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Personality Traits and
Provision of Incentives**

Vera Brencic
University of Alberta

Andrew McGee
University of Alberta

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Employers' demand for personality traits and provision of incentives[°]

Vera Brenčič*

Andrew McGee[♦]

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Abstract:

We measure firms' demands for personality traits from job ads and assess how these demands relate to the incentives firms offer. The demand measures produce intuitive rankings of occupations in terms of personality requirements and, at the occupation-level, are positively correlated with the traits of workers in those occupations for all traits except emotional stability. Employers primarily demand workers who are extroverted, conscientious, and open-to-experience. Firms seeking conscientious workers are less likely to offer incentive pay and promotion opportunities, which suggests that personality demands interact with the optimal design of pay if conscientious workers require fewer incentives to elicit effort.

Keywords: personality, job ads, incentive pay, promotions, recruitment

JEL codes: D22, J23, J24, J33, M51

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* Department of Economics, University of Alberta, 8-14 Tory Building, Edmonton, AB T6G 2H4, Canada. E-mail: vbrencic@ualberta.ca.

[♦] Corresponding Author: Department of Economics, University of Alberta, 8-14 Tory Building, Edmonton, AB T6G 2H4, Canada, and IZA. E-mail: mcgee1@ualberta.ca.

1. Introduction

Personality traits—the “patterns of thoughts, feelings and behaviors that reflect the tendency to respond in certain ways under certain circumstances” (Roberts, 2009)—influence how workers interact with coworkers and customers, respond to incentives, and react to the everyday challenges of the workplace. These traits are related to job performance in meta-analyses (e.g., Barrick and Mount, 1991; Tett et al., 1991; Salgado, 1997), but the relationships between personality traits and performance differ across incentive schemes (Fulmer and Walker, 2015). Despite this, evidence on the extent of employers’ demand for personality traits and how the incentives offered by firms interact with these demands remains scarce and incomplete.

The Occupational Information Network (O*NET), for example, surveys workers and human resource experts on sub-traits of conscientiousness, but these measures reflect neither employers’ demand nor the full breadth of personality traits (Peterson et al., 2001). Likewise, a handful of studies characterize employers’ personality requirements for individual occupations using job ads, but no prior work characterizes employer demand for personality traits in a broad cross-section of occupations in a uniform fashion.¹ Sackett and Walmsley (2014) (p. 543), in particular, note that, “(t)here is no authoritative source of which we are aware that summarizes the personality attributes employers seek in potential employees.”

We fill this gap by measuring employers’ expressed demand for personality traits in a sample of 140,193 job ads for 249 occupations posted to Monster.com over a two-week period in 2006. Our approach builds on the insight of the lexical hypothesis in psychology, the notion that important individual differences in the way people engage with each other and their

¹ Job ads have been used to infer personality requirements for librarians (Tokarz, 2019), civil servants (Kruyen et al., 2020), supply management professionals (Klezl et al., 2022), and brand managers (Wroblowska, 2019).

environments become encoded into language (Allport and Odbert, 1936). Specifically, we identify job ads containing trait-descriptive terms that Goldberg (1981) and John (1990) associated with the ten positive and negative poles of the Big Five traits: extroversion, conscientiousness, openness-to-experience, agreeableness, and emotional stability.²

We pay particular attention to the problems of false positives (i.e., ads with trait-descriptive terms used for reasons unrelated to personality) and false negatives (i.e., ads in which we fail to identify personality trait demands even though they are mentioned in the ads). False positives prove significant: as many as half of all instances of trait-descriptive terms in job ads are false positives. By contrast, false negatives appear to be a less significant problem as a tripling of the number of trait-descriptive terms used to categorize ads yields increases in the fraction of ads referencing personality traits of only around 20 percent. Overall, we find that employers predominantly demand extroversion (31% of ads), conscientiousness (26% of ads) and openness (21% of ads), while references to introversion, non-conscientiousness, close-mindedness, antagonism, and neuroticism are essentially absent from job ads.

To validate our measures, we confirm that the rankings of the 249 occupations represented in our sample in terms of their demands for personality traits are intuitively plausible. For example, the occupations highest in demand for extroversion include occupations in which individuals interact regularly with customers or subordinates, while the occupations highest in the demand for conscientiousness include jobs where attention-to-detail and effort may be difficult to monitor. Likewise, we find that demands for the Big Five traits are correlated with

² The trait names refer to the “positive” poles (Goldberg, 1990), while we refer to the corresponding “negative” poles as introversion, non-conscientiousness, closed-to-experience, antagonism, and neuroticism. According to McCrae and John (1992), extroverts tend to be more energetic, outgoing, ambitious, and assertive. Conscientious individuals tend to be diligent, well-organized, and neat. Individuals high in openness/intellect have greater need for varied and novel experiences, aesthetic sensitivity, and curiosity. Agreeable individuals tend to be more trusting, modest, and compliant. Emotionally stable individuals tend to be calm and even-tempered.

requirements for “soft skills” such as people management and customer service but uncorrelated with “hard” skills such as financial and specific software skills. Finally, we merge the personality demand measures at the occupation-level to the National Longitudinal Survey of Youth 1997 (NLSY97), a longitudinal sample of youth who were between 12 and 16 in 1996. If the measures captured only boilerplate ad language or cheap talk on the part of firms, we would not expect to observe relationships between the personality demand measures from ads and the measured traits of these workers, most of whom entered the labor force around 2006 when the trait demands were measured. Instead, we find that the occupational personality demand measures are positively correlated with the personality traits of workers in these occupations for every trait except emotional stability, which is consistent with our measures capturing job requirements.

We proceed to investigate the connection between personality demands and the incentives offered by firms. Studies exploiting random assignment to compensation structures have found that performance under different incentive structures varies with personality traits. In a laboratory experiment, Fulmer and Walker (2015) find that the productivity-enhancing effects of incentive pay are most pronounced among less conscientious workers. Similarly Donato et al. (2017) in a field experiment found that post-birth complications fall when maternity care providers in India received incentive pay, but the health benefits arising from incentive pay are absent among conscientious providers. Firms seeking workers with different traits may find it in their interests to offer different incentives if workers with different personality traits react differently to incentives. Job ads are well suited for studying the relationships between personality demands and the incentives offered by firms because they often describe the structure of compensation even when wages are not posted (Brenčić and Norris, 2010). In our sample, for

instance, 81 percent of the ads either post a wage or wage range or describe the nature of compensation (e.g., incentive pay, bonuses, employee stock purchase plans, 401Ks, benefits.).

With this focus in mind, we turn to the incentive-enhancing traits model of Bowles et al. (2001). In the model, workers are endowed with traits such as conscientiousness that allow employers to elicit effort from them at lower cost. If workers with these traits can be identified, then employers must pay them more in perfectly competitive labor markets when employers cannot capture worker-specific rents. The Bowles et al. model served as a theoretical framework motivating much of the empirical literature on personality and wages, but estimates of the wage returns to conscientiousness have not provided strong support for the model's hypotheses.³

We propose an alternative model in which incentive-enhancing personality traits influence the wage structure rather than the wage level. Bowles et al. (2001) assume that all firms observe incentive-enhancing traits, but where personality is concerned this involves either personality testing or interviewing—both more costly than the resume reviews used to screen for other requirements. Moreover, employers may find learning about personalities difficult when applicants have incentives to misrepresent themselves.⁴ In our model, employers choose between a fixed wage or incentive-based compensation when effort is unobservable and workers differ in their intrinsic motivation to supply effort. We show that the difference between expected profits from fixed wage and incentive-pay contracts is higher for firms that screen for conscientious workers, and thus firms indicating demand for (and presumably screening for) conscientiousness

³ Mueller and Plug (2005), Heineck and Anger (2010) and Heineck (2011) find limited evidence of a positive correlation between wages and conscientiousness for women but not men in samples from the United States, Germany, and the UK, respectively, while Fletcher (2013) finds no evidence of a positive return to conscientiousness for either gender after accounting for family effects in the United States. Nyhus and Pons (2006) find an insignificant but positive return to conscientiousness at the outset of employment but a significant negative return associated with the interaction between conscientiousness and tenure.

⁴ McGee and McGee (2023) show that incentivized personality measures such as those taken in job applications are only weakly to moderately correlated with non-incentivized measures for the same individuals in a lab experiment.

should be less likely to offer incentive pay. Intuitively firms relying on intrinsic motivation with a fixed wage to elicit effort benefit more from identifying conscientious workers.

This prediction is borne out in our data even after controlling for firm fixed effects and many job characteristics that may influence the optimal provision of incentives. Job ads indicating demand for conscientious workers are as much as 3.7 percentage points less likely to offer incentive pay than other ads in a sample in which 21 percent of ads indicate the use of incentive pay. As a robustness exercise, we note that firms may alternatively use promotion tournaments to motivate workers when effort is non-contractible, but firms seeking out conscientious workers would have less need to offer promotion opportunities to solve the moral hazard problem. Consistent with this hypothesis, ads demanding conscientious workers are as much as 2.7 percentage points less likely to reference promotion opportunities in a sample in which 16 percent of ads reference promotion opportunities. Firms appear to seek out conscientious workers for positions offering fewer advancement opportunities and thus potentially less wage growth. This last observation may help explain the negative interaction between conscientiousness and tenure in wage regressions found by Nyhus and Pons (2005) who speculated that firms may not need to raise the wages of conscientious workers to motivate them.

In addition to complementing the literature on the wage returns to personality traits, our study makes five primary contributions. First, we demonstrate that personality trait demands can be measured in job ads to provide evidence of the extent of employers' demand for non-cognitive skills. In particular, 54% of job ads make at least one reference to personality traits—the same percentage of ads that reference educational requirements which suggests strong demand for noncognitive skills. We also provide the first characterization of occupations in terms of personality requirements from job ads, an endeavor similar in spirit to studies applying

text analysis to job ad data to replicate O*NET measures of occupation skill and task requirements (e.g., Djumalieva and Sleeman, 2018; Lassébie et al., 2021).

Second, our study contributes to the literature measuring personality using text from social media (e.g., Schwartz et al., 2013; Plank and Hovy, 2015; Arnoux et al., 2017; Kern et al. 2019). The study most similar to ours is that of Kern et al. (2019) who analyze tweets from Twitter users to create occupation-specific personality profiles. In contrast to their study, we measure employer demand rather than the average traits of workers in an occupation who are active on Twitter—a noteworthy distinction if personality is systematically related to the decision to use Twitter. Using job ads rather than Twitter posts also allows us to examine how personality demands are related to incentives, skills and tasks as indicated in the ads to further our understanding of the relationships between personality and employment.

Third, our findings regarding false positives highlight the pitfalls for economists of using simple text analysis relying on keywords. Searching for personality keywords without considering the context of their use would dramatically overstate the demand for these traits. Moreover, the measurement error associated with identifying keywords in inappropriate contexts is almost certainly systematic as words do not appear randomly. For example, “progressive” is a trait-descriptive term associated with openness, but firms often seek candidates with “progressive experience,” meaning individuals with a history of positions of increasing responsibility. Failing to identify these false positives risks inducing a positive correlation between the openness demand measure and outcomes such as posted wages, job levels, or promotion opportunities.

