance among real estate agents. *Journal of Applied Psychology, 80*(4), 532-537.
- Crant, J. M. (2000). Proactive behavior in organizations. *Journal of Management, 26*(3), 435-462.
- Crant, J. M., & Bateman, T. S. (2000). Charismatic leadership viewed from above: The impact of

- proactive personality. *Journal of Organizational Behavior*, 21(1), 63-75.
- Day, D. V., Sin, H.-P., & Chen, T. T. (2004). Assessing the burdens of leadership: Effects of formal leadership roles on individual performance over time. *Personnel Psychology*, 57(3), 573-605.
- Deci, E. L., & Ryan, R. M. (1990). A motivational approach to self: Integration in personality. In R. A. Dienstbier (Ed.), *Perspectives on motivation: Nebraska symposium on motivation* (Vol. 38, pp. 237-288). Lincoln: University of Nebraska Press.
- Depue, R. A., & Collins, P. F. (1999). Neurobiology of the structure of personality: Dopamine, facilitation of incentive motivation, and extraversion. *Behavioral and Brain Sciences*, 22(3), 491-517.
- DeRue, D. S., & Wellman, N. (2009). Developing leaders via experience: The role of developmental challenge, learning orientation, and feedback availability. *Journal of Applied Psychology*, 94(4), 859-875.
- Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The satisfaction with life scale: A measure of life satisfaction. *Journal of Personality Assessment*, 49(1), 71-75.
- Dragoni, L., Tesluk, P. E., Russell, J. E. A., & Oh, I. S. (2009). Understanding managerial development: Integrating developmental assignments, learning orientation, and access to developmental opportunities in predicting managerial competencies. *Academy of Management Journal*, 52(4), 731-743.
- Elder, G. H. (1969). Occupational mobility, life patterns, and personality. *Journal of Health and Social Behavior*, 10, 308-323.
- Erdogan, B., & Bauer, T. N. (2005). Enhancing career benefits of employee proactive personality: The role of fit with jobs and organizations. *Personnel Psychology*, 58(4), 859-891.

- Evans, W. E., & Relling, M. V. (2004). Moving towards individualized medicine with pharmacogenomics. *Nature*, *429*(6990), 464-468.
- Fay, D., & Frese, M. (2000a). Conservatives' approach to work: Less prepared for future work demands? *Journal of Applied Social Psychology*, *30*(1), 171-195.
- Fay, D., & Frese, M. (2000b). Working in East German socialism in 1980 and in capitalism 15 years later: A trend analysis of a transitional economy's working conditions. *Applied Psychology: An International Review*, *49*(4), 636-657.
- Fay, D., & Frese, M. (2001). The concept of personal initiative: An overview of validity studies. *Human Performance*, *14*(1), 97-124.
- Fay, D., & Sonnentag, S. (2002). Rethinking the effects of stressors: A longitudinal study on personal initiative. *Journal of Occupational Health Psychology*, *7*(3), 221-234.
- Fay, D., & Sonnentag, S. (2012). Within-person fluctuations of proactive behavior: How affect and experienced competence regulate work behavior. *Human Performance*, *25*(1), 72-93.
- Ferrer, E., & McArdle, J. J. (2010). Longitudinal modeling of developmental changes in psychological research. *Current directions in psychological science*, *19*(3), 149-154.
- Fleeson, W. (2004). Moving personality beyond the person-situation debate: The challenge and the opportunity of within-person variability. *Current Directions in Psychological Science*, *13*(2), 83-87.
- Forbes, E., Brown, S., Kimak, M., Ferrell, R., Manuck, S., & Hariri, A. (2007). Genetic variation in components of dopamine neurotransmission impacts ventral striatal reactivity associated with impulsivity. *Molecular psychiatry*, *14*(1), 60-70.
- Frese, M. (1999). Social support as a moderator of the relationship between work stressors and psychological dysfunctioning: A longitudinal study with objective measures. *Journal of*

- Occupational Health Psychology*, 4(3), 179-192.
- Frese, M., Erbe-Heinbokel, M., Grefe, J., Ryowiak, V., & Weike, A. (1994). Mir ist es lieber, wenn ich genau gesagt bekomme, was sich tun muß: Probleme der Akzeptanz von Verantwortung und Handlungsspielraum in Ost und West. ["I am rather told what I should do": Problems of acceptance of responsibility and control in East and West]. *Zeitschrift für Arbeits- und Organisationspsychologie*, 38, 22-33.
- Frese, M., & Fay, D. (2001). Personal initiative: An active performance concept for work in the 21st century. *Research in Organizational Behavior*, 23, 133-187.
- Frese, M., Fay, D., Hilburger, T., Leng, K., & Tag, A. (1997). The concept of personal initiative: Operationalization, reliability and validity in two German samples. *Journal of Occupational and Organizational Psychology*, 70, 139-161.
- Frese, M., Garst, H., & Fay, D. (2007). Making things happen: Reciprocal relationships between work characteristics and personal initiative in a four-wave longitudinal structural equation model. *Journal of Applied Psychology*, 92(4), 1084-1102.
- Frese, M., Kring, W., Soose, A., & Zempel, J. (1996). Personal initiative at work: Differences between East and West Germany. *Academy of Management Journal*, 39(1), 37-63.
- Frese, M., & Zapf, D. (1988). Methodological issues in the study of work stress: Objective vs. subjective measurement. In C. Cooper & R. Payne (Eds.), *Causes, coping, and consequences of stress at work* (pp. 375-411). Chichester: John Wiley & Sons.
- Frese, M., & Zapf, D. (1999). On the importance of the objective environment in stress and attribution theory. Counterpoint to Perrewé and Zellars. *Journal of Organizational Behavior*, 20(5), 761-765.
- Fritz, C., & Sonnentag, S. (2009). Antecedents of day-level proactive behavior: A look at job

- stressors and positive affect during the workday. *Journal of Management*, 35(1), 94-111.
- Fugate, M., Prussia, G. E., & Kinicki, A. J. (2012). Managing employee withdrawal during organizational change: The role of threat appraisal. *Journal of Management*, 38(3), 890-914.
- Fuller, B., & Marler, L. E. (2009). Change driven by nature: A meta-analytic review of the proactive personality literature. *Journal of Vocational Behavior*, 75, 329-345.
- Garst, H., Frese, M., & Molenaar, P. (2000). The temporal factor of change in stressor-strain relationships: A growth curve model on a longitudinal study in East Germany. *Journal of Applied Psychology*, 85(3), 417-438.
- George, L. G., Helson, R., & John, O. P. (2011). The “CEO” of women's work lives: How Big Five Conscientiousness, Extraversion, and Openness predict 50 years of work experiences in a changing sociocultural context. *Journal of Personality and Social Psychology*, 101(4), 812-830.
- Glomb, T. M., Rotundo, M., & Kammeyer-Mueller, J. D. (2004). Emotional labor demands and compensating wage differentials. *Journal of Applied Psychology*, 89, 700-714.
- Grant, A. M., & Ashford, S. J. (2008). The dynamics of proactivity at work. *Research in Organizational Behavior*, 28, 3-34.
- Grant, A. M., Fried, Y., & Juillerat, T. (2010). Work matters: Job design in classic and contemporary perspectives. In S. Zedeck (Ed.), *APA handbook of industrial and organizational psychology* (Vol. 1, pp. 417-453). Washington, DC: American Psychological Association.
- Grant, A. M., Parker, S., & Collins, C. (2009). Getting credit for proactive behavior: Supervisor reactions depend on what you value and how you feel. *Personnel Psychology*, 62(1), 31-55.

- Gray, J. A. (1970). The psychophysiological basis of introversion-extraversion. *Behaviour research and therapy*, 8(3), 249-266.
- Greguras, G. J., & Diefendorff, J. M. (2010). Why does proactive personality predict employee life satisfaction and work behaviors? A field investigation of the mediating role of the self-concordance model. *Personnel Psychology*, 63(3), 539-560.
- Griffin, M. A., Neal, A., & Parker, S. K. (2007). A new model of work role performance: Positive behavior in uncertain and interdependent contexts. *The Academy of Management Journal*, 50(2), 327-347.
- Hackman, J. R., & Oldham, G. R. (1975). Development of the job diagnostic survey. *Journal of Applied Psychology*, 60, 159-170.
- Hackman, J. R., & Oldham, G. R. (1976). Motivation through the design of work: Test of a theory. *Organizational Behavior and Human Performance*, 16, 250-279.
- Hackman, J. R., & Oldham, G. R. (1980). *Work redesign*. Reading, MA: Addison-Wesley.
- Hall, D. T. (1971). A theoretical model of career subidentity development in organizational settings. *Organizational Behavior and Human Performance*, 6(1), 50-76.
- Hall, R. J., Snell, A. F., & Foust, M. S. (1999). Item parceling strategies in SEM: Investigating the subtle effects of unmodeled secondary constructs. *Organizational Research Methods*, 2(3), 233-256.
- Häusser, J. A., Mojzisch, A., Niesel, M., & Schulz-Hardt, S. (2010). Ten years on: A review of recent research on the Job Demand–Control (-Support) model and psychological well-being. *Work & Stress*, 24(1), 1-35.
- Hazucha, J. F., Hezlett, S. A., & Schneider, R. J. (2006). The impact of 360-degree feedback on management skills development. *Human Resource Management*, 32(2-3), 325-351.