Fourth, our study contributes to the literature on the role of personality traits in recruitment by documenting employers’ demands for the Big Five traits at the outset of the selection process. This process consists of two stages: (1) the selection of candidates for interviews and further

assessment based on resumes, cover letters, and other available information and (2) the screening of selected candidates through interviews and trial work. Prior studies focus exclusively on the role of personality traits in the second stage through surveys (Dunn et al., 1995; Moy and Lam, 2004) and discrete choice experiments (Wehner et al., 2022) among hiring managers and observed hiring following apprenticeships (Hoeschler and Backes-Gellner, 2018).⁵ These studies find that conscientiousness has the strongest positive effect on hiring among the Big Five traits.

Humburg and van der Velden (2015) demonstrate that the factors influencing the two selection stages differ, and personality traits may influence the first stage of screening as well as the second. Caldwell and Burger (1998) suggest that personalities can influence the information contained in cover letters and CVs, while Baert (2018) finds in a field experiment with fictitious job applications that brief reviews of photos on social media correlated with perceived personality traits influence the initial stages of selection. Perhaps more importantly, the increased use of personality testing by firms means that applicants arriving at the second stage of recruiting may have already been selected explicitly on the basis of personalities. Our estimates of employers' demands for traits at the outset of the hiring process thus may better capture the overall demand for personality traits than studies of their influence at later stages of hiring.⁶

Finally, the personnel economics literature examining the optimal provision of incentives focuses largely on characteristics of the job environment such as multi-tasking (Holmstrom and

⁵ Hiring managers were asked about job candidates in six occupations in Dunn et al. (1995), entry-level workers in Moy and Lam (2004), and vocational training graduates with five years of work experience in Wehner et al. (2022), while Hoeschler and Backes-Gellner (2018) observed firms' hiring decisions following apprenticeships for electricians, polymechanics, and commercial employees. By contrast, our study is not restricted to particular occupations or groups of workers.

⁶ For instance, Hoeschler and Backes-Gellner (2018) find that extroversion explains almost none of the hiring decisions among apprentices, whereas extroversion is the most sought out trait in our sample of job ads. Among the Big Five traits, however, extroversion is relatively easy to assess in brief interactions (Funder and Colvin, 1988; John and Robins, 1993) early in the application process. Studies focusing on later stages in the hiring process may miss such initial screening of the applicant pool.

Milgrom, 1991), monitoring costs (Lazear, 1986; Brown, 1990), teamwork (Holmstrom, 1982) and the need for cooperative work (Lazear, 1989). By contrast, we demonstrate that the provision of incentives may be informed by the firm’s personality demands during recruitment. Our findings from a broad sample of employers indicate that employers appreciate the relationship between incentives and conscientiousness and are much less likely to offer extrinsic rewards when seeking out conscientious applicants—suggesting an important interaction between the decision to screen for personality traits and firms’ use of incentives.

2. Measuring personality trait demands

2.1 Data from job ads

The job ad sample consists of 142,618 job ads posted to Monster.com from June 26, 2006, to July 8, 2006; we restrict our attention to ads with text resulting in a final sample of 140,193 job ads.⁷ Pre-eminent among employment websites operating in the United States in 2006, Monster.com ranked first in the share of visitors and the number of resumes hosted and second in the share of page views among 350 employment websites in the online recruiting industry at the time (Weddle, 2009). According to the Bureau of Labor Statistics (2006), there were 3.8 million job openings in July 2006—some of which were existing vacancies (i.e., the stock rather than the flow of new job postings). Given that we observe less than half of the month, our sample likely accounts for approximately 10% of new job postings in the United States in this period.

Summary statistics for the variables constructed from the job ad data other than the personality demand measures are reported in Table 1. The dependent variables that we examine include the level of the offered wage, whether incentive pay is part of the compensation and whether the ad mentions promotion opportunities. To construct offered wages, we take the

⁷ Ads without text result from scraping errors.

midpoint of the upper and lower bounds on wages listed in the ad and separately analyze ads associated with hourly and annual rates of pay. Offered wages are available for only 24 percent of the ads in our sample.⁸ We identify 21 percent of the ads that indicate that bonuses, commissions, pay-for-performance, piece-rates, or incentive pay form part of a job's compensation and 16 percent of the ads that mention promotion opportunities (e.g., "within firm advancement," "in-house promotion," "promotion opportunities").

The control variables include job characteristics from standardized Monster.com fields (e.g., location) and others extracted from the text of the ad. We control for the length of the ad in characters, education and experience requirements (if any), the job's location, occupation, and the skill and task requirements mentioned in the ad.⁹ Similar to the job ads analyzed in Hershbein and Kahn (2018), only 54 percent of job ads included education requirements and 30 percent experience requirements. A total of 249 occupations are represented in our data, and 80 percent of ads were matched to occupations.¹⁰ The skill requirements, which were constructed following Deming and Kahn (2018), include financial skill, cognitive skill, general computer skill, specific software skill, customer service skill, social skill, character skill, project

⁸ Marinescu and Wolthoff (2020) similarly report that 20 percent of job ads from CareerBuilder.com reveal information about the offered wage. In our sample, 301 job ads (0.2%) post a wage using a rate of pay other than hourly or annual. We exclude these ads from our analysis of posted wages for simplicity.

⁹ The 262 location codes in the Monster data roughly correspond to the U.S. Census Bureau's public use microdata area (PUMA) codes subdividing the United States into areas containing no fewer than 100,000 people each.

¹⁰ We use the Dorn (2009) occupation codes that aggregate U.S. Census occupation codes to a balanced panel of occupations for the 1980, 1990, and 2000 Census and the 2005-2008 American Community Surveys in order to facilitate merging our personality demand measures to other data sets. To identify the occupation, we first attempt to match the text following the string "Job Title:" in the ad to strings associated with each occupation code. For example, for the "Special Education Teachers" category, we searched for the strings "special education teacher*", "spec-ed teacher*" and "special needs teacher*". Not all ads, however, contain the "Job Title:" string. For the remaining ads, we count the number of times strings associated with each Dorn occupation code appear in the ad. We then identify the occupation mentioned most often in the ad giving priority to specific occupations over "not elsewhere categorized" occupations (e.g., "electrical engineer" instead of "engineer, n.e.c." even if strings associated with the latter appear more often). Monster had an occupation field, but it was relatively coarse with only nine categories (i.e., business and management professions, engineering and computer science professions, education-related professions, medical professions, administrative, clerical, or legal professions, mechanics or laborers, service industry professions, research, science or technical professions, or other professions).

management skill, people management skill, and writing skill.¹¹ The job task measures include indicators for whether the ad mentions routine tasks, manual tasks, mathematical tasks, and nine general tasks required to different degrees on many jobs such as communication and teamwork. We use the task measures only as controls in our analysis as the relationships between personality demands and the tasks mentioned in the ads are examined at length in Brenčič and McGee (2023). We also construct an indicator for whether the ad indicates that multi-tasking is required.¹² Finally, we identify the firm posting the ad for 68 percent of the ads.¹³

Using online job ads to characterize employers' demand has advantages and disadvantages discussed extensively in other studies (e.g., Kureková et al., 2015). The primary advantage of the Monster.com sample is that we have the full-text of the job ads, which allows us to investigate the importance of false positives. Prior studies relying on the proprietary algorithms of third-party data providers to generate keyword-based variables are unable to examine the potential importance of measurement error of this sort. Moreover, using a two-week flow of new vacancies reduces the likelihood that the ads are phantom vacancies, ads posted for positions that have already been filled or which firms have no intention of filling which Cheron and Decreuse (2017) and Albrecht et al. (2023) have shown are common on job boards.¹⁴ Likewise using ads from a single job board means that ads cannot be scraped more than once from different sites.

¹¹ We construct indicators for these skill requirements using the keywords and phrases detailed in Table 1 of Deming and Kahn (2018) except for the specific software requirement for which we supplied our own list of software and programming languages.

¹² In brief, we use dictionaries of phrases associated with each task drawn from corresponding task measures in O*NET to identify tasks mentioned in the ads. Appendix Table 1 provides the phrases in job ads associated with each task measure and the multi-tasking measure.

¹³ Deming and Kahn (2018) are similarly able to match 63 percent of ads in their sample to firms. We use a fuzzy matching algorithm applied to the firm name strings to match ads from the same firm. We set the firm identifier equal to missing for ads associated with well-known recruiting agencies.

¹⁴ The two-week observation window implies that we cannot investigate interactions between the personality demands and the business cycle and seasonal trends. How the business cycle influences personality demands is an interesting topic for future research, but it is unlikely that personality demands vary seasonally for most occupations.

Finally, having job ads from 2006 has the advantage of corresponding to the entry of the NLSY97 cohort into the labor market. This allows us to investigate whether the personality demand measures by occupation are correlated with the traits of workers in those occupations. Employers' demands for personality traits may have changed since 2006, but we present evidence in Section 2.6 that the occupational personality demand measures remain correlated with the personalities of NLSY97 respondents in these occupations more than a decade later.

The dataset also has limitations. First, the dataset is smaller than those in studies using, for instance, Burning Glass datasets. At the same time, the small size is what allows us to review every instance of trait-descriptive terms to achieve a degree of accuracy where false positives are concerned that may not be possible in larger samples. Second, the occupational distribution of the sample differs from that of the labor force at the time—similar to other studies of online job ads (e.g., Rothwell, 2014; Hershbein and Kahn, 2018). Comparing our sample to the Bureau of Labor Statistics' Occupational Employment and Wage Statistics in May 2006 in Appendix Table 2, our sample over-represents managers, business operations and financial specialists, engineers, and media and communications occupations, while it under-represents teachers, food preparation and service occupations, office and administrative support occupations, and janitorial occupations. From our point of view, these disadvantages primarily influence the reliability of the personality demands by occupation in occupations in which we observe few (or no) ads.

2.2 The lexical hypothesis

According to Allport and Odbert's (1936) lexical hypothesis, individual differences that are most significant in daily interactions eventually become encoded in language. Allport and Odbert (1936) initiated a literature dedicated to identifying descriptive adjectives associated with individual traits. Refining Norman's (1967) catalogue of 2,797 trait-descriptive adjectives in the

English language, Goldberg (1981, 1982) narrowed this list to 1,710 trait-descriptive adjectives. Goldberg (1981) surveyed university students concerning whether the adjectives accurately described them or someone they knew and identified five factors (each with two poles) that accounted for most of the correlations among adjectives. This research confirmed the five factors identified in earlier lexical studies (e.g., Tupes and Christal, 1961; Norman, 1963; Borgatta 1964; Digman and Takemoto-Chock, 1981) and was subsequently validated in other studies (e.g., John, 1990; Wiggins, 1995). The resulting Five Factor Model (Goldberg, 1982) characterizes personality in terms of the Big Five traits.

2.3 Methodology

We take the lexical hypothesis as our starting point and assume that firms indicate desired personality traits through the terms used in job ads. We match terms in the ads to the trait-descriptive term lists from Goldberg (1981) and John (1990) to identify ads containing terms associated with each personality trait pole (e.g., extroversion/introversion and emotional stability/neuroticism).¹⁵ There are two potential sources of measurement error: Type II errors (false negatives) when our ten trait categorization dictionaries omit terms that employers use to signal preferred personalities and Type I errors (false positives) when we identify trait-descriptive terms in ads that are not indicative of desired personality traits.

In the next section, we demonstrate that expanding the word lists leads to small increases in the number of trait descriptive terms identified, suggesting that false negatives may not be that

¹⁵ Concerning our choice of the word lists in Goldberg (1981) and John (1990), the two studies represent the culmination of decades of research in psychology identifying personality traits and categorizing words in terms of their association with these traits in a scientifically rigorous fashion; the two studies have over seven thousand citations between them. Alternative, naïve methods of identifying trait descriptive adjectives such as using words based on their semantic similarity to the Big Five trait names would ignore the fact that the Big Five are broad traits subsuming narrower traits, and thus semantic similarity ought to be defined relative to a group of adjectives reflecting these narrower traits—which is effectively what the psychology research in this area has done. Ultimately we use all of the words in the Goldberg (1981) and John (1990) lists and thus minimize the role of researcher discretion where the word lists are concerned.

prevalent. The more challenging issue proves to be false positives. For instance, “flexible” is in the agreeableness dictionary, but “flexible” in job ads frequently refers to work arrangements. Similarly, job ad jargon is problematic as adjectives like “progressive” and “direct” are used in ways very particular to human resources. To address the issue of false positives, we require that trait-descriptive terms be used to describe desired job candidates, the firm’s existing workers, the firm itself, or its environment.¹⁶ We assume that firms may describe themselves, their employees, or their environment using personality-related adjectives in order to attract similar applicants. We further require that the adjectives are used as adjectives (rather than another part of speech) and that the adjectives are used in a sense relevant to personality.^{17,18} We thus exclude instances of words in our dictionaries when they appear as proper nouns (e.g., “Progressive Insurance”), nouns (e.g., “objective”), or verbs (e.g., “articulate”) and when they are used to describe a firm’s product or geographic location or in any sense not related to personality.

We implemented these rules using an extensive exclusion list of over 18,000 words and phrases to be ignored when measuring the frequency of personality-related adjectives. The list was developed using the natural language processing software WordStat to review all the contexts in which words in our personality dictionaries appeared in the job ads. This allowed us to identify expressions associated with false positives and to exclude them from the counts.

We briefly comment on the potential for using machine learning classification algorithms to identify personality demands in job ads. Such an approach would require the existence of a

¹⁶ We count adjectives modifying job tasks in some instances given how many job ads are written. For instance, a firm may require “courteous service,” but “courteous” is a function of the individual performing the task rather than an intrinsic feature of “service.” In all such instances—which admittedly fall in something of a grey area between adjectives and adverbs and require some judgment—we require that the adjective describe the person performing the task rather than an essential feature of the task.

¹⁷ A small number of nouns appear in our lists, and for these we count instances in which they appear as nouns.

¹⁸ The requirement that the adjective be used in a sense relevant to personality addresses the concern that many adjectives have multiples uses and meanings.

dataset linking explicit expressions of employers' demands for traits with the text of the job ads in order to train the classification algorithm to identify trait demands. Studies such as Schwartz et al. (2013) using machine learning (ML) to classify social media profiles in terms of their personality traits had access to personality tests taken on the social media platform to train the ML algorithms, but no similar training dataset is available in this context. In the absence of such a dataset, a classification algorithm would likely have to rely on a training dataset such as ours in which the personality demands in ads have been inferred by human judges. In that case, any ML approach would perpetuate the classification errors and biases of the human judges who constructed the training dataset, and thus such an approach would be no more free from measurement error than a study such as ours.¹⁹ While our “brute force” approach could not be used for datasets that are orders of magnitude larger, this approach has the advantage of making explicit the rules and criteria used to identify personality demands in the ads. As such, our approach can be replicated by others adhering to the same rules and criteria.

2.4 Measured trait demands

Table 2 reports the fraction of job ads in which trait-descriptive terms appear for each of the ten trait poles using different categorization dictionaries and different exclusions lists for eliminating Type I errors. Column 1 reports the statistics using dictionaries including only the trait names themselves (e.g., “extroversion,” “extrovert,” and “extroverted”) to reflect the fact that the Big Five personality taxonomy is known to firms and human resource professionals.

¹⁹ Other potential issues with ML-based approaches are more technical. For instance, Schwartz et al. (2013) show that the prediction accuracy of open-vocabulary ML approaches in which all words are used as potential predictors of traits is greater than that of closed-vocabulary approaches relying on word dictionaries. Open vocabulary ML algorithms, however, need large amounts of text to achieve predictive accuracy. The job ads in our sample average only 292 words, and thus an open vocabulary ML algorithm would not likely be viable in this context. Relying on word dictionaries of trait-descriptive terms in a closed-vocabulary ML approach as in our study, however, might work well given that employers are explicitly describing desired employees in job ads (in contrast to the largely random subjects of social media).

Very few ads, however, explicitly state a preference for the Big Five personality traits: no trait pole is represented in more than one percent of ads except for emotional stability.²⁰

The traits-only categorization dictionary in Column 1, however, undoubtedly misses a great many terms signaling employers' demand for personality traits (Type II errors) as the Big Five traits themselves were identified from the correlations among many adjectives. Column 2 reports the summary statistics using a categorization dictionary that includes the traits themselves together with the word lists from Goldberg (1990), Saucier and Goldberg (1996), and John (1990). Goldberg (1990) reduced Goldberg's (1981) list of 1,710 items to a list of 339 terms associated with the Big Five traits to be used in studies with subjects, while Saucier and Goldberg (1996) categorize by trait 435 of the most familiar terms in Goldberg's (1981) list. John's (1990) list consists of words assigned to a Big Five domain by at least 90 percent of expert judges. We include John's (1990) list to reduce our reliance on a single source, but the three lists overlap to a significant extent. Each term is placed in the categorization dictionary of the trait for which it had the highest factor loading in these studies. Because some terms load on different traits in different studies, a small number of terms appear in categorization dictionaries for more than one trait. The categorization dictionaries used in Column 2 include 560 terms.²¹

In Column 2, a term is counted regardless of how it is used in the ad. Using these categorization dictionaries, 53 percent of job ads include terms associated with each of extroversion and conscientiousness, while over a third of the job ads include terms associated with each of openness and agreeableness. The problem of false positives (Type I errors), however, appears to be very important. Using the same categorization dictionaries but applying

²⁰ The fraction of ads containing references to emotional stability stems from our inclusion of "stable" in the traits-only category dictionary for emotional stability.

²¹ Appendix Table 3 lists the trait categorization dictionaries (i.e., word lists) used for every column in Table 2.

the rules described in the previous section to remove false positives from the adjective counts in Column 3, firms primarily demand workers who are extroverted (26% of ads), conscientious (20%), and open-to-experience (20%)—nearly 50 percent reductions relative to Column 2. For some traits like neuroticism, almost all instances of trait-descriptive terms are false positives.

To examine the importance of false negatives, we expand the categorization dictionaries in Column 4 to include all of the terms in Goldberg’s (1981) list as well as the terms from John [1990]—a near tripling of the number of terms counted in the personality demand measures—while continuing to remove false positives. The fractions of ads containing trait-descriptive terms associated with extroversion and conscientiousness, however, increase by a mere 20 to 25 percent, while the fractions of ads containing terms associated with the remaining trait poles are basically unaffected by the expansion of the dictionaries. While Type II errors (false negatives) undoubtedly exist in the personality demand measures in Column 4, it would appear that the dictionaries have entered the region of rapidly diminishing returns to further expansion.

According to the measures in Column 4, employers primarily demand extroversion (31% of ads), conscientiousness (26%), and openness (21%), but a non-trivial number of ads indicate demand for agreeableness (12%) and emotional stability (7%) as well. Figure 1 displays the word clouds associated with extroversion, conscientiousness, openness, agreeableness, and emotional stability.²² In the word clouds, the size of a word indicates its relative frequency among the words in the trait dictionary. Two things are apparent. First, a small number of words represent a disproportionately large share of the trait descriptive terms identified in our data for each trait. One could obtain broadly similar measures using far fewer than 1,710 terms or even the 560 used in Columns 2 and 3. Second, two words, “verbal” (in the dictionary for

²² The word clouds for introversion, non-conscientiousness, closed-to-experience, antagonism, and neuroticism are available from the authors.

extroversion) and “analytical” (in the dictionaries for conscientiousness and openness), play an outsized role in our measures of personality demands. “Verbal” (in 9% of ads) and “analytical” (in 5% of ads) appear in many ads in the phrases “verbal skill” and “analytical skill.” Both contexts satisfy our rules insofar as the terms are being used as adjectives modifying an attribute (skill) of the desired worker. Furthermore, who is to say that a person who has verbal skill is not verbal or that a person with analytical skill is not analytical? We are agnostic on these questions, but we also recognize that these expressions may not refer to the applicant’s personality. Thus we report in Column 5 of Table 2 the fraction of ads in which trait-descriptive terms are mentioned excluding “verbal” and “analytical,” but it remains the case that employers primarily demand extroversion (22% of ads), conscientiousness (21%), and openness (15%).

Finally, we consider how many trait-descriptive terms job ads use. While different adjectives might indicate demand for different facets (i.e., sub-traits) of personality, the number of trait descriptive terms in an ad may also signal the intensity of the employer’s desire for an individual with a given trait. Table 3 reports the fraction of ads with less than or equal to a given number of references to individual personality traits or any personality trait. Conditional on an ad containing a trait-descriptive term for a trait, the modal number of such terms in an ad is one for all of the Big Five traits.²³ That said, for each trait a small number of ads contain several terms associated with the trait—as many as 16 such references in the case of openness. Last, we note from Column 6 that 54 percent of job ads contain at least one trait-descriptive term—the same fraction of ads that include education requirements.

²³ We focus on extroversion, conscientiousness, openness, agreeableness, and emotional stability from here onward given the very small number of ads containing terms associated with the other poles.

2.5 Trait demands by occupation and skill requirements

Workers in different occupations perform different tasks in different environments, and thus the optimal personality trait combination informing how workers respond to situations likely varies by occupation. Table 4 reports the top 10 percent of occupations when ranked in descending order by the fraction of ads in an occupation using trait-descriptive terms for each trait. We restrict the sample to the 133 occupations for which we observe more than 20 job ads to limit the role of sampling variance in the rankings; the summary statistics for all occupations for all traits are reported in Appendix Tables 4 and 5.

Three things are apparent from the occupation rankings. First, the measures of employer demand for personality traits produce mostly intuitive rankings of occupations. The occupations highest in employer demand for extroversion include those in which individuals interact regularly with the public (e.g., restaurant staff, sales) or subordinates (e.g., managers). The occupations highest in the demand for conscientiousness include jobs where attention-to-detail (e.g., technical writers, proofreaders, industrial engineers, actuaries) and effort (e.g., porters, housekeepers) may be difficult to monitor. The occupations highest in demand for agreeableness include many customer-facing jobs (e.g., photographers, cashiers, bank-tellers). The occupations highest in the demand for emotional stability include many occupations in which interactions with unhappy individuals are possible (e.g., waiters/waitresses, clerks). Small samples in some occupations likely contribute to a few unusual rankings (e.g., the demand for agreeableness among geologists), but overall the rankings of occupations seem very plausible.