- Heaphy, E. D., & Dutton, J. E. (2008). Positive social interactions and the human body at work: Linking organizations and physiology. *The Academy of Management Review*, 33(1), 137-162.
- Heinrichs, M., Baumgartner, T., Kirschbaum, C., & Ehlert, U. (2003). Social support and oxytocin interact to suppress cortisol and subjective responses to psychosocial stress. *Biological psychiatry*, 54(12), 1389-1398.
- Helson, R., Kwan, V. S. Y., John, O. P., & Jones, C. (2002). The growing evidence for personality change in adulthood: Findings from research with personality inventories. *Journal of Research in Personality*, 36(4), 287-306.
- Heslin, P. A. (Writer). (2005). Conceptualizing and evaluating career success [Article], *Journal of Organizational Behavior*.
- Hoffman, L. W. (1991). The influence of the family environment on personality: Accounting for sibling differences. *Psychological Bulletin*, 110(2), 187-203.
- Holland, J. L. (1996). Exploring careers with a typology: What we have learned and some new directions. *American Psychologist*, 51(4), 397-406.
- Hornung, S., Rousseau, D. M., & Glaser, J. (2008). Creating flexible work arrangements through idiosyncratic deals. *Journal of Applied Psychology*, 93(3), 655-664.
- Howard, A. (1995). *The changing nature of work*. San Francisco: Jossey-Bass.
- Hudson, N. W., Roberts, B. W., & Lodi-Smith, J. (2012). Personality trait development and social investment in work. *Journal of Research in Personality*, 46, 334-344.
- Humphrey, S. E., Nahrgang, J. D., & Morgeson, F. P. (2007). Integrating motivational, social, and contextual work design features: A meta-analytic summary and theoretical extension of the work design literature. *Journal of Applied Psychology*, 92(5), 1332-1356.

- Ilies, R., Arvey, R. D., & Bouchard, T. J. (2006). Darwinism, behavioral genetics, and organizational behavior: A review and agenda for future research. *Journal of Organizational Behavior*, 27(2), 121-141.
- Jackson, J. J., Hill, P. L., Payne, B. R., Roberts, B. W., & Stine-Morrow, E. A. L. (2012). Can an old dog learn (and want to experience) new tricks? Cognitive training increases openness to experience in older adults. *Psychology and Aging*, 27(2), 286-292.
- James, W. (1975). *Pragmatism (F. Bowers, Text Ed.)*. Cambridge, MA:: Harvard University Press.
- Janssen, O. (2003). Innovative behaviour and job involvement at the price of conflict and less satisfactory relations with co-workers. *Journal of Occupational and Organizational Psychology*, 76(3), 347-364.
- Jocklin, V., McGue, M., & Lykken, D. T. (1996). Personality and divorce: a genetic analysis. *Journal of Personality and Social Psychology*, 71(2), 288-299.
- John, O. P., Donahue, E. M., & Kentle, R. L. (1991). *The Big Five Inventory--Versions 4a and 54*. Berkeley, CA: University of California, Berkeley, Institute of Personality and Social Research.
- Johns, G. (2006). The essential impact of context on organizational behavior. *Academy of Management Review*, 31(2), 386-408.
- Johnson, J. A. (1997). Units of analysis for the description and explanation of personality. In R. Hogan, J. A. Johnson & S. R. Briggs (Eds.), *Handbook of personality psychology* (pp. 73-93). San Diego, CA: Academic Press.
- Johnson, W., & Krueger, R. F. (2006). How money buys happiness: Genetic and environmental processes linking finances and life satisfaction. *Journal of Personality and Social Psychology*, 90(4), 680-691.



- Johnson, W., Turkheimer, E., Gottesman, I. I., & Bouchard, T. J. (2009). Beyond heritability: Twin studies in behavioral research. *Current Directions in Psychological Science, 18*(4), 217-220.
- Judge, T. A. (2007). The future of person-organization fit research: Comments, observations, and a few suggestions. In C. Ostroff & T. A. Judge (Eds.), *Perspectives on organizational fit* (pp. 419-445). Mahwah, NJ: Lawrence Erlbaum Associates.
- Judge, T. A., Bono, J. E., Ilies, R., & Gerhardt, M. W. (2002). Personality and leadership: A qualitative and quantitative review. *Journal of Applied Psychology, 87*(4), 765-779.
- Judge, T. A., Bono, J. E., & Locke, E. A. (2000). Personality and job satisfaction: The mediating role of job characteristics. *Journal of Applied Psychology, 85*(2), 237-249.
- Judge, T. A., Cable, D. M., Boudreau, J. W., & Bretz, R. D. (1995). An empirical investigation of the predictors of executive career success. *Personnel Psychology, 48*, 485-519.
- Judge, T. A., Higgins, C. A., Thoresen, C. J., & Barrick, M. R. (1999). The Big Five personality traits, general mental ability, and career success across the life span. *Personnel Psychology, 52*(3), 621-652.
- Judge, T. A., & Hurst, C. (2008). How the rich (and happy) get richer (and happier): Relationship of core self-evaluations to trajectories in attaining work success. *Journal of Applied Psychology, 93*, 849-863.
- Judge, T. A., Ilies, R., & Zhang, Z. (2012). Genetic influences on core self-evaluations, job satisfaction, and work stress: A behavioral genetics mediated model. *Organizational Behavior & Human Decision Processes, 117*, 208-220.
- Judge, T. A., Klinger, R. L., & Simon, L. S. (2010). Time is on my side: Time, general mental ability, human capital, and extrinsic career success. *Journal of Applied Psychology, 95*(1),

- 92-107.
- Karasek, R. A. (1979). Job demands, job decision latitude, and mental strain: Implications for job redesign. *Administrative Science Quarterly*, 24, 285-308.
- Karasek, R. A., Brisson, C., Kawakami, N., Houtman, I., Bongers, P., & Amick, B. (1998). The Job Content Questionnaire (JCQ): An instrument for internationally comparative assessments of psychosocial job characteristics. *Journal of Occupational Health Psychology*, 3(4), 322-355.
- Karasek, R. A., & Theorell, T. (1990). *Healthy work: Stress, productivity, and the reconstruction of working life*. New York: Basic Books.
- Katz, D., & Kahn, R. L. (1978). *The Social Psychology of Organizations* (2nd ed.). New York: John Wiley & Sons, Inc.
- Kessler, R. C., Oilman, S. E., Thornton, L. M., & Kendler, K. S. (2004). Health, well-being, and social responsibility in the MIDUS twin and sibling subsamples. In O. D. Brim, C. D. Ryff & R. C. Kessler (Eds.), *How healthy are we: A national study of well-being at midlife* (pp. 124–152). Chicago: University of Chicago Press.
- Keyes, C. L. M., Shmotkin, D., & Ryff, C. D. (2002). Optimizing well-being: The empirical encounter of two traditions. [Review]. *Journal of Personality and Social Psychology*, 82(6), 1007-1022.
- Kim, E., & Glomb, T. M. (2010). Get smarty pants: Cognitive ability, personality, and victimization. *Journal of Applied Psychology*, 95(5), 889-901.
- Kim, H., & Yukl, G. (1995). Relationships of managerial effectiveness and advancement to self-reported and subordinate-reported leadership behaviors from the multiple-linkage mode. *The Leadership Quarterly*, 6(3), 361-377.

- Kline, R. B. (2005). *Principles and practice of structural equation modeling* (2nd ed.). New York: Guilford.
- Kohn, M. L., & Schooler, C. (1973). Occupational experience and psychological functioning: An assessment of reciprocal effects. *American Sociological Review*, *38*(1), 97-118.
- Kohn, M. L., & Schooler, C. (1978). The reciprocal effects of the substantive complexity of work and intellectual flexibility: A longitudinal assessment. *American Journal of sociology*, *84*(1), 24-52.
- Kohn, M. L., & Schooler, C. (1982). Job conditions and personality: A longitudinal assessment of their reciprocal effects. *American Journal of Sociology*, *87*(6), 1257-1286.
- Kristof-Brown, A. L., & Guay, R. P. (2010). Person-environment fit In S. Zedeck (Ed.), *APA handbook of industrial and organizational psychology* (Vol. 3, pp. 3-50). Washington, DC: American Psychological Association.
- Kulik, C. T., Oldham, G. R., & Hackman, J. R. (1987). Work design as an approach to person-nvironment fit. *Journal of Vocational Behavior*, *31*(3), 278-296.
- Kunz-Ebrecht, S. R., Kirschbaum, C., & Steptoe, A. (2004). Work stress, socioeconomic status and neuroendocrine activation over the working day. *Social Science and Medicine*, *58*(8), 1523-1530.
- Lachman, M. E., & Weaver, S. L. (1997). The Midlife Development Inventory (MIDI) personality scales: Scale construction and scoring. *Waltham, MA: Brandeis University*.
- Landis, R. S., Beal, D. J., & Tesluk, P. E. (2000). A comparison of approaches to forming composite measures in structural equation models. *Organizational Research Methods*, *3*(2), 186-207.
- Lawler, E. E. (1974). The individualized organization: Problems and promise. *California*

- Management Review*, 17(2), 31-39.
- Lawler, E. E., & Finegold, D. (2000). Individualizing the organization: Past, present, and future. *Organizational Dynamics*, 29(1), 1-15.
- Lent, R. W., Brown, S. D., & Hackett, G. (1994). Toward a unifying social cognitive theory of career and academic interest, choice, and performance. *Journal of Vocational Behavior*, 45(1), 79-122.
- LePine, J. A., LePine, M. A., & Jackson, C. L. (2004). Challenge and hindrance stress: Relationships with exhaustion, motivation to learn, and learning performance. *Journal of Applied Psychology*, 89, 883-891.
- LePine, J. A., Podsakoff, N. P., & LePine, M. A. (2005). A meta-analytic test of the challenge stressor-hindrance stressor framework: An explanation for inconsistent relationships among stressors and performance. *Academy of Management Journal*, 48(5), 764-755.
- Lewis, M. (1999). On the development of personality. In L. A. Pervin & O. P. John (Eds.), *Handbook of personality: Theory and research* (Vol. 2, pp. 327-346). New York: Guilford Press.
- Li, W. D., & Arvey, R. D. (2010). *The heritability of work design characteristics*. Paper presented at the Annual Academy of Management Meeting, Montréal, Canada.
- Li, W. D., Frese, M., & Fay, D. (2013). *Reciprocal relationships between proactive personality and work experiences*. Paper presented at the the 2013 Annual Conference of Society for Industrial and Organizational Psychology, Houston, Texas, USA.
- Li, W. D., Song, Z., & Arvey, R. D. (2011). The influence of general mental ability, self-esteem and family socioeconomic status on leadership role occupancy and leader advancement: The moderating role of gender. *The Leadership Quarterly*, 22(3), 520-534.

- Li, W. D., Song, Z., & Arvey, R. D. (2012). *Genes, job characteristics, and job satisfaction: Examining gene-environment interplay*. Paper presented at the the 2012 Annual Conference of Society for Industrial and Organizational Psychology, San Diego, CA, USA.
- Li, W. D., Song, Z., & Arvey, R. D. (2013). *Dopamine receptor gene D4 and job satisfaction: Examining multiple pathways*, in Ward, M.K. & Craig, B. (Chairpersons): *Organizational neuroscience: Classic I-O topics, innovative approaches*. Paper presented at the The 28th Annual Conference of the Society for Industrial and Organizational Psychology, Houston, Texas.
- Little, T. D., Cunningham, W. A., Shahar, G., & Widaman, K. F. (2002). To parcel or not to parcel: Exploring the question, weighing the merits. *Structural Equation Modeling*, 9(2), 151-173.
- Liu, C., Spector, P., & Jex, S. (2005). The relation of job control with job strains: A comparison of multiple data sources. *Journal of Occupational and Organizational Psychology*, 78(3), 325-336.
- Locke, E. A., & Latham, G. P. (1990). *A theory of goal setting and task performance*. Englewood Cliffs, NJ: Prentice Hall.
- Locke, E. A., & Latham, G. P. (2006). New directions in goal-setting theory. *Current directions in psychological science*, 15(5), 265-268.
- Loehlin, J. C. (2007). The strange case of  $c^2 = 0$ : What does it imply for views of human development? *Research in Human Development*, 4(3-4), 151-162.
- Lord, R. G., & Emrich, C. G. (2000). Thinking outside the box by looking inside the box: Extending the cognitive revolution in leadership research. *The Leadership Quarterly*, 11(4), 551-579.
- Luthans, F., Avolio, B. J., Walumbwa, F. O., & Li, W. (2005). The psychological capital of Chinese

- workers: Exploring the relationship with performance. *Management and Organization Review*, 1(2), 249-271.
- Maslach, C., Schaufeli, W. B., & Leiter, M. P. (2001). Job burnout. *Annual review of psychology*, 52(1), 397-422.
- Mathieu, J. E., Gilson, L. L., & Ruddy, T. M. (2006). Empowerment and Team Effectiveness: An Empirical Test of an Integrated Model. *Journal of Applied Psychology*, 91(1), 97-108.
- McArdle, J. J. (2001). A latent difference score approach to longitudinal dynamic structural analysis. In R. Cudeck, S. d. Toit & D. So r̈bom (Eds.), *Structural equation modeling: Present and future. A Festschrift in honor of Karl Jo r̈reskog* (pp. 341-380). Lincolnwood, IL: Scientific Software International
- McArdle, J. J. (2009). Latent variable modeling of differences and changes with longitudinal data. *Annual review of psychology*, 60, 577-605.
- McArdle, J. J., & Hamagami, F. (2001). Latent difference score structural models for linear dynamic analyses with incomplete longitudinal data. In L. Collins & A. Sayer (Eds.), *New methods for the analysis of change* (pp. 137-176). Washington, DC: APA Press.
- McCormick, E. J., DeNisi, A. S., & Shaw, J. B. (1979). Use of the position analysis questionnaire for establishing the job component validity of tests. *Journal of Applied Psychology*, 64(1), 51-56.
- McCrae, R. R., Costa Jr, P. T., Ostendorf, F., Angleitner, A., Hřebíčková, M., Avia, M. D., et al. (2000). Nature over nurture: Temperament, personality, and life span development. *Journal of Personality and Social Psychology*, 78(1), 173-186.
- McCrae, R. R., Scally, M., Terracciano, A., Abecasis, G. R., & Costa Jr, P. T. (2010). An alternative to the search for single polymorphisms: Toward molecular personality scales for the

- five-factor model. *Journal of Personality and Social Psychology*, 99(6), 1014-1024.
- McEwen, B. S. (2007). Physiology and neurobiology of stress and adaptation: Central role of the brain. *Physiological Reviews*, 87(3), 873-904.
- McGregor, D. (1960). *The human side of enterprise*. New York: McGraw-Hill.
- McGue, M., & Bouchard, T. J. (1984). Adjustment of twin data for the effects of age and sex. *Behavior Genetics*, 14(4), 325-343.
- Mirvis, P. H., & Hall, D. T. (1994). Psychological success and the boundaryless career. *Journal of Organizational Behavior*, 15(4), 365-380.
- Mitchell, T. R., & James, L. R. (2001). Building better theory: Time and the specification of when things happen. *Academy of management Review*, 26(4), 530-547.
- Morgeson, F. P., & Campion, M. A. (2003). Work design. In W. C. Borman, D. R. Ilgen & R. J. Klimoski (Eds.), *Handbook of psychology: Industrial and organizational psychology* (Vol. 12, pp. 423-452). New York, NY, US: John Wiley & Sons, Inc.
- Morrison, E. W., & Phelps, C. C. (1999). Taking charge at work: Extrarole efforts to initiate workplace change. *Academy of Management Journal*, 42, 403-419.
- Mortimer, J. T., & Lorence, J. (1979). Occupational experience and the self-concept: A longitudinal study. *Social Psychology Quarterly*, 42(4), 307-323.
- Mõttus, R., Johnson, W., Starr, J. M., & Deary, I. J. (2012). Correlates of personality trait levels and their changes in very old age: The Lothian Birth Cohort 1921. *Journal of Research in Personality*, 46(3), 271-278.
- Munafò, M. R., Yalcin, B., Willis-Owen, S. A., & Flint, J. (2008). Association of the Dopamine D4 Receptor (DRD4) gene and approach-related personality traits: Meta-analysis and new data. *Biological psychiatry*, 63(2), 197-206.

- Muthen, L. K., & Muthen, B. O. (1998-2011). *Mplus User's Guide* (6th ed.). Los Angeles, CA: Muthen & Muthen.
- Neale, M. C., & Cardon, L. R. (1992). *Methodology for genetic studies of twins and families*. Dordrecht, The Netherlands: Kluwer Academic
- Ng, T. W. H., Eby, L. T., Sorensen, K. L., & Feldman, D. C. (2005). Predictors of objective and subjective career success: A meta-analysis. *Personnel Psychology*, 58(2), 367-408.
- Ng, T. W. H., & Sorensen, K. L. (2008). Toward a further understanding of the relationships between perceptions of support and work attitudes: A meta-analysis. *Group & Organization Management*, 33(3), 243-268.
- Nicholson, N. (1997). Evolutionary psychology: Toward a new view of human nature and organizational society. *Human Relations*, 50(9), 1053-1078.
- Nicholson, N., & de Waal Andrews, W. (2005). Playing to win: Biological imperatives, self regulation, and trade offs in the game of career success. *Journal of Organizational Behavior*, 26(2), 137-154.
- Ohlott, P. J. (2004). Job assignments. In C. D. McCauley & E. Van Velsor (Eds.), *The center for creative leadership handbook of leadership development* (2nd ed., pp. 151-182). San Francisco: Jossey-Bass.
- Ohly, S., & Fritz, C. (2010). Work characteristics, challenge appraisal, creativity, and proactive behavior: A multi-level study. *Journal of Organizational Behavior*, 31(4), 543-565.
- Ohly, S., Sonnentag, S., & Pluntke, F. (2006). Routinization, work characteristics and their relationships with creative and proactive behaviors. *Journal of Organizational Behavior*, 27(3), 257-279.
- Parker, S. K., & Axtell, C. M. (2001). Seeing another viewpoint: Antecedents and outcomes of



- employee perspective taking. *Academy of Management Journal*, 44(6), 1085-1100.
- Parker, S. K., Bindl, U. K., & Strauss, K. (2010). Making things happen: A model of proactive motivation. *Journal of Management*, 36(4), 827-856.
- Parker, S. K., & Sprigg, C. A. (1999). Minimizing strain and maximizing learning: The role of job demands, job control, and proactive personality. *Journal of Applied Psychology*, 84(6), 925-939.
- Parker, S. K., Williams, H. M., & Turner, N. (2006). Modeling the antecedents of proactive behavior at work. *Journal of Applied Psychology*, 91(3), 636-652.
- Plomin, R. (1994). The Emanuel Miller memorial lecture 1993. Genetic research and identification of environmental influences. *Journal of Child Psychology and Psychiatry*, 35(5), 817-834.
- Plomin, R., & Bergeman, C. S. (1991). The nature of nurture: Genetic influence on “environmental” measures. *Behavioral and Brain Sciences*, 14(03), 373-386.
- Plomin, R., DeFries, J. C., McClearn, G. E., & McGuffin, P. (2008). *Behavioral genetics* (5th ed.). New York, NY: Worth.
- Plomin, R., & Kovas, Y. (2005). Generalist genes and learning disabilities. *Psychological Bulletin*, 131(4), 592-617.
- Plomin, R., Owen, M. J., & McGuffin, P. (1994). The genetic basis of complex human behaviors. *Science*, 264(5166), 1733-1739.
- Plomin, R., & Spinath, F. M. (2002). Genetics and general cognitive ability (g). *Trends in Cognitive Sciences*, 6(4), 169-176.
- Preacher, K. J., & Hayes, A. F. (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behavior research methods*, 36(4), 717-731.