Second, some occupations (e.g., religious workers, coaches) appear in the top 10 percent of the rankings for several traits. This suggests that personality trait bundles are important for some occupations. Third, high-skill occupations are not well-represented among the occupations with

the highest personality demands. In particular, we note the near-complete absence in Table 4 of STEM occupations even while these occupations are well-represented in our sample. This suggests that personality traits may matter most in occupations where responses to situations and other individuals are more important than domain-specific skills.

Next, we turn to Table 5 that reports the correlations between the indicators for trait-descriptive terms appearing in an ad for each trait (using the extended dictionaries with “verbal” and “analytical” removed) with the same measures for the other traits and the skill requirement measures proposed by Deming and Kahn (2018). Among the traits, the demands for extroversion and agreeableness are the most highly correlated (0.27), which is not surprising given the high rankings of occupations requiring interactions with the public for both traits in Table 4. None of the correlations between trait demands in the job ads, however, are very high, which suggests variation in the personality trait bundles required by employers.

The skill requirements could be broadly grouped into “soft skills” involving interactions with others (i.e., social skills, character, customer service, and people management) and domain-specific skills (i.e., project management, financial skills, writing, general computer skills, and specific software skills) with “cognitive” skill (defined by the keywords “problem solving,” “research,” “analytical,” “critical thinking,” “math,” and “statistics”) not fitting well in either category. Broadly speaking, the personality trait demands are uncorrelated with the domain-specific skills and mostly uncorrelated with cognitive skill. By contrast, the trait requirements are weakly correlated with most of the soft skills, which is consistent with our earlier supposition that personality traits are most important on jobs involving interactions with others.²⁴

²⁴ Brenčić and McGee (2023) show that the personality trait demands in the ads are correlated with the general tasks referenced in the ads but negatively correlated or uncorrelated with routine and mathematics tasks.

2.6 Correlations between trait demands and workers' traits within occupations

If the job ad measures simply capture boilerplate ad language or cheap talk unrelated to job requirements, then the measures should be unrelated to the traits of workers hired to fill the vacancies. Unfortunately, no dataset linking the text of ads to the traits of workers hired to fill the vacancies exists. We instead examine whether the personality demand measures aggregated to the occupation-level are correlated with the traits of workers in these occupations. In effect, the share of job ads in each occupation indicating demand for a trait functions as a proxy for the probability that firms hiring in that occupation screen for the trait, and workers in occupations with higher probabilities of screening for a trait should have more of the trait.

For this validation exercise, we merge the occupational trait demands measured in the Monster.com data to the National Longitudinal Survey of Youth 1997 (NLSY97). The NLSY97 consists of a representative sample of individuals in the United States born between January 1, 1980, and December 1, 1984, interviewed annually from 1997 to 2011 and biennially thereafter through 2019. For our purposes, the NLSY97 has two primary advantages. First, both respondents' personality traits and occupations are observed. In 2008, the NLSY97 respondents completed the Ten Item Personality Inventory (Gosling et al., 2003) measuring the Big Five personality traits and four items from the Chernyshenko Conscientiousness Scale (Chernyshenko, 2002), and respondents indicated in every interview their occupation on their main job using the 2002 Census codes. Second, the personality demands from the Monster.com data were measured in 2006 when the NLSY97 respondents were between 22 and 26 and entering the workforce. As such, the demands measures are contemporaneous or nearly so for many of the years in which NLSY97 respondents are interviewed.

To construct the NLSY97 sample, we retain all person-year observations from respondents who completed the personality items, were older than 18 at the time of the interview, and whose occupation in their main job was recorded.²⁵ We exclude person-year observations if the respondent was serving in the military or employed in a farming, fishing, or forestry occupation. Prior to merging the trait demand measures from the job ads to the NLSY97, we consolidate the occupation categories to match the broader three-digit 2002 Census occupation categories in the NLSY97 to reflect the fact that some of the narrower occupations are observed very infrequently in the Monster.com data.²⁶ Moreover, the personality demand measures constructed using the 30 broad occupation categories are influenced less by sampling variance given that they are constructed using a larger number of ads.²⁷ The final NLSY97 sample includes 88,913 person-year observations from 6,998 respondents. Appendix Table 6 reports the summary statistics for the NLSY97 sample along with the distribution of the observations across the broad occupation categories.²⁸

To estimate the correlations between employers' demands and workers' traits, for each trait we regress an NLSY97 respondent's standardized trait score on the corresponding trait demand measure from job ads for the respondent's broad (three-digit Census) occupation in a given year and a vector of occupational characteristics from O*NET including education, related

²⁵ For most respondents, the personality traits were measured after labor market entry, which introduces the possibility of reverse causality in observations prior to 2008 if experiences in occupations influence workers' personalities. Cobb-Clark and Schurer (2012) and Elkins et al. (2017), however, demonstrate that personality measures are largely stable post-adolescence and little influenced by major life events. As evident from the analysis to follow, excluding the observations prior to 2008 would have little effect on our conclusions.

²⁶ We exclude the 573 person-year observations from individuals employed in farming, fishing, or forestry occupations because we observe only five job ads in this three-digit occupation category in the job ad sample.

²⁷ For instance, the median (minimum) number of ads in the broader occupation categories is 707 (10) versus just 23 (1) using the narrower categories.

²⁸ For the TIPI extroversion, openness, agreeableness, and emotional stability measures, we standardize the respondents' trait scores to have mean zero and standard deviation one among respondents who completed the personality scales. For the conscientiousness measure, we constructed a factor score from the TIPI and Chernyshenko items using principal component analysis and then similarly standardized this score.

experience, and training requirements and measures of task importance for the respondent's narrower (four-digit Census) occupation in that year.²⁹ We cluster the standard errors at the respondent-level to account for having multiple observations from each respondent.

Table 6 reports coefficient estimates from these regressions using the trait specified in each row as the dependent variable.³⁰ For each trait, Column (1) reports the estimated coefficient of the occupational trait demand measure in specifications without the O*NET controls.

Respondents' personality traits are positively and significantly correlated with the demand for that trait in their occupations for each Big Five trait except emotional stability.

Personality sorting into occupations, however, undoubtedly occurs on the basis of occupational characteristics other than employers' personality demands. Studies such as Gensowski (2018) have documented that conscientiousness is positively correlated with education levels, and thus sorting into occupations on the basis of educational attainment will result in personality sorting. Likewise personality sorting may occur on the basis of tasks if traits convey comparative advantages in some tasks. The coefficient estimates in Column (1) may overstate the correlations between respondents' traits and the occupational personality demands if these other occupational characteristics are correlated with employers' personality demands. Sorting at the occupation-level based on education, experience, and skill levels could also be problematic for the estimates in Column (1) if firms ask for traits that are difficult to find in their applicant pools, which would tend to induce negative correlations between trait demands and worker traits. For example, firms hiring in low-skill occupations may place an emphasis on

²⁹ The measures of task importance are the employment-weighted (using the 2000 Census) standardized averages of the O*NET items listed in Appendix Table 1 for each task. See the notes to Appendix Table 1 for more information on the construction of these measures.

³⁰ In Table 6 and all of the tables that follow, we use the trait requirement measures derived using the extended trait dictionaries omitting "verbal" and "analytical", but all of the estimates in Table 6 and subsequent tables are robust to including "verbal" and "analytical" in the dictionaries.

identifying emotionally stable and conscientious workers who show up to work every day if these traits are difficult to find among workers in these occupations.³¹

To account for sorting based on other occupational characteristics, the specifications in Column (2) of Table 6 includes the O*NET controls concerning the expected years of education, related experience, and training required of a worker in the occupation as well as measures of task importance. While the coefficient estimates in Column (2) for employers' extroversion, conscientiousness, openness, and agreeableness demands are smaller than in Column (1), all of the estimates remain positive and statistically significant at the 5 percent level.³² Again, this would be unlikely to be the case if the personality demand measures simply detect boilerplate job ad language or cheap talk by firms unrelated to the hiring criteria.³³ By contrast, the emotional stability coefficient actually increases when controlling for the education and experience requirements, which suggests that employers may seek emotional stability precisely when it is difficult to find.

Finally, a potential concern regarding the personality demand measures is that employers' personality demands may have changed since 2006. For each trait, Columns (3) and (4) report specifications corresponding to those in Columns (1) and (2) using only observations from 2004 to 2008—observations within two years of the measurement of the personality demands. By

³¹ Dunn et al. (1995) find that, among the Big Five traits, hiring managers negatively associated emotional stability and conscientiousness with the likelihood of engaging in counterproductive behaviors at work. Thus in occupations in which counterproductive behaviors are common, firms may prioritize emotional stability and conscientiousness.

³² Ten percentage point increases in the fraction of ads in an occupation demanding extroversion, conscientiousness, openness, and agreeableness (i.e., roughly the standard deviations reported in Appendix Table 6 for these measures) are associated with increases in these traits among respondents employed in these occupations of 0.026 (0.257*0.10), 0.024, 0.024, and 0.020 standard deviations, respectively. These magnitudes seem plausible and non-trivial given that the occupation-specific trait means in the NLSY97 range mostly between -0.2 and 0.2 as evident from Appendix Table 7, which reproduces Table 11 from Brenčič and McGee (2023) depicting the personality distributions by three-digit Census occupations for the NLSY97 respondents using a single observation per NLSY97 respondent between the ages of 32 and 34.

³³ Employers are also unlikely to engage in cheap talk in describing themselves and their desired employees given that they are vying for job seekers' limited attention. Brenčič (2014), for instance, finds that visitors view only 14 job postings on average on employment websites.

contrast, Columns (5) and (6) use only observations from 2015 to 2019—a decade or more after the personality demands were measured in job ads.³⁴ Comparing these estimates allows us to investigate whether the correlations between occupational personality demand measures and respondent traits changed in the decade after the measurement of the personality demands. Following a single cohort over time as we do, however, implies that any changes reflect both changes in the correlation between the personality demand measures and the true demand for personality traits over time and the further sorting of this cohort into occupations as careers evolve. These dynamics likely have offsetting effects. Increased measurement error as the demand measures become dated would likely drive the coefficient estimates toward zero, while increased sorting on employers' personality demands would tend to increase the coefficients.³⁵

With these caveats in mind, we note that we reject the equality of the coefficients in Columns (5) and (6) with the corresponding coefficients in Columns (3) and (4) only for emotional stability in Column (5) without the O*NET controls. Controlling for the occupational characteristics, the estimated coefficients for extroversion, openness, and agreeableness are virtually identical in the earlier and later periods. That is, the correlations between these respondent traits and occupational personality demands are little changed after accounting for the sorting due to occupational education, experience, training and task requirements that presumably increased over time. This is consistent with the correlations between the personality

³⁴ The smaller sample in Columns (5) and (6) relative to Columns (3) and (4)—which influences the statistical precision of our estimates—reflects the shift to biennial interviews in 2011 resulting in observations from only 2015, 2017, and 2019.