- Prenda, K. M., & Lachman, M. E. (2001). Planning for the future: A life management strategy for increasing control and life satisfaction in adulthood. *Psychology and Aging, 16*(2), 206-216.
- Purcell, S. (2002). Variance components models for geneenvironment interaction in twin analysis. *Twin Research, 5*(6), 554-571.
- Raabe, B., Frese, M., & Beehr, T. A. (2007). Action regulation theory and career self-management. *Journal of Vocational Behavior, 70*(2), 297-311.
- Roberts, B. W., Caspi, A., & Moffitt, T. E. (2003). Work experiences and personality development in young adulthood. *Journal of Personality and Social Psychology, 84*(3), 582-593.
- Roberts, B. W., & DelVecchio, W. F. (2000). The rank-order consistency of personality traits from childhood to old age: A quantitative review of longitudinal studies. *Psychological Bulletin, 126*(1), 3-25.
- Roberts, B. W., & Jackson, J. J. (2008). Sociogenomic personality psychology. *Journal of Personality, 76*(6), 1523-1544.
- Roberts, B. W., & Mroczek, D. (2008). Personality trait change in adulthood. *Current directions in psychological science, 17*(1), 31-35.
- Roberts, B. W., & Robins, R. W. (2004). Person-Environment Fit and its implications for personality development: a longitudinal study. *Journal of Personality, 72*(1), 89-110.
- Roberts, B. W., Wood, D., & Caspi, A. (2008). The development of personality traits in adulthood. In O. P. John, R. W. Robins & L. A. Pervin (Eds.), *Handbook of personality: Theory and research* (3rd ed., pp. 375-398). New York: Guilford Press.
- Roberts, B. W., Wood, D., & Smith, J. L. (2005). Evaluating Five Factor Theory and social investment perspectives on personality trait development. *Journal of Research in*

- Personality*, 39(1), 166-184.
- Rogers, W. H. (1993). Regression standard errors in clustered samples. *Stata Technical Bulletin*, 13, 19-23.
- Rossi, A. S. (2001). *Caring and doing for others: Social responsibility in the domains of family, work, and community*. Chicago: University of Chicago Press.
- Rousseau, D. M. (2005). *I-deals: Idiosyncratic deals employees negotiate for themselves*. New York: M. E. Sharpe.
- Rousseau, D. M., Ho, V. T., & Greenberg, J. (2006). I-deals: Idiosyncratic terms in employment relationships. *Academy of Management Review*, 31(4), 977-994.
- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, 55(1), 68-78.
- Ryan, R. M., & Deci, E. L. (2001). On happiness and human potentials: A review of research on hedonic and eudaimonic well-being. *Annual review of psychology*, 52, 141-166.
- Ryff, C. D. (1989). Happiness is everything, or is it? Explorations on the meaning of psychological well-being. *Journal of Personality and Social Psychology*, 57(6), 1069-1081.
- Ryff, C. D., & Keyes, C. L. M. (1995). The structure of psychological well-being revisited. *Journal of Personality and Social Psychology*, 69(4), 719-727.
- Sargent-Cox, K. A., Anstey, K. J., & Luszcz, M. A. (2012). The relationship between change in self-perceptions of aging and physical functioning in older adults. *Psychology and Aging*, 27(3), 750-760.
- Schein, E. H. (1990). *Career anchors: Discovering your real values*. San Diego: Pfeiffer & Associates.
- Schmidt, F. L., & Hunter, J. E. (2004). General mental ability in the world of work: Occupational

- attainment and job performance. *Journal of Personality and Social Psychology*, 86(1), 162-173.
- Schneider, B. (1983). Interactional psychology and organizational behavior. In B. M. Staw & L. L. Cummings (Eds.), *Research in Organizational Behavior* (Vol. 5, pp. 1-31). Greenwich, CT: JAI Press.
- Schneider, B. (1987). The people make the place. *Personnel Psychology*, 40(3), 437-453.
- Schneider, B., Goldstein, H. W., & Smith, D. B. (1995). The ASA framework: An update. *Personnel Psychology*, 48(4), 747-773.
- Scollon, C. N., & Diener, E. (2006). Love, work, and changes in extraversion and neuroticism over time. *Journal of Personality and Social Psychology*, 91(6), 1152-1165.
- Seeman, T. E., Singer, B. H., Ryff, C. D., Love, G. D., & Levy-Storms, L. (2002). Social relationships, gender, and allostatic load across two age cohorts. *Psychosomatic Medicine*, 64(3), 395-406.
- Seibert, S. E., Crant, J. M., & Krainer, M. L. (1999). Proactive personality and career success. *Journal of Applied Psychology*, 84(3), 416-427.
- Seibert, S. E., Krainer, M. L., & Crant, J. M. (2001). What do proactive people do? A longitudinal model linking proactive personality and career success. *Personnel Psychology*, 54(4), 845-874.
- Semin, G. R., Higgins, T., de Montes, L. G., Estourget, Y., & Valencia, J. F. (2005). Linguistic signatures of regulatory focus: How abstraction fits promotion more than prevention. *Journal of Personality and Social Psychology*, 89(1), 36-45.
- Semmer, N. (1982). Stress at work, stress in private life and psychological well-being. In W. Bachmann & I. Udrys (Eds.), *Mental load and stress in activity: European approaches* (pp.

- 42-55). Amsterdam: Elsevier.
- Senior, C., Lee, N., & Butler, M. J. R. (2011). Organizational cognitive neuroscience. *Organization Science*, 22(3), 804-815.
- Shane, S. (2009). Introduction to the focused issue on the biological basis of business. *Organizational Behavior and Human Decision Processes*, 110(2), 67-69.
- Shane, S., Nicolaou, N., Cherkas, L., & Spector, T. D. (2010). Genetics, the big five, and the tendency to be self-employed. *Journal of Applied Psychology*, 95(6), 1154-1162.
- Song, Z., Li, W. D., & Arvey, R. D. (2011). Associations between dopamine and serotonin genes and job satisfaction: Preliminary evidence from the Add Health Study. *Journal of Applied Psychology*, 96(6), 1223-1233.
- Sonnentag, S. (2012). Time in organizational research: Catching up on a long neglected topic in order to improve theory. *Organizational Psychology Review*, 2(4), 361-368.
- Sonnentag, S., & Zijlstra, F. R. H. (2006). Job characteristics and off-job activities as predictors of need for recovery, well-being, and fatigue. *Journal of Applied Psychology*, 91(2), 330-350.
- Spector, P. E., & Brannick, M. T. (2011). Methodological urban legends: The misuse of statistical control variables. *Organizational Research Methods*, 14(2), 287-305.
- Spector, P. E., & Jex, S. M. (1991). Relations of job characteristics from multiple data sources with employee affect, absence, turnover intentions, and health. *Journal of Applied Psychology*, 76(1), 46-53.
- Spector, P. E., & Jex, S. M. (1998). Development of four self-report measures of job stressors and strain: Interpersonal Conflict at Work Scale, Organizational Constraints Scale, Quantitative Workload Inventory, and Physical Symptoms Inventory. *Journal of Occupational Health Psychology*, 3(4), 356-367.

- Spector, P. E., Zapf, D., Chen, P. Y., & Frese, M. (2000). Why negative affectivity should not be controlled in job stress research: Don't throw out the baby with the bath water. *Journal of Organizational Behavior, 21*(1), 79-95.
- Speier, C., & Frese, M. (1997). Generalized self efficacy as a mediator and moderator between control and complexity at work and personal initiative: A longitudinal field study in East Germany. *Human Performance, 10*(2), 171-192.
- Sutin, A. R., Costa Jr, P. T., Miech, R., & Eaton, W. W. (2009). Personality and career success: Concurrent and longitudinal relations. *European Journal of Personality, 23*(2), 71-84.
- Sutin, A. R., & Costa, P. T. (2010). Reciprocal influences of personality and job characteristics across middle adulthood. *Journal of personality, 78*(1), 257-288.
- Taubman, P. (1976). The determinants of earnings: Genetics, family, and other environments: A study of white male twins. *The American Economic Review, 66*, 858-870.
- Terborg, J. R. (1981). Interactional psychology and research on human behavior in organizations. *The Academy of Management Review, 6*(4), 569-576.
- Terracciano, A., Costa, P. T., & McCrae, R. R. (2006). Personality plasticity after age 30. *Personality and Social Psychology Bulletin, 32*(8), 999-1009.
- Terracciano, A., McCrae, R. R., Brant, L. J., & Costa, P. T. (2005). Hierarchical linear modeling analyses of the NEO-PI-R scales in the Baltimore Longitudinal Study of Aging. *Psychology and Aging, 20*(3), 493-506.
- Tett, R. P., & Burnett, D. D. (2003). A personality trait-based interactionist model of job performance. *Journal of Applied Psychology, 88*(3), 500-517.
- Tett, R. P., & Guterman, H. A. (2000). Situation trait relevance, trait expression, and cross-situational consistency: Testing a principle of trait activation. *Journal of Research in*

- Personality*, 34(4), 397-423.
- Thomas, J. P., Whitman, D. S., & Viswesvaran, C. (2010). Employee proactivity in organizations: A comparative meta-analysis of emergent proactive constructs. *Journal of Occupational and Organizational Psychology*, 83(2), 275-300.
- Thompson, J. A. (2005). Proactive personality and job performance: A social capital perspective. *Journal of Applied Psychology*, 90(5), 1011-1017.
- Toker, S., & Biron, M. (2012). Job burnout and depression: Unraveling their temporal relationship and considering the role of physical activity. *Journal of Applied Psychology*, 97(3), 699-710.
- Tomer, R., Goldstein, R. Z., Wang, G. J., Wong, C., & Volkow, N. D. (2008). Incentive motivation is associated with striatal dopamine asymmetry. *Biological psychology*, 77(1), 98-101.
- Tornau, K., & Frese, M. (2013). Construct clean-up in proactivity research: A meta-analysis on the nomological net of work-related proactivity concepts and incremental validity. *Applied Psychology: An International Review*, 62(1), 44-96.
- U.S. Department of Labor. (1991). *Dictionary of occupational titles, revised* (4th ed.). Washington, D.C.: U.S. Government Printing Office.
- Van Der Doef, M., & Maes, S. (1999). The job demand-control (-support) model and psychological well-being: A review of 20 years of empirical research. *Work & Stress*, 13(2), 87-114.
- Van Dyne, L., Kamdar, D., & Joireman, J. (2008). In-role perceptions buffer the negative impact of low LMX on helping and enhance the positive impact of high LMX on voice. *Journal of Applied Psychology*, 93(6), 1195-1207.
- Vandenberg, R. J., & Lance, C. E. (2000). A review and synthesis of the measurement invariance

- literature: Suggestions, practices, and recommendations for organizational research. *Organizational Research Methods*, 3(1), 4-70.
- Waldman, D. A., Balthazard, P. A., & Peterson, S. J. (2011). Leadership and neuroscience : can we revolutionize the way that inspirational leaders are identified and developed? *The Academy of Management Perspectives*, 25(1), 60-74.
- Wall, T. D., Jackson, P. R., & Davids, K. (1992). Operator work design and robotics system performance: A serendipitous field study. *Journal of Applied Psychology*, 77(3), 353-362.
- Wall, T. D., Kemp, N. J., Jackson, P. R., & Clegg, C. W. (1986). Outcomes of autonomous workgroups: A long-term field experiment. *Academy of Management Journal*, 29(2), 280-304.
- Warr, P., & Fay, D. (2001). Age and personal initiative at work. *European Journal of Work and Organizational Psychology*, 10(3), 343-353.
- Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, 54(6), 1063-1070.
- Whetten, D. A. (1989). What constitutes a theoretical contribution? *Academy of management Review*, 14(4), 490-495.
- Wilk, S. L., & Sackett, P. R. (1996). Longitudinal analysis of ability-job complexity and job change. *Personnel Psychology*, 49(4), 937-967.
- Wrosch, C., Heckhausen, J., & Lachman, M. E. (2000). Primary and secondary control strategies for managing health and financial stress across adulthood. *Psychology and Aging*, 15(3), 387-399.
- Wrzesniewski, A., & Dutton, J. E. (2001). Crafting a job: Revisioning employees as active crafters



- of their work. *Academy of Management Review*, 26(2), 179-201.
- Wu, C. H., & Griffin, M. A. (2012). Longitudinal relationships between core self-evaluations and job satisfaction. *Journal of Applied Psychology*, 97(2), 331-342.
- Xie, J. L., & Schaubroeck, J. (2001). Bridging approaches and findings across diverse disciplines to improve job stress research. *Research in occupational stress and well-being*, 1, 1-61.
- Yukl, G. (2006). *Leadership in Organizations* (6th ed.). Upper Saddle River, NJ: Pearson Prentice-Hall.
- Zapf, D. (1993). Stress-oriented analysis of computerized office work. *The European Work and Organizational Psychologist*, 3(2), 85-100.
- Zhou, J., & George, J. M. (2001). When job dissatisfaction leads to creativity: Encouraging the expression of voice. *Academy of Management Journal*, 44(4), 682-696.
- Zuckerman, M. (1991). *Psychobiology of personality*. Cambridge, UK: Cambridge University Press.

**Tables, Figures, and Appendices for Study 1**

Table 1

*Correlations between the Two Proactive Personality Measures and Other Variables*

Variables	The 10-item measure of proactive personality: (95% confidence interval)	The current 13-item measure (95% confidence interval)
Extraversion	.34** (.26, .42)	.43** (.37, .50)
Agreeableness	.03 (-.06, .12)	.01 (-.08, .10)
Conscientiousness	.21** (.13, .29)	.29** (.21, .37)
Neuroticism	-.24** (-.32, -.17)	-.26** (-.34, -.18)
Openness	.44** (.37, .52)	.28** (.20, .36)
Promotion focus	.63** (.57, .68)	.64** (.59, .69)
Prevention focus	.26** (.18, .34)	.13** (.03, .22)
Positive affectivity	.53** (.46, .59)	.52** (.45, .58)
Negative affectivity	-.06 (-.15, .03)	-.13** (-.22, -.04)
Life satisfaction	.25** (.17, .33)	.30** (.22, .38)

Note.  $N = 502$ ; \*  $p < .05$ ; \*\*  $p < .01$ .

Table 2  
*Descriptive Statistics and Zero-order Correlations for Study Variables at the Individual Level*

Variables	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9	10	11
1. Gender	--	--	--										
2. Age	41.98	9.76	-.02	--									
3. Neuroticism	2.24	.69	.05	-.16**	--								
4. Extraversion	3.20	.57	.07	.03	-.18**	--							
5. Openness	2.99	.53	.02	-.02	-.19**	.53**	--						
6. Conscientiousness	3.45	.43	.18**	.01	-.20**	.25**	.28**	--					
7. Agreeableness	3.49	.47	.27**	.03	-.07	.53**	.33**	.26**	--				
8. Proactive personality	3.01	.49	.02	.04	-.22**	.62**	.57**	.42**	.28**	--			
9. Leadership role occupancy	.93	1.29	-.19**	.03	-.06	.08*	.03	.11**	.00	.19**	--		
10. Job complexity	8.04	2.63	-.11**	.01	-.01	.00	.13**	.17**	.04	.16**	.19**	--	
11. Log income	10.27	0.67	-.38**	.12**	-.03	.00	.06	.04	-.17**	.16**	.25**	.30**	--
12. Psychological well-being	5.62	.77	.03	.03	-.50**	.45**	.37**	.37**	.29**	.56**	.12**	.17**	.19**

Note.  $N = 976$  individuals. Gender: 0 = male, 1 = female. \*  $p < .05$ ; \*\*  $p < .01$ .

Table 3

*Within-twin-pair Correlations for the Study Variables*

Variables	1	2	3	4	5	6	7	8	9	10
1. Proactive personality, twin 1 (t1)	1.00	.15*	.17*	.18*	.60**	.45**	.00	.12	.05	.33**
2. Leadership role occupancy, t1	.18*	1.00	.27**	.21**	.06	.22**	.14	.12	.23**	.10
3. Job complexity, t1	.09	.20	1.00	.36**	.15*	.18*	.09	.32**	.16	.13
4. Income (Log transformed), t1	.15	.27**	.25	1.00	.16*	.03	.16	.24**	.55**	.11
5. Psychological well-being, t1	.50**	.15*	.02	.16	1.00	.41**	-.04	.15	.03	.44*
6. Proactive personality, twin 2 (t2)	.13	.09	-.02	-.11	.23*	1.00	.17*	.18*	.17*	.60**
7. Leadership role occupancy, t2	.26**	.19	.03	.07	.15	.30**	1.00	.19*	.30**	.12
8. Job complexity, t2	.14	.03	.12	.16	.12	.19	.07	1.00	.33**	.20**
9. Income (Log transformed), t2	.00	.00	.24*	.18	.14	.14	.22	.30**	1.00	.24**
10. Psychological well-being, t2	.00	.03	-.03	-.03	.27**	.53**	.12	.30**	.20*	1.00

Note.  $N = 472$  for individuals of MZ twin pairs and 504 individuals of DZ twin pairs. \*  $p < .05$ ; \*\*  $p < .01$ . T1 and t2 refers to twin 1 and twin 2 within the same twin pair.

Values in the upper diagonal are within-pair correlations of study variables for MZ twins and values in the lower diagonal are within-pair correlations for DZ twins.