³⁵ An additional limitation of observing only a single cohort over time is that occupational choices may be path-dependent. A correlation between occupational trait demands and traits in the later period may simply reflect choices made in the earlier period. In the NLSY97 sample, however, respondents change broad occupations on average 4.2 times over the course of the observation period—suggesting considerable occupational mobility.

demand measures and the underlying personality demands by occupation remaining relatively unchanged over the course of the decade after the personality demands were measured.³⁶

To summarize, the evidence in Table 6 suggests that the personality demand measures are correlated with factors influencing the selection process into occupations—presumably employers’ demand for personality traits. Moreover, the personality demand measures appear to be correlated with the underlying personality demands ten or more years after measurement.

3. Incentive-enhancing personality traits, wages, and incentives

3.1 Evidence on personality traits and posted wages

Bowles et al. (2001) hypothesized that traits such as conscientiousness enable employers to induce effort at a lower cost when effort is not contractible. In a competitive labor market, firms must pay workers with these traits more even when the trait does not directly contribute to production. Among the Big Five traits, conscientiousness lends itself most directly to a hypothesis regarding its relationship to wages in the incentive-enhancing traits model, but, as noted in the Introduction, the estimates of these wage returns vary considerably in the literature.

We begin by testing the hypothesis that employers’ demand for conscientiousness is positively correlated with posted wages in job ads. The sample is restricted to ads for which posted wages are available and the occupation could be identified. Table 7 reports coefficient estimates from regressions of the log of the posted wage on the personality trait measures and various sets of controls including the length of the job ad in characters, education and experience

³⁶ The coefficients of emotional stability in Columns (5) and (6) in the later period are negative, precisely estimated, and larger in magnitude than in the earlier period. One possibility is that employers in occupations demanding emotional stability ask for that which they tend not to find, and the negative selection of workers into these occupations strengthens as workers continue to sort. That is, on average the only workers left in occupations demanding emotional stability later in careers tend to be exactly those workers who do not possess emotional stability in abundance.

requirements, job location, occupation, skill and task requirements, and firm fixed effects. We run the regressions separately for ads posting hourly wages and ads posting annual salaries, and the usual caveats about analyses in a sample in which 76% of ads do not post a wage apply.³⁷

Among ads posting hourly wages in Panel A, posted wages for ads referencing conscientiousness are an estimated 0.8 percent lower than for jobs without such terms with all of the controls in Column (4) and 1.9 percent lower including firm fixed effects in Column (5)—though neither estimate is statistically significant. Among ads posting annual salaries in Panel B, the posted wages of ads demanding conscientiousness are an estimated 2.2 percent higher than those for other jobs in Column (4) with all of the controls but only 0.8 percent higher controlling for firm effects in Column (5). Overall, we find little consistent evidence in support of the incentive-enhancing trait hypothesis where conscientiousness and wages are concerned.

By contrast, the estimated coefficients for extroversion, agreeableness, and emotional stability are consistently negative, statistically significant and larger in magnitude than those for conscientiousness in almost all specifications and in both job ads with hourly and annual wage offers. Only for openness in the hourly wage sample are the coefficient estimates positive and statistically significant.³⁸ For all of the estimates, we note that omitted variables biases could influence the coefficients of the trait demands if these demands are correlated with unobserved

³⁷ For instance, Brenčič (2012) and Banfi and Villena-Roldan (2019) show that posted wages are more common in ads seeking less skilled workers.

³⁸ Our findings with respect to openness and agreeableness have precedents in the literature relating workers' traits to their earnings. Heineck (2011) and Mueller and Plug (2006) for both men and women and Heineck and Anger (2010) for women find positive relationships between openness and earnings in their specifications similar to those in Table 7 controlling for occupations, locations, human capital, and job characteristics. Likewise, all of the studies referenced in the Introduction except Fletcher (2013) find a negative relationship between agreeableness and earnings for at least some group of workers (i.e., men or women). Concerning extroversion, Fletcher and Heineck and Anger find limited evidence of a positive relationship to earnings for men, but otherwise these studies do not find evidence of a strong link between extroversion and earnings. The estimates in Table 7 are most at odds with the literature relating personality to earnings where emotional stability is concerned. All of the studies except Heineck and Anger find evidence of a positive relationship between emotional stability and earnings for at least some group of workers, whereas the estimates in Table 7 for emotional stability are consistently negative.

job requirements or work conditions, but we attempt to mitigate this concern by controlling for occupations, locations, and an extensive vector of job-specific skill and task requirements. The mixed evidence on the associations between wages and personality traits both here and in other studies raises the following questions: if employers do not pay for traits, why do some employers seek workers with particular traits, and how do traits influence the employment relationship?

3.2 Model of screening for incentive-enhancing traits and wage structure

Bowles et al. (2001) assume that incentive-enhancing traits are observed, but employers may find screening for and observing personality traits difficult. Even those employers that do screen applicants for personality traits may not need to reward these traits if sufficiently many employers do not observe these traits. That is, firms may be able to retain worker-specific rents in the presence of incomplete information where incentive-enhancing traits are concerned.

We propose a simple, alternative model in which incentive-enhancing traits influence the wage structure—rather than the wage level—offered by employers. Specifically, firms should not offer fixed wage contracts due to the moral hazard problem when effort is prohibitively costly to monitor. Workers with incentive-enhancing traits, however, may supply effort even when effort is unobservable. Consequently, employers have less need to offer incentive-based compensation when they seek out workers with these traits.

Suppose that workers supply unobserved effort e and that the firm's (observed) output is $e + v$, where v is an i.i.d. mean zero random variable. The revenue generated by the worker is $p(e + v)$, where p is the price of the firm's output. The worker's earnings consist of a fixed wage w and any compensation conditioned on output (e.g., piece-rates or commissions) paying r per-unit of output. Further assume that the worker's utility is a function of compensation, the disutility of effort ($-e^2$), and intrinsic motivation given by

$$U = w + r(e + v) - e^2 + \theta(e - \underline{e})$$

where $\theta \geq 0$ is a parameter characterizing the degree to which the worker is intrinsically motivated. Workers for whom $\theta = 0$ respond only to extrinsic incentives, while other workers attach some importance to intrinsic motivations. Intrinsically motivated workers derive utility from supplying more than the norm effort level \underline{e} and disutility when they shirk relative to this norm.

Workers maximize their expected utility by choosing effort $e^* = \frac{r+\theta}{2}$. Firms choose whether to screen applicants and seek out individuals with high values of θ ($S = 1$) such that $E(\theta|S = 1) > E(\theta|S = 0)$. The firm-specific screening costs are given by the random variable $C(S)$; firms with large $C(1)$ may choose not to screen. If labor is the only input, the firm's expected profit conditional on its screening behavior is $E(\pi|S) = (p - r) \left(\frac{r+E(\theta)}{2} \right) - w - C(S)$.

Suppose firms choose between a fixed wage contract ($w_1, r_1 = 0$) and a contract paying both a fixed wage and compensation conditioned on performance ($w_2, r_2 > 0$). The difference in expected profits between the contracts is given by

$$E(\pi_1|S) - E(\pi_2|S) = E(\theta|S) \left(\frac{r_2}{2} \right) - (p - r_2)(r_2/2) - (w_1 - w_2)$$

It follows that the difference in expected profits between a fixed wage contract and the performance pay contract is larger for firms that engage in screening: $E(\pi_1|S = 1) - E(\pi_2|S = 1) > E(\pi_1|S = 0) - E(\pi_2|S = 0)$. Put differently, the probability that a firm hires workers on a fixed wage contract should be higher for firms screening applicants for the trait θ .

We make three remarks. First, not all firms screening choose the fixed wage contract as $E(\pi_1|S = 1) - E(\pi_2|S = 1)$ may be negative depending on the contract terms (w_1, w_2, r_2). Other things being equal though, screening makes the fixed wage contract more attractive relative to incentive pay. In Lazear's (1986) seminal study of the firm's choice between salaries and piece

rates, the value of piece rates rises relative to fixed wages as the difference between the effort induced by the piece rate and the effort exerted under the fixed wage increases. Screening for incentive-enhancing traits, however, tends to reduce the difference between these effort levels by ensuring a higher level of effort under the fixed wage and thus attenuates the benefits of piece rates.³⁹

Second, extensive evidence from psychology (e.g., Deci, 1975; Deci and Ryan, 1985) and economics (e.g., Gneezy and Rustichini, 2000; Fehr and Gächter, 2000; Huffman and Bognanno, 2018) suggests that extrinsic rewards may “crowd out” intrinsic motivations and result in less effort being exerted than in the absence of extrinsic incentives.⁴⁰ Our model does not allow for this possibility, but we note that the crowding-out of intrinsic motivations would only tend to reinforce the finding that screening firms are more likely to choose the fixed wage.⁴¹

Finally, screening firms may also make different decisions regarding the contract choice because of differences in the relevance of intrinsic motivation on a job. How personalities manifest themselves depends on situations and contexts, and work circumstances may not support intrinsic motivation.⁴² If the nature of a job mitigates intrinsic motivations, the upper bound on values of θ is effectively lower than in other contexts, in which case the benefit to screening would be small.

³⁹ Our model does not incorporate the monitoring costs incurred under piece rates and fixed wages, which influence the firm’s choice in Lazear’s (1986) model. An alternative model could assume that workers with incentive-enhancing traits require less monitoring with fixed wages, which would also tend to make the fixed wage more attractive to firms.

⁴⁰ In the models of Bénabou and Tirole (2003, 2006), intrinsic motivations arise as a result of the strategic incentives created for an agent from a signal extraction problem where the uncertainty surrounds some aspect of the agent, the task, or both. By contrast, intrinsic motivation in our model derives the worker’s type, which is consistent with modeling assumption in Bénabou and Tirole (2016) that workers differ in their work ethics, which may or may not be observed. Our assumption that firms can pay to learn about the worker’s intrinsic motivation is consistent with the large industry devoted to personality testing.

⁴¹ Specifically, suppose that the utility derived from intrinsic motivations were $a(r)\theta(e - \underline{e})$ where $a(r)$ captures the crowding-out effect. Provided $0 \leq a(r) \leq 1$, $a' \leq 0$, and $a(0) = 1$, it is straightforward to show that the difference in expected profits from the two contracts will be even larger when crowding-out occurs.

⁴² See Fishbach and Woolley (2022) for a useful review of the workplace antecedents of intrinsic motivation.

This implies that controlling for occupations and tasks will be important when estimating the relationship between a firm’s demand for conscientiousness and the wage structure.

3.3 Evidence on incentive-enhancing traits and extrinsic rewards

To test this model of incentive-enhancing traits applied to wage structure, we estimate models of the probability that an ad indicates incentive compensation (i.e., bonuses, commissions, performance pay, incentives, or piece-rates) is offered controlling for the personality trait demand indicators, the length of the ad in characters, and the same sets of controls as in the log-posted wage regressions. Unlike posted wages, the incentive compensation indicator is defined for all of the job ads in our sample, which we again restrict to the ads for which the occupation is identified.