Table 4  
*Results of Regression Analyses Controlling for the Big Five Personality Traits*

Variables	Model 1 Log income b	Model 2 Leadership role occupancy b	Model 3 Job complexity b	Model 4 Psychological well-being b	Model 5 Log income b	Model 6 Psychological well-being b
Gender	-0.47 <sup>***</sup>	-0.53 <sup>***</sup>	-0.73 <sup>***</sup>	.00	-0.44 <sup>***</sup>	.01
Age	0.01 <sup>***</sup>	0.00	0.00	.00	0.01 <sup>***</sup>	.00
Neuroticism	0.02	0.02	0.10	-0.44 <sup>***</sup>	0.01	-0.44 <sup>***</sup>
Extraversion	-0.03	-0.03	-0.68 <sup>**</sup>	0.13 <sup>*</sup>	0.01	0.15 <sup>***</sup>
Openness	0.05	-0.30 <sup>*</sup>	0.48 <sup>*</sup>	0.00	0.02	-0.02
Conscientiousness	0.15 <sup>*</sup>	0.34 <sup>**</sup>	0.93 <sup>***</sup>	0.21 <sup>***</sup>	0.10	0.20 <sup>***</sup>
Agreeableness	-0.23 <sup>***</sup>	0.02	0.17	0.14 <sup>**</sup>	-0.23 <sup>***</sup>	0.15 <sup>**</sup>
Proactive Personality	0.22 <sup>***</sup>	0.61 <sup>***</sup>	0.69 <sup>*</sup>	0.53 <sup>***</sup>	0.18 <sup>*</sup>	0.51 <sup>***</sup>
Job complexity	--	--	--	--	0.06 <sup>***</sup>	0.02 <sup>**</sup>
F	18.35 <sup>***</sup>	7.73 <sup>***</sup>	5.26 <sup>***</sup>	94.63 <sup>***</sup>	22.03 <sup>***</sup>	83.21 <sup>***</sup>
R <sup>2</sup>	0.215	0.092	0.073	0.495	0.273	0.501

Note:  $N = 976$  individuals. \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$ . Gender: 0=male and 1=female. Coefficients were unstandardized.

Table 5

*Results of Univariate Behavioral Genetics Model Fitting for Proactive Personality and Outcome Variables*

Models	Model fit indices							Model estimate (% variance explained)		
	$\chi^2$ (df)	$\Delta\chi^2$	CFI	TLI	AIC	RMSEA	SRMR	$a^2$	$c^2$	$e^2$
Proactive personality										
Model 1: A,C,E	5.26 (6)	--	1.00	1.01	2008.05	0.000	0.057	42.5***	0	57.5***
Model 2: A,E <sup>@</sup>	5.26 (7)	0	1.00	1.02	2006.05	0.000	0.057	42.5***	--	57.5***
Model 3: C,E	12.73 (7)	7.74**	0.82	0.95	2013.51	0.058	0.091	--	30.6***	69.4***
Model 4: E	36.22*** (8)	30.96***	0.12	0.78	2035.01	0.120	0.161	--	--	100
Leadership role occupancy										
Model 1: A,C,E	4.21 (6)	--	1.00	1.00	2032.07	0.000	0.068	1.6	11.4	87.0***
Model 2: A,E	4.52 (7)	0.31	1.00	1.00	2030.39	0.000	0.071	15.0	--	85.0***
Model 3: C,E	4.21 (7)	0	1.00	1.00	2030.08	0.000	0.068	--	12.6	87.4***
Model 4: E <sup>@</sup>	8.10 (8)	3.89	0.95	0.99	2031.97	0.007	0.088	--	--	100
Job complexity										
Model 1: A,C,E	3.42 (6)	--	1.00	1.00	1975.90	0.000	0.053	30.8***	0	69.2***
Model 2: A,E <sup>@</sup>	3.42 (7)	0	1.00	1.00	1973.90	0.000	0.053	30.8***	--	69.2***
Model 3: C,E	6.76 (7)	3.34	1.00	1.00	1977.24	0.000	0.071	--	22.2***	77.8***
Model 4: E	18.51* (8)	15.09***	0.24	0.81	1986.99	0.074	0.120	--	--	100
Income (log transformed)										
Model 1: A,C,E	14.30* (6)	--	0.75	0.92	1930.13	0.076	0.127	53.5***	0	46.5***
Model 2: A,E <sup>@</sup>	14.30* (7)	0	0.78	0.94	1928.13	0.066	0.127	53.5***	--	46.5***
Model 3: C,E	24.14** (7)	9.84**	0.49	0.85	1937.96	0.102	0.149	--	39.7***	60.3***
Model 4: E	49.37*** (8)	35.07***	0.00	0.69	1961.20	0.148	0.201	--	--	100
Psychological well-being										
Model 1: A,C,E	1.44 (6)	--	1.00	1.01	2000.36	0.000	0.025	29.4*	12.8	57.8***
Model 2: A,E <sup>@</sup>	1.78 (7)	0.34	1.00	1.01	1998.71	0.000	0.031	43.3***	--	56.7***
Model 3: C,E	3.07 (7)	1.63	1.00	1.01	1999.99	0.000	0.042	--	36.8***	63.2***
Model 4: E	34.63*** (8)	33.19***	0.16	0.79	2029.56	0.117	0.165	--	--	100

Note. Sample sizes were 254 and 234 for MZ and DZ twin pairs respectively. \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ .

$a^2$  indicates influences of additive genetic factors,  $c^2$  shared environmental factors, and  $e^2$  unique environmental factors.

<sup>@</sup> Indicates the best fit model. A, C, and E denotes additive genetic factor, shared environmental factor and unique/non-shared environmental factor respectively. CFI=Comparative Fit Index. TLI=Tucker-Lewis Index, RMSEA=Root Mean Square Error of Approximation. SRMR=Standardized Root Mean Square Residual. AIC=Akaike's Information Criterion.

Table 6

*Fitness and Path Coefficient Estimates for Models of Bivariate Behavioral Genetic Analyses for Proactive Personality and Outcome Variables Controlling for the Big Five Personality Traits*

Bivariate genetic models: Proactive personality with	Model fit indices						Path coefficients estimates							
	$\chi^2$ (df)	CFI	TLI	RMSEA	SRMR	AIC	a <sub>11</sub>	a <sub>21</sub>	a <sub>22</sub>	e <sub>11</sub>	e <sub>21</sub>	e <sub>22</sub>	a <sub>11</sub> ×a <sub>21</sub>	e <sub>11</sub> ×e <sub>21</sub>
Leadership role occupancy, Model 1	27.05 (22)	.90	.94	.031	.092	4017.92	.63	--	--	.76	.12	.98	--	.09
Job complexity, Model 2	13.46 (20)	1.00	1.00	.000	.059	3967.56	.65	.11	.48	.75	.02	.85	.07	.02
Income (log transformed), Model 3	21.49 (20)	.98	.99	.017	.090	3915.72	.65	.06	.70	.75	.14	.68	.04	.11
Psychological well-being, Model 4	20.13 (20)	1.00	1.01	.005	.075	3984.53	.64	.24	.38	.76	.06	.88	.15	.05

Note. Sample sizes were 254 and 234 for MZ and DZ twin pairs respectively. \*  $p < .05$ , \*\*  $p < .01$ .

Parameters a<sub>11</sub>, a<sub>21</sub>, a<sub>22</sub>, e<sub>11</sub>, e<sub>21</sub>, and e<sub>22</sub> denote paths presented in Appendix C; a<sub>11</sub>\*a<sub>21</sub> and e<sub>11</sub>\*e<sub>21</sub> present correlations between proactive personality and work variables attributable to common genetic and environmental factors.

RMSEA=Root Mean Square Error of Approximation, TLI = Tucker–Lewis Index, CFI = Comparative Fit Index, SRMR=Standardized Root Mean Square Residual, AIC = Akaike’s Information Criterion;

Path coefficient estimates below .05 are not significant at the .05 level; path coefficient estimates within the range between .065 and .21 are significant at the .05 level; path coefficient estimates larger than .22 are significant at the .001 level.

Table 7

*Percentage of Phenotypic Correlation between Proactive Personality and Outcome Variables Attributable to Common Genetic and Environmental Factors (%) Controlling for the Big Five Personality Traits*

Correlation between	Due to common genetic factors	Due to common environmental factors
<b>Proactive personality and</b>		
Leadership role occupancy	0	100
Job complexity	80.7	19.3
Income	27.9	72.1
Psychological well-being	76.9	23.1

Note. Sample sizes were 254 and 234 for MZ and DZ twin pairs respectively.