Columns (1) to (4) of Table 8 report the estimated marginal effects for the trait demands from probit models with different sets of controls. Controlling in Column (3) for education and experience requirements, location, and occupation, conscientiousness is associated with a 4.3 percentage point reduction in the probability that incentive pay is offered—a sizeable effect considering only 21 percent of ads indicate the use of incentive pay. As noted in the log-wage regressions, personality trait demands may be correlated with job characteristics such as teamwork (Holmstrom, 1982), multi-tasking (Holmstrom and Milgrom, 1991; Bénabou et al., 2016), and monitoring costs (Lazear, 1986) emphasized in the literature on the optimal provision of incentives. In the absence of plausibly exogenous sources of variation in the trait demands, we attempt to control for job characteristics that influence the optimal design of pay by including the ten skill measures, thirteen task measures and firm fixed effects. Among other things, the task measures include job-specific indicators for teamwork, multi-tasking, and independent work, which we take as a proxy for the extent of monitoring on the job.

Even controlling for the skill and task requirements in Column (4), however, ads indicating demand for conscientiousness remain an estimated 3.6 percentage points less likely to offer incentive pay. Finally, the demand for conscientiousness is associated with a 1.2 percentage point reduction in the probability of offering incentive pay in the linear probability model in Column (5) adding firm fixed effects. Even within firms, positions requiring conscientious workers are less likely to be compensated using incentive pay than positions not requiring conscientious workers. These estimates are consistent with the hypothesis that firms seeking workers with incentive-enhancing traits are less impacted by moral hazard issues and thus able to offer fixed wages rather than performance-based pay when effort is non-contractible.

In lieu of incentive pay, firms may instead use the prospect of future promotions to elicit effort from workers (Lazear and Rosen, 1981). Similar to the model above, firms hiring conscientious workers may have less need to elicit effort via promotion tournaments as these workers supply effort in the absence of extrinsic incentives. As an alternative test of our hypothesis that incentive-enhancing traits reduce firms' reliance on extrinsic incentives to motivate workers, we estimate models of the probability that an ad mentions promotion opportunities. Table 9 reports the estimated marginal effects of the personality demand measures in these models. Consistent with our hypothesis, demand for conscientiousness is associated with significant reductions in the probability that an ad mentions promotion opportunities of 3.1 percentage points in the probit model in Column (3) controlling for education, experience, location and occupation and 2.7 percentage points in Column (4) adding the vector of skill and task requirements. The linear probability model estimates incorporating firm effects in Column (5) imply that positions indicating a need for conscientious workers are 3.5 percentage points less likely to be associated with promotion opportunities than positions in the same firm without similar requirements. In a

sample in which 15.6 percent of ads mention promotion opportunities, these estimates imply sizable reductions in the probability that firms reference promotion opportunities when recruiting conscientious workers. Together with the incentive pay estimates, we infer that firms are less likely to offer extrinsic incentives when seeking conscientious workers.

We did not hypothesize that the remaining Big Five traits would be incentive-enhancing, but openness is negatively correlated with incentive pay and promotion opportunities in all but one specification in Tables 8 and 9. By contrast, the demands for extroversion and emotional stability are positively correlated with both incentive pay and promotion opportunities in all specifications in which we control for occupation. In their laboratory experiments, Fulmer and Walker (2015) find that the productivity-enhancing effects of incentive pay are positively correlated with extroversion and emotional stability. They hypothesized that extraverts might respond more to incentive pay because extraverts find stimuli more salient in situations providing specific cues about desired and status-enhancing behaviors. Likewise they hypothesized that more emotionally stable individuals would be less likely to choke in the face of pressure induced by performance pay while less emotionally stable individuals might less reliably attend to the signals from incentive pay due to differences in cognitive function.⁴³ Our findings suggest that employers may appreciate these dynamics and seek extroverted and emotionally stable workers when using extrinsic rewards while seeking out conscientious workers when using low-powered incentives.⁴⁴

⁴³ Fulmer and Walker (2015) hypothesized that less conscientious workers would be more productive under performance pay because such individuals are less focused on task mastery and thus able to devote more cognitive resources towards meeting external demands.

⁴⁴ The incentives offered by employers when seeking individuals with particular traits ought to influence the employment conditions in which workers with particular traits are found—though these conditions will also reflect the preferences and choices of the workers. Appendix Table 8 reports the marginal effects of workers' personality traits from Probit estimators of the probability that an NLSY97 respondent receives performance pay (tips, bonuses, commissions, or incentive pay) using the same sample of person-year observations as in Table 6. Consistent with our findings regarding offered incentives and personality demands, respondents' extroversion is positively correlated with the receipt of performance pay in all specifications, while conscientiousness is negatively correlated with the receipt of performance pay in all specifications. The latter relationship is not significant when controlling for

4. Conclusion

We develop measures of employer demand for personality traits by identifying job ads containing personality trait-descriptive terms. These novel measures complement existing measures of skill and task requirements at the occupation level in O*NET and can be used to investigate the role of personality in the labor market. In that regard, we show that job ads demanding conscientious workers are less likely than other ads to mention incentive pay and promotion opportunities given that such workers are more likely to supply effort in the absence of extrinsic incentives. When these traits are difficult to observe—as they often are—non-cognitive traits may influence employment relationships through contracts and the work environments to which workers match rather than the level of wage.

We show that the demand for personality traits is widespread with the same fraction of ads referencing personality traits as reference standard measures of human capital such as education and experience. More than a fifth of ads reference each of extroversion, conscientiousness and openness—a finding that differs from earlier studies suggesting that applicants' conscientiousness and agreeableness are most important in hiring. This may reflect our focus on employer demand at the outset of the recruitment process rather than at later stages of hiring. Our findings also underscore the potential for complementarities between incentive systems and human resource management practices emphasized in Ichniowski and Shaw (2003) such as personality testing and algorithmic screening and the need for researchers and firms to understand how incentives and human resource management practices function in tandem. In

respondents' AFQT scores, which mainly reflects the reduction in sample size due to the low response rate in the NLSY97 to the AFQT rather than a change in the estimated marginal effect. In contrast to the estimates in Table 8, respondents' openness is positively correlated with the receipt of performance pay in all specifications.

this respect, our study also highlights the potential for job ads to offer a window into the compensation and human resource practices of firms.

Finally, the demand for personality traits may evolve as increases in remote work and the use of AI fundamentally change the situations and circumstances individuals encounter at work. Understanding how technological changes influence the demand for personality traits can provide valuable insight into how different workers will be affected by the changing landscape of the workplace. Our study provides an approach that in combination with machine learning could be used to investigate employers' demands for personality traits in larger and longitudinal datasets in order to shed light on the impacts of these important labor market trends.

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Figure 1: Personality trait word clouds from job ads

Notes: Each panel depicts the word clouds for extroversion (A), conscientiousness (B), openness (C), agreeableness (D), and emotional stability (E). Within each word cloud, the size of a word indicates its relative frequency in the job ad sample among the trait-descriptive terms in the dictionary for that trait extreme. Because the word clouds have been individually re-scaled to fit the page, comparisons of word sizes in different word clouds should be avoided.

Table 1: Summary statistics

	(1)	(2)	
<u>Dependent variables:</u>			
Hourly wage offered in \$ (n = 12,971)	17.28 (10.78)		
Annual salary offered in \$ (n =20,653)	61,344 (28,545)		
Incentive pay offered	0.21		
Promotion opportunities offered	0.16		
<u>Ad characteristics:</u>			
No occupation determined	0.20		
Firm identified	0.68		
Ad length in characters	2,654 (1,341)		
<u>Education requirements:</u>		<u>Experience requirements:</u>	
None given	0.46	None given	0.70
High school	0.14	< 1 year of experience	0.03
Associates degree	0.06	1-2 years of experience	0.06
Bachelor's degree	0.32	2-5 years of experience	0.12
Post-graduate degree	0.02	5-7 years of experience	0.06
		7-10 years of experience	0.01
		10-15 years of experience	0.01
		> 15 years of experience	0.00
<u>Skill requirements:</u>		<u>Task requirements:</u>	
Customer service	0.59	Communication	0.37
People management	0.52	Interpersonal relationships	0.18
Financial	0.25	Teamwork	0.20
Cognitive	0.29	Caring/service	0.24
General computer	0.34	Leadership & decision-making	0.22
Social	0.39	Problem-solving	0.13
Software	0.11	Creative	0.04
Character	0.14	Attention-to-detail	0.15
Project management	0.06	Independent work	0.08
Writing	0.05	Routine	0.07
		Manual	0.03
		Mathematical	0.04
		Multitasking	0.08
Number of job ads	140,193		

Notes: Standard deviations are given in parentheses when applicable. Incentive pay includes bonuses, commissions, incentive compensation, pay-for-performance, and piece-rates. The education, experience, skill and task requirement variables are all indicator variables for whether an ad included the requirement as described in the text.

Table 2: Fraction of ads containing personality trait-descriptive terms

Trait	(1)	(2)	(3)	(4)	(5)
Extroversion	0.00	0.53	0.26	0.31	0.22
Conscientiousness	0.00	0.53	0.20	0.26	0.21
Openness	0.00	0.34	0.20	0.21	0.15
Agreeableness	0.00	0.36	0.12	0.12	0.12
Emotional stability	0.04	0.15	0.07	0.07	0.07
Introversion	0.00	0.08	0.00	0.00	0.00
Non-conscientiousness	0.00	0.00	0.00	0.00	0.00
Disagreeableness	0.00	0.11	0.01	0.02	0.02
Non-openness	0.00	0.05	0.00	0.01	0.01
Neuroticism	0.00	0.01	0.00	0.00	0.00
Traits only	X				
Short trait-descriptive term list		X	X		
False positives removed			X	X	X
Extended trait-descriptive term list				X	X
“Verbal” & “analytical” removed					X

Notes: Each column indicates the fraction of ads in which words for a given trait are found using different categorization dictionaries and exclusion lists. Column (1) searches for the plain English names of the traits themselves (e.g., “extrovert” and “extroversion”). Column (2) searches for words in the lists from Goldberg [1990], Saucier and Goldberg [1996], and John [1990]. Column (3) removes false positives from the measures in Column (2) using exclusion lists. Column (4) expands the word list in Column (2) to include all 1,710 trait descriptive adjectives in Goldberg [1981] with false positives removed. Column (5) uses the same list as in Column (4) but removes the words “verbal” and “analytical” from the categorization dictionaries.

Table 3: Frequency of trait-descriptive terms in ads

	(1)	(2)	(3)	(4)	(5)	(6)
# of terms	Extroversion	Conscientiousness	Openness	Agreeableness	Emotional stability	Total
0	69.34	74.08	79.32	87.94	92.60	46.30
1	91.17	92.69	94.20	97.03	99.20	67.06
2	97.54	97.73	98.03	99.01	99.92	80.46
3	99.15	99.15	99.23	99.76	100.00	88.62
4	99.64	99.54	99.83	99.90	100.00	93.34
5	99.88	99.66	99.93	99.98	100.00	96.25
6	99.98	99.98	99.97	99.99		97.78
7	99.99	99.99	99.99	99.99		98.47
8	100.00	100.00	99.99	100.00		98.92
9	100.00	100.00	99.99	100.00		99.26
10		100.00	100.00	100.00		99.39
11		100.00	100.00	100.00		99.81
12		100.00	100.00			99.87
13		100.00	100.00			99.92
14			100.00			99.96
15			100.00			99.98
16			100.00			99.99
17						99.99
18						99.99
19						100.00
20						100.00
21						100.00
22						100.00
23						100.00
24						100.00

Notes: Columns (1) to (5) report the fraction of ads containing the number of trait-descriptive terms specified in each row or fewer for each of the Big 5 traits using the extended trait-descriptive term list in Column (4) of Table 1. Column (6) reports the fraction of ads containing the number of trait-descriptive terms specified in each row or fewer from any of the trait descriptive terms lists for the Big 5 traits. Multiple entries of “100.00” reflect the rounding to two decimal points; the last entry in each column reflects the maximum number of occurrences of words associated with a given trait in an ad in our sample.

Table 4: Top 10% of occupations by trait demand measures

	Extroversion	Conscientious.	Openness	Agreeableness	Emotional Stability
1	<i>Photographers (189)</i>	Clergy and religious workers (176)	Clergy and religious workers (176)	Clergy and religious workers (176)	Waiters and waitresses (435)
2	Miscellaneous food preparation and service workers (444)	Technical writers (184)	Insurance sales occupations (253)	<i>Kindergarten and earlier school teachers (155)</i>	<i>Airplane pilots and navigators (226)</i>
3	Chief executives, public administrators, and legislators (4)	Management support occupations (37)	Fire fighting, fire prevention, and fire inspection occs (417)	<i>Photographers (189)</i>	Insurance sales occupations (253)
4	<i>Interviewers, enumerators, and surveyors (316)</i>	<i>Proofreaders (384)</i>	Actuaries (66)	<i>Bakers (687)</i>	Respiratory therapists (98)
5	<i>Managers of medicine and health occupations (15)</i>	Industrial engineers (56)	<i>Kindergarten and earlier school teachers (155)</i>	Social workers (174)	General office clerks (379)
6	Heating, air conditioning, and refrigeration mechanics (534)	Cashiers (276)	Industrial engineers (56)	Gardeners and groundskeepers (451)	<i>Mail clerks, outside of post office (356)</i>
7	Management support occupations (37)	Actuaries (66)	Athletes, coaches, and officials (199)	<i>Airplane pilots and navigators (226)</i>	<i>Photographers (189)</i>
8	Advertising and related sales jobs (256)	Baggage porters, bellhops and concierges (464)	Writers and authors (183)	Guards and police, except public service (426)	Data entry keyers (385)
9	<i>Kindergarten and earlier school teachers (155)</i>	Fire fighting, fire prevention, and fire inspection occs (417)	<i>Weighers, measurers, and checkers (368)</i>	Cashiers (276)	<i>Bakers (687)</i>
10	Real estate sales occupations (254)	Mathematicians and statisticians (68)	Advertising and related sales jobs (256)	<i>Weighers, measurers, and checkers (368)</i>	File clerks (335)
11	Athletes, coaches, and officials (199)	Operations and systems researchers and analysts (65)	<i>Airplane pilots and navigators (226)</i>	Bank tellers (383)	Housekeepers, maids, butlers, and cleaners (405)
12	Cooks (436)	<i>Gardeners and groundskeepers (451)</i>	Baggage porters, bellhops and concierges (464)	Baggage porters, bellhops and concierges (464)	Secretaries and stenographers (313)
13	Sales supervisors and proprietors (243)	Athletes, coaches, and officials (199)	Patternmakers and model makers (645)	<i>Interviewers, enumerators, and surveyors (316)</i>	Customer service reps, invest., adjusters, excl. insur. (376)
14	Human resources and labor relations managers (8)	Housekeepers, maids, butlers, and cleaners (405)	Operations and systems researchers and analysts (65)	Geologists (75)	Payroll and timekeeping clerks (338)

Notes: The table reports the top 10 percent of occupations when ranked in descending order by the fraction of ads including trait-descriptive terms associated with the trait for each column. We restrict the ranking to the 133 occupations for which we observe 20 or more ads. Occupations in italics are close to this 20-ad threshold. The occupation codes are listed in parentheses.

Table 5: Correlations among trait demand and skill measures

	Trait demand measure				
	(1)	(2)	(3)	(4)	(5)
	Extroversion	Conscient.	Openness	Agreeable	Emotional stability
Trait measure:	<u>A. Correlations among trait requirement measures</u>				
Extroversion	1.00				
Conscientiousness	0.16	1.00			
Openness	0.15	0.15	1.00		
Agreeableness	0.27	0.18	0.19	1.00	
Emotional stability	0.07	0.05	0.18	0.09	1.00
Skill measure:	<u>B. Correlations with skill requirement measures</u>				
Cognitive	0.01	0.10	0.18	0.02	-0.01
Social	0.14	0.14	0.20	0.13	0.04
Character	0.14	0.23	0.13	0.09	0.05
Writing	0.00	0.03	0.05	0.03	0.00
Customer Service	0.18	0.10	0.13	0.13	0.03
Project Management	0.00	0.02	0.06	0.00	-0.01
People Management	0.10	0.11	0.14	0.10	0.00
Financial	-0.02	0.01	-0.01	-0.02	0.00
Computer	0.01	0.06	0.03	0.02	0.09
Software	-0.02	0.00	0.03	-0.02	-0.01

Notes: The table reports the correlations between the indicators for trait-descriptive terms appearing in an ad and the other trait indicators and skill measures constructed as described in Deming and Kahn [2018]. The trait demand indicators in this and subsequent tables are constructed using the extended dictionaries with false positives removed excluding “verbal” and “analytical” (i.e., Column (5) of Table 2).

Table 6: Correlations between NLSY97 respondent traits and occupational trait demands from job ads

Occupational trait demands from job ads	Full sample		2004 to 2008		2015 to 2019	
	(1)	(2)	(3)	(4)	(5)	(6)
	<u>Dependent variable: Respondent's extroversion score</u>					
Extroversion	0.448*** (0.071)	0.257*** (0.095)	0.517*** (0.090)	0.281** (0.125)	0.463*** (0.121)	0.271* (0.164)
	<u>Dependent variable: Respondent's conscientiousness score</u>					
Conscientiousness	0.328*** (0.102)	0.239** (0.110)	0.449*** (0.125)	0.345** (0.136)	0.181 (0.158)	0.163 (0.177)
	<u>Dependent variable: Respondent's openness score</u>					
Openness	0.348*** (0.090)	0.237** (0.102)	0.243** (0.109)	0.229* (0.138)	0.430*** (0.123)	0.210 (0.157)
	<u>Dependent variable: Respondent's agreeableness score</u>					
Agreeableness	0.891*** (0.084)	0.195** (0.097)	0.979*** (0.103)	0.238* (0.133)	0.763*** (0.112)	0.225 (0.146)
	<u>Dependent variable: Respondent's emotional stability score</u>					
Emotional stability	-0.465*** (0.172)	-0.200 (0.205)	-0.429* (0.223)	-0.230 (0.280)	<i>-1.111***</i> (0.284)	<i>-0.846**</i> (0.372)
Number of person-year observations	88,913	88,913	29,067	29,067	15,759	15,759
O*NET controls		X		X		X

Notes: Each cell reports coefficient estimates from regressions of the standardized personality trait score for NLSY97 respondents specified in the row on the average demand from job ads for the corresponding trait in the respondent's occupation using 30 broad occupation categories with different controls. Standard errors clustered at the respondent-level are reported in parentheses. Columns (1), (3), and (5) include no other controls in the regressions other than the intercept. Columns (2), (4), and (6) include the education, related experience, training, and task requirement measures from O*NET for the respondent's occupation using the Dorn occupation codes. The sample in Columns (1) and (2) includes the full NLSY97 sample as described in the text. The sample in Columns (3) and (4) is restricted to respondent-year observations between 2004 and 2008, while the sample in Columns (5) and (6) is restricted to respondent-year observations between 2015 and 2019. Coefficients in italics in Columns (5) and (6) indicate that we reject the equality of the coefficients with the corresponding coefficients in Columns (3) and (4) at the 5 percent level. Significance levels: *** p<0.01, ** p<0.05, * p<0.10

Table 7: Log-wage models

	(1)	(2)	(3)	(4)	(5)
A. Ads reporting an hourly wage (n=10,323)					
Extroversion	-0.128*** (0.010)	-0.119*** (0.009)	-0.059*** (0.008)	-0.048*** (0.008)	-0.043*** (0.015)
Conscientiousness	-0.092*** (0.011)	-0.053*** (0.010)	-0.024*** (0.009)	-0.008 (0.009)	-0.019 (0.016)
Openness	0.118*** (0.019)	0.060*** (0.016)	0.045*** (0.015)	0.029* (0.015)	0.052** (0.023)
Agreeableness	-0.072*** (0.012)	-0.068*** (0.012)	-0.058*** (0.011)	-0.046*** (0.010)	-0.065*** (0.018)
Emotional stability	-0.100*** (0.010)	-0.079*** (0.009)	-0.033*** (0.008)	-0.032*** (0.008)	-0.017 (0.018)
R ²	0.058	0.315	0.543	0.577	0.848
B. Ads reporting an annual salary (n=17,273)					
Extroversion	-0.099*** (0.008)	-0.057*** (0.008)	-0.076*** (0.007)	-0.050*** (0.007)	-0.021* (0.012)
Conscientiousness	-0.049*** (0.008)	-0.044*** (0.008)	-0.008 (0.007)	0.022*** (0.008)	0.008 (0.013)
Openness	0.034*** (0.009)	-0.032*** (0.009)	-0.019** (0.009)	-0.005 (0.009)	0.010 (0.015)
Agreeableness	-0.173*** (0.012)	-0.120*** (0.011)	-0.072*** (0.010)	-0.061*** (0.009)	-0.049*** (0.018)
Emotional stability	-0.120*** (0.011)	-0.070*** (0.010)	-0.028*** (0.009)	-0.022** (0.009)	-0.024 (0.017)
R ²	0.103	0.297	0.434	0.486	0.830
Controls:					
Education, experience & location		X	X	X	X
Occupation			X	X	X
Skill & task requirements				X	X
Firm fixed effects					X

Notes: Each column reports coefficient estimates from log-posted wage regressions controlling for the indicators of personality trait demands, the length of the job ad in characters and other controls as specified at the bottom of the table. Panel A uses the subsample of ads posting an hourly wage for which an occupation could be identified, while Panel B uses the subsample of ads posting an annual salary. In Column 5, the samples are further restricted to include only those job ads for which a firm could be identified (n = 5,645 in Panel A and n = 11,547 in Panel B). Heteroskedasticity robust standard errors are given in parentheses. Significance levels: *** p<0.01, ** p<0.05, * p<0.10

Table 8: Incentive pay models

	Dependent variable: Incentive pay offered				
	(1)	(2)	(3)	(4)	(5)
Extroversion	0.087*** (0.003)	0.084*** (0.003)	0.044*** (0.003)	0.040*** (0.003)	0.052*** (0.005)
Conscientiousness	-0.048*** (0.003)	-0.048*** (0.003)	-0.043*** (0.003)	-0.036*** (0.003)	-0.012*** (0.004)
Openness	-0.031*** (0.004)	-0.027*** (0.003)	-0.046*** (0.003)	-0.032*** (0.003)	-0.020*** (0.005)
Agreeableness	0.020*** (0.004)	0.003 (0.004)	0.002 (0.004)	-0.002 (0.004)	-0.010* (0.006)
Emotional stability	-0.018*** (0.005)	-0.009* (0.005)	0.012** (0.005)	0.013*** (0.004)	0.022*** (0.007)
<u>Controls:</u>					
Education, experience & location		X	X	X	X
Occupation			X	X	X
Skill & task requirements				X	X
Firm fixed effects					X

Notes: Columns (1) to (4) report estimated marginal effects from probit models of the probability that an ad indicates that incentive pay (bonuses, commissions, pay-for-performance, piece-rates, or incentive pay) is part of the compensation controlling for the indicators of personality trait demands, the length of the job ad in characters, and other controls as specified at the bottom of the table. Column (5) reports coefficient estimates from a linear probability model of the probability that an ad indicates that incentive pay is part of the compensation including firm fixed effects. The sample in Columns (1) to (4) is restricted to 112,812 observations for which an occupation could be identified; the sample in Column (5) is further restricted to 80,385 job ads for which a firm could be identified. Heteroskedasticity robust standard errors are given in parentheses. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Table 9: Promotion opportunities models

	Dependent variable: Promotion opportunities mentioned				
	(1)	(2)	(3)	(4)	(5)
Extroversion	0.066*** (0.003)	0.065*** (0.003)	0.049*** (0.003)	0.043*** (0.003)	0.027*** (0.005)
Conscientiousness	-0.030*** (0.003)	-0.032*** (0.003)	-0.031*** (0.003)	-0.027*** (0.003)	-0.035*** (0.004)
Openness	-0.033*** (0.003)	-0.018*** (0.003)	-0.023*** (0.003)	-0.023*** (0.003)	0.003 (0.005)
Agreeableness	0.013*** (0.003)	0.008** (0.003)	0.008** (0.003)	0.003 (0.003)	0.018*** (0.005)
Emotional stability	0.057*** (0.004)	0.048*** (0.004)	0.052*** (0.004)	0.050*** (0.004)	0.009 (0.007)
<u>Controls:</u>					
Education, experience & location		X	X	X	X
Occupation			X	X	X
Skill & task requirements				X	X
Firm fixed effects					X

Notes: Columns (1) to (4) report estimated marginal effects from probit models of the probability that an ad indicates that promotion opportunities are available (e.g., “within firm advancement,” “in-house promotion,” “promotion opportunities”) controlling for the indicators of personality trait demands, the length of the job ad in characters, and other controls as specified at the bottom of the table. Column (5) reports coefficient estimates from a linear probability model of the probability that an ad indicates promotion opportunities are available including firm fixed effects. The sample in Columns (1) to (4) is restricted to 112,812 observations for which an occupation could be identified; the sample in Column (5) is further restricted to 80,385 job ads for which a firm could be identified. Heteroskedasticity robust standard errors are given in parentheses. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Appendix Table 1: Constructing task requirement measures from O*NET and job ads

Task requirement	O*NET Constructs and phrase dictionaries
Communication	<p><i>Interpreting the Meaning of Information for Others</i> (Activities 25) <i>Communicating with Supervisors, Peers, or Subordinates</i> (Activities 26) <i>Communicating with People Outside the Organization</i> (Activities 27) <i>Active Listening</i> (Skills 2) <i>Writing</i> (Skills 3) <i>Speaking</i> (Skills 4) <i>Persuasion</i> (Skills 13) <i>Negotiation</i> (Skills 14) <i>Instructing</i> (Skills 15)</p> <p>“ability to communicate” “able to communicate” “ask* questions” “bargain* for” “bargain* on behalf” “bargain* with” “bargaining” “barter* a trade” “barter* an exchange” “barter* with” “bring* around to” “change* the opinion” “charm* buyer*” “charm* client*” “charm* potential” “charm* seller*” “coaxing” “cold call*” “communicat* to” “communicat* with” “communication* skill*” “compromise* with” “excellent communication” “excellent verbal” “excellent written” “explain* information” “explain* to” “explain* to colleagues” “explain* to coworkers” “explain* to peers” “gain* cooperation from” “hash* out” “horse trad*” “inform* coworkers” “inform* manager” “inform* subordinates” “inform* supervisor” “interpret* for” “interpret* how” “mediate* disputes” “negotiate with” “negotiates with” “pay* full attention” “persuad*” “persuasion” “persuasive” “persuasively” “persuasiveness” “present* abilit*” “present* information” “present* skill*” “present* to coworker*” “present* to peer*” “present* to supervisor*” “present* justification” “prove* to customer*” “provide* assurance” “provid* feedback” “provid* information to” “renegotiate*” “resolv* conflict*” “resolv* dispute*” “rope* in” “settl* dispute*” “speak* to other*” “strong communication” “strong verbal” “sway*” “sweet-talk*” “talk* to” “talk* into” “talk* terms” “translat* for” “understand* point* being made” “verbal abilit*” “verbal and written communication” “verbal skill*” “win* over” “written and oral”</p>
Interpersonal	<p><i>Establishing and Maintaining Interpersonal Relationships</i> (Activities 28) <i>Social Perceptiveness</i> (Skills 11)</p> <p>“aware of feelings” “aware of customers* feelings” “aware of others* feelings” “build* relation*” “constructive working” “cooperative working” “deal* with other*” “deal* with other*” “deal* with people” “develop* relation*” “develop* working relationship*” “establish* interpersonal” “establish* personal” “excellent interpersonal” “face to face” “form* working relationship*” “help* colleague*” “help* coworker*” “help* to coworker*” “inter* with coworker*” “inter* with subordin*” “interac* with other*” “interact* social*” “interact* with “</p>

	<p>“interpersonal relation*” “interpersonal skill*” “keep* in touch” “maintain* good *** relation*” “maintain* relation*” “maintain* working relationship*” “sensitive to customer* feeling*” “social interact*” “social* perceptiv” “social* aware*” “socially astute” “strong interpersonal” “understanding of coworkers” “understanding of others” “understanding others” “work* closely with”</p>
Teamwork	<p>How important are interactions that require you to work with or contribute to a work group or team to perform your current job? (Context 7) <i>Cooperation</i> (Styles 5) <i>Coordination</i> (Skills 12)</p> <p>“consult* with other” “contribu* to a group” “contribu* to a team” “contribu* to coworker*” “contribu* to other*” “contribut* to a team” “contribut* to the team” “contribute as a team” “contribute to a team” “contribute to team” “contribute to the team” “cooperat* among team*” “cooperat* with” “coordinat* activit*” “coordinat* effort*” “coordinat* work” “coordinate* with” “deal* with coworker*” “discussion with team” “discussion* with coworkers” “discussion* with peers” “group work” “groupwork” “instruct* coworkers” “liais* with” “member of a team” “member of team” “member of the team” “part of a team” “part of team” “provid* advice to” “teach* coworker*” “team contribution” “team driven” “team dynamic*” “team environment” “team focus” “team member” “team oriented” “team player” “team production” “team spirit*” “team work” “team-center*” “team-centric” “team-driven” “teamwork” “work* as part of a team” “work* in a group” “work* in a group” “work* in a team” “work* in a team” “work* in group*” “work* with colleague*” “work* with fellow” “work* with other*” “work* with peers” “work* with team*”</p>
Caring	<p><i>Concern for Others</i> (Style 6) <i>Service Orientation</i> (Skills 16) <i>Assisting and Caring for Others</i> (Activities 29)</p> <p>“ask* customer*” “assist* others” “care for “ “cared for” “caregiver*” “cares for” “caring for” “concern for coworkers” “concern for customer*” “concern for others” “concern for patient* “ “concern for student*” “customer service*” “customer support” “emotional support” “emotional well-being” “giv* care to” “help* customer*” “help* patient*” “help* people” “help* to customer*” “help* to others” “help* to patient*” “look* to help” “nurtur* child*” “nurtur* patient*” “nurtur* student*” “personal assistance to” “personal care for” “personal care to “ “provid* assistance” “provid* care to” “provid* personal assistance” “provid* service* to” “sensitive to feelings” “sensitive to needs” “sensitive to other* feeling*” “sensitive to the needs of” “support* of child*” “support* of patient*” “support* patient*” “understanding of patient*”</p>
Leadership & decision-making	<p><i>Leadership</i> (Styles 4)</p>

In your current job, how important are interactions that require you to coordinate or lead others in accomplishing work activities (not as a supervisor or team leader)? (Context 9)

Judgment and Decision Making (Skills 31)

Management of Personnel Resources (Skills 35)

Making Decisions and Solving Problems (Activities 10)

Coordinating the Work and Activities of Others (Activities 33)

Developing and Building Teams (Activities 34)

Guiding, Directing, and Motivating Subordinates (Activities 36)

“ability to lead” “ability to manage” “able to lead” “able to manage”
“assess* performance*” “build* team*” “coordinat* the work”
“coordinate* among” “deal* with subordin*” “decid* on” “decid* to”
“decision maker” “decision making” “determin* the agenda*” “determin*
the best course” “develop* people” “develop* staff” “develop* team*”
“develop* team*” “direct* employees” “direct* other” “direct* staff”
“direct* team*” “direct* the acti*” “encourag* cooperat*” “experience
leading” “guid* direct report*” “guid* junior” “guid* staff” “guid*
subordinate*” “guid* team*” “lead* a” “lead* direct report*” “lead*
group*” “lead* people” “lead* staff” “lead* subordinates” “lead* team*”
“lead* the” “lead* your subordinates” “leadership ability” “mak* a
decision” “mak* choice*” “mak* decision*” “mak* the decision” “mak*
the determination” “manage* multiple*” “managerial ability” “monitor*
performance” “motivat* direct report*” “motivat* staff” “motivat*
subordinate*” “motivat* team*” “organiz* the work” “organizational
abilit*” “organizational skill*” “oversee* “ “proven leader*” “set* goals”
“set* priorities” “set* standards” “set* tasks” “set* the agenda*”
“supervis* a” “supervis* acti*” “supervis* staff” “supervis* team”
“supervis* the” “tak* action” “tak* corrective action” “tak* decision”
“tak* decisive” “team build*”

Problem-solving

Deductive Reasoning (Abilities 8)

Inductive Reasoning (Abilities 9)

Analytical Thinking (Styles 16)

Critical Thinking (Skills 7)

Complex Problem Solving (Skills 17)

“analytical abil*” “analytical skill*” “apply* rule*” “combin*
information” “complex reasoning” “deductive reasoning” “deductive
skill*” “determin* the” “diagnose* problem*” “diagnose* the” “excellent
analytical” “inductive* reasoning” “inductive* skill*” “problem solv*”
“solv* problems” “strong analytical” “systematic think*” “thoughtful
analysis” “us* principle*”

Creativity

Thinking Creatively (Activities 11)

Fluency of Ideas (Abilities 5)

Originality (Abilities 6)

Innovation (Styles 15)

	<p>“alternative thinking” “brainstorm*” “com* up