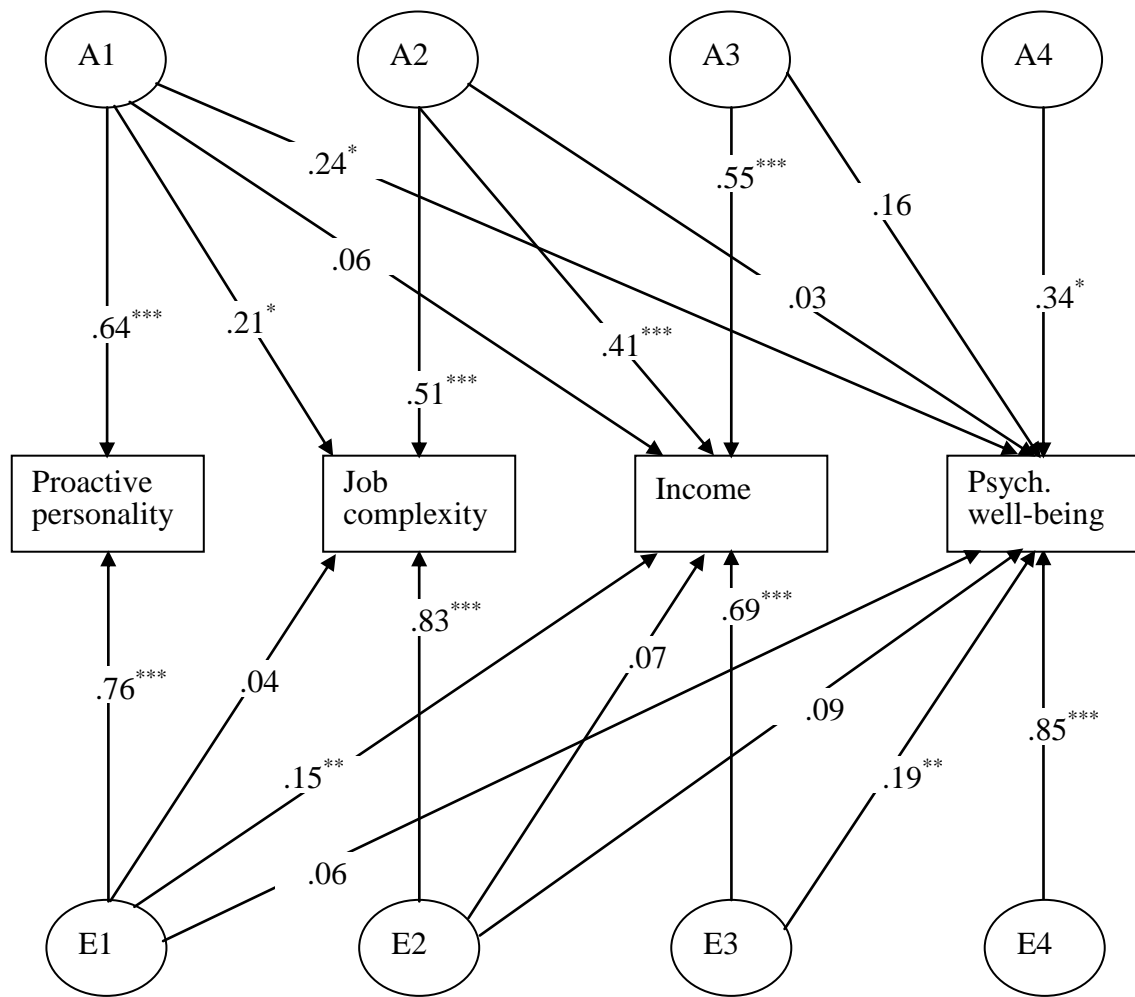


Figure 1. Path Coefficients Estimates of Multi-group Confirmatory Structural Model Based on Multivariate Cholesky Approach for Proactive Personality, Job Complexity, Income, and Psychological Well-Being Controlling for the Big Five Personality Traits.

Sample sizes were 254 and 234 for MZ and DZ twin pairs respectively.

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ .

This is a partial diagram with additive genetic factors (A1, A2, A3, and A4) and unique environmental factors (E1, E2, E3, and E4) for only one twin for simplicity. The influences of shared environmental factors (C1, C2, C3, and C4) were not modeled because they were not significant.

**Appendix A: Items Used in the Proactive Personality Measure in the First Study**

Please indicate how well each of the following describes you.

**Agency:**

Self-confident  
Forceful  
Assertive  
Outspoken  
Dominant

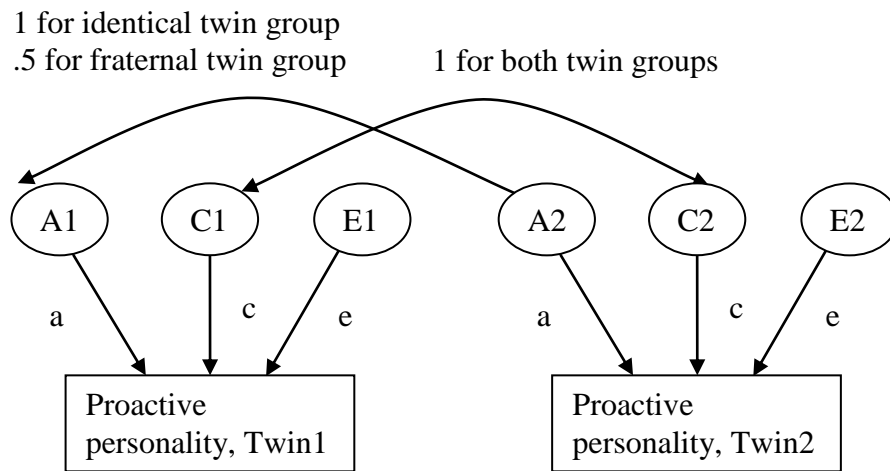
**Self-directedness and planning**

I like to make plans for the future  
I know what I want out of life  
I find it helpful to set goals for the near future

**Persistence in goal striving**

When things don't go according to my plans, my motto is, "Where there's a will, there's a way."  
When faced with a bad situation, I do what I can do to change it for the better  
Even when I feel I have too much to do, I find a way to get it all done  
When I encounter problems, I don't give up until I solve them  
I rarely give up on something I am doing, even when things get tough

**Appendix B:** Univariate Multi-group Confirmatory Structural Model.



A = additive genetic factor, C = shared environmental factors between co-twins of a twin pair that cause similarity among people from the same environment, such as the same experienced family background, E = unique environmental factors that makes individuals different such as different parental treatment and unique organizational experiences and/or measurement error.

An observed variable, P, is modeled to be influenced by three factors: A, C, and E.

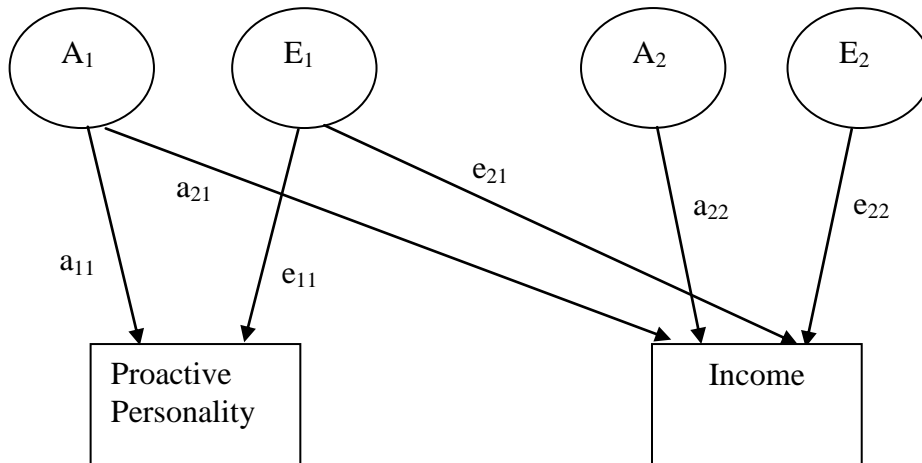
$$P = a*A + c*C + e*E + u \tag{1}$$

where P represents an observed variable; A, C, and E are standardized latent genetic and environmental variables (with means and variance specified at 0 and 1, respectively); a, c, and e are their corresponding coefficients to be estimated; and u denotes the intercept.

Variance in P thus can be decomposed into three parts,  $a^2$ ,  $c^2$ , and  $e^2$ . Genetic influences on P can be estimated ( $= a^2 / (a^2 + c^2 + e^2)$ ).

To determine the best-fitting model, I compared the fit indices of alternative models (ACE, AE, CE, and E models) and tested the significance of the influence of A, C, and E (Kline, 2005). To assess model fit, I use CFI, TLI, RMSEA, SRMR, as well as Akaike's information criterion (AIC, W. Johnson & Krueger, 2006).

**Appendix C:** Multi-group Confirmatory Structural Model (Bivariate Cholesky Decomposition) for Proactive Personality and Outcomes (using log transformed income as an example).



This is a partial diagram with additive genetic factors (A1 and A2) and unique environmental factors (E1 and E2) for only one twin for the sake of simplicity. The influences of shared environmental factors (C1 and C2) are not modeled because univariate behavioral genetic analyses show their influences were not significant. For leadership role occupancy,  $a_{11}$  and  $a_{21}$  were fixed to zero since genetic influences on this variable were not significant.

Four bivariate genetic analyses were conducted with proactive personality as one variable and each of the four outcomes as the other. For simplicity purposes, Appendix C illustrates an example with proactive personality and income for one twin (the effects of shared environmental factors, C1 and C2, were not modeled since their influences were nonsignificant in the univariate analyses).

To examine common genetic (environmental) influences, I test the significance of two paths:  $a_{11}$  and  $a_{21}$  ( $e_{11}$  and  $e_{21}$ ). Furthermore, the observed association between two variables (i.e., phenotypic correlation) can be partitioned into two parts: one genetic part ( $a_{11} \times a_{21}$ ) through a common genetic factor A1, and one environmental part ( $e_{11} \times e_{21}$ ) through a common environmental factor E1. Therefore, the genetic contribution to the phenotypic correlation can be estimated ( $= (a_{11} \times a_{21}) / (a_{11} \times a_{21} + e_{11} \times e_{21})$ , Plomin & Kovas, 2005; Shane et al., 2010). The same is true for testing the environmental contribution ( $= (e_{11} \times e_{21}) / (a_{11} \times a_{21} + e_{11} \times e_{21})$ ). In the bivariate model with proactive personality and leadership role occupancy, univariate analyses indicated nonsignificant influences of genetic factors and shared environmental factors on leadership, so I modeled only one genetic factor associated with proactive personality.

## Tables, Figures, and Appendices for Study 2

Table 8  
*Means, SDs, and Correlations for Variables in the Second Study*

Variables	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Proactive personality T1	3.55	0.51	---																
2. Job demands T1	3.50	0.75	.38**	---															
3. Job control T1	3.61	0.85	.39**	.21**	---														
4. Supervisory support T1	2.86	0.70	.12*	-.02	.28**	---													
5. Coworker support T1	3.00	0.56	.09	.02	.05	.44**	---												
6. Org. constraints T1	1.89	0.66	.02	-.02	-.01	-.29**	-.11*	---											
7. Proactive personality T2	3.63	0.56	.68**	.31**	.33**	.10	.08	-.05	---										
8. Job demands T2	3.51	0.68	.28**	.65**	.13*	-.04	-.03	-.05	.21**	---									
9. Job control T2	3.62	0.83	.31**	.17**	.71**	.17**	-.05	.01	.36**	.15**	---								
10. Supervisory support T2	2.93	0.67	.08	.04	.19**	.52**	.24**	-.21**	.18**	-.02	.27**	---							
11. Coworker support T2	3.07	0.57	.12*	.01	.07	.20**	.58**	-.07	.18**	-.04	.08	.38**	---						
12. Org. constraints T2	1.81	0.65	-.05	.02	-.01	-.20**	-.04	.70**	-.11	-.05	-.03	-.31**	-.08	---					
13. Proactive personality T3	3.65	0.53	.72**	.32**	.31**	.08	.03	.01	.71**	.26**	.30**	.09	.08	-.06	---				
14. Job demands T3	3.52	0.69	.31**	.61**	.17**	-.03	-.06	.00	.27**	.67**	.10	-.04	-.09	.04	.28**	---			
15. Job control T3	3.65	0.89	.32**	.21**	.55**	.11	-.03	.00	.26**	.22**	.68**	.18**	.01	-.04	.31**	.18**	---		
16. Supervisory support T3	2.93	0.67	.07	.01	.10	.39**	.27**	-.12*	.10	.03	.12*	.49**	.25**	-.22**	.17**	-.01	.25**	---	
17. Coworker support T3	3.09	0.56	.07	-.05	.06	.22**	.43**	-.01	.09	-.12*	.09	.25**	.48**	-.07	.10	-.10	.11*	.41**	---
18. Org. constraints T3	1.75	0.61	-.07	-.03	-.04	-.22**	-.05	.61**	-.09	-.03	-.04	-.23**	-.02	.69**	-.12*	.09	-.07	-.30**	-.17**

Note.  $N = 330-458$  individuals. \*  $p < .05$ ; \*\*  $p < .01$ . Org. constraints=organizational constraints

Table 9

*Fitness and Parameter Estimates for Bivariate Latent Change Score (LCS) Models with Proactive Personality and Work Variables*

Bivariate LCS Model	Model fit indices					Parameter estimates ( <i>S.E.</i> )			
	$\chi^2$ ( <i>df</i> )	CFI	TLI	RMSEA	SRMR	Lagged effect of work variables, $\gamma_1$	Lagged effect of personality, $\gamma_2$	Mean of Slope 2, linear trajectory for work variables	Mean of Intercept 2, starting point for work variables
Proactive personality with									
Job demands, Model 1	1565.90 (710)	.89	.89	.052	.120	.07* (.04)	.11** (.05)	.28 (.30)	3.47*** (.18)
Job control, Model 2	1310.98 (593)	.90	.90	.052	.119	.05* (.02)	.30*** (.09)	2.12*** (.68)	4.17*** (.22)
Supervisory support, Model 3	1054.90 (500)	.91	.91	.050	.105	.04 (.04)	.14* (.06)	.49 (.37)	3.13*** (.18)
Coworker support, Model 4	1050.51 (500)	.91	.91	.049	.105	.01 (.04)	.07 (.04)	.78* (.34)	3.28*** (.14)
Org. constraints, Model 5	2027.20 (1064)	.91	.90	.045	.093	-.01 (.03)	-.13** (.05)	.93** (.28)	3.08*** (.19)

Note. N=330-458 individuals. \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ . Age and gender were controlled. All  $\chi^2$  are significant at  $p < .001$ . Parameters are unstandardized. Org. constraints=organizational constraints.

CFI = Comparative Fit Index, TLI = Tucker–Lewis Index, RMSEA=Root Mean Square Error of Approximation, SRMR=Standardized Root Mean Square Residual.

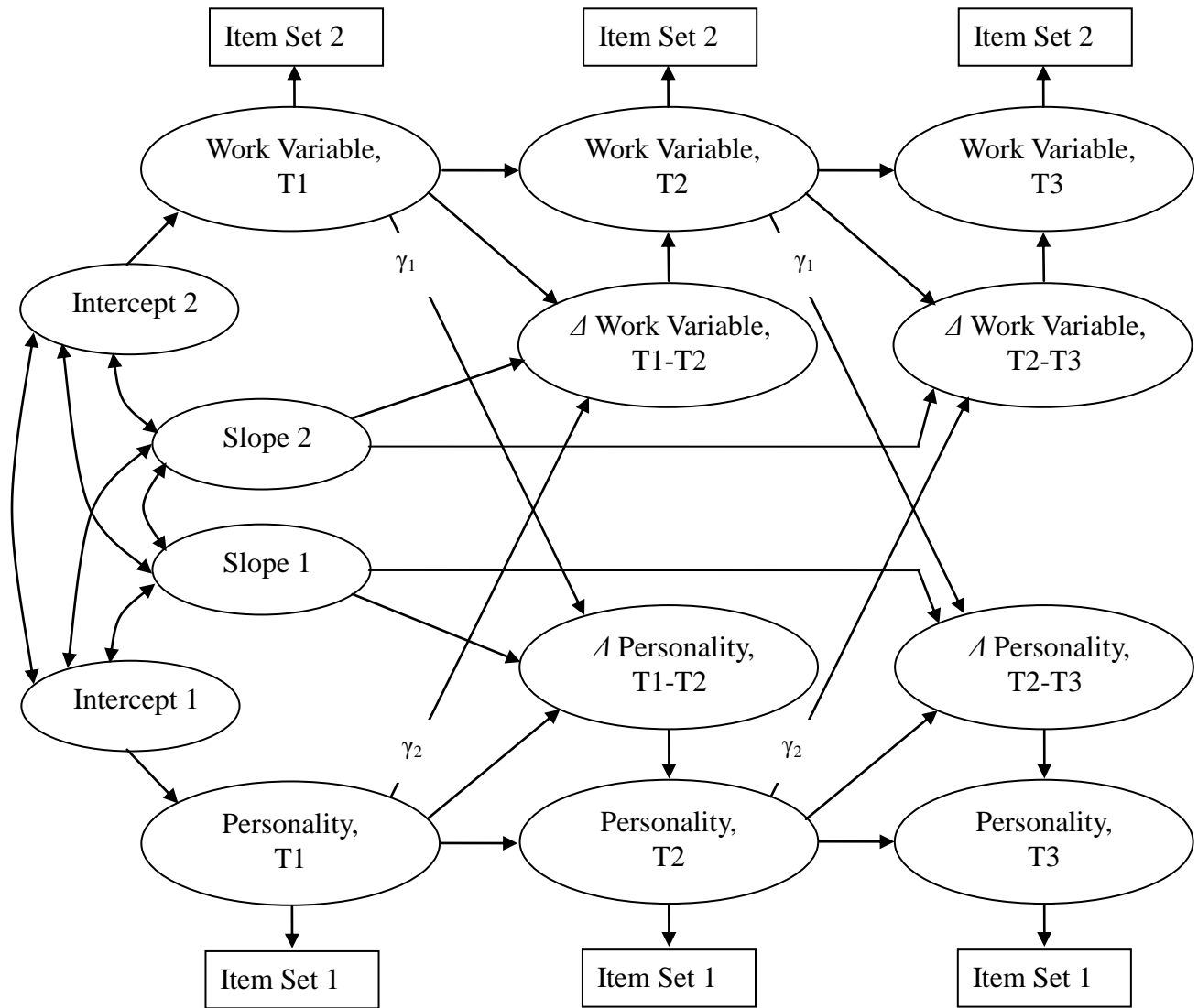


Figure 2: Bivariate Latent Change Score Model for Proactive Personality and Work Environments. Adapted from McArdle (2009, p. 596) and Ferrer and McArdle (2010, p.151).

This is a simplified representation of a bivariate latent change score model. Paths from a variable at Time  $n$  to the same variable at Time  $n+1$  are fixed to 1, the same for the paths from a latent change variable from Time  $n$  to to the same construct at Time  $n+1$ . See McArdle (2001; 2009) for more details.

### Appendix D

#### Comparison of Items Used in the Two Proactive Personality Instruments

Characteristics	The ten-item measure by Seibert, Crant, and Krainer (1999)	The scale use in study 2
Change orientation	<p>If I see something I don't like, I fix it.</p> <p>I am always looking for better ways to do things.</p> <p>I am constantly on the lookout for new ways to improve my life.</p>	<p>Whenever something goes wrong, I search for a solution immediately.</p> <p>I actively attack problems.</p>
Action orientation	<p>Wherever I have been, I have been a powerful force for constructive change.</p>	<p>Whenever there is a chance to get actively involved, I take it.</p> <p>Usually I do more than I am asked to do.</p>
Opportunity recognition and utilization	<p>I excel at identifying opportunities.</p> <p>I can spot a good opportunity long before others can.</p>	<p>I use opportunities quickly in order to attain my goals.</p> <p>I take initiative immediately even when others don't.</p>
Realizing changes	<p>No matter what the odds, if I believe in something I will make it happen.</p> <p>If I believe in an idea, no obstacle will prevent me from making it happen.</p> <p>I love being a champion for my ideas, even against others' opposition.</p> <p>Nothing is more exciting than seeing my ideas turn into reality.</p>	<p>I am particularly good at realizing ideas.</p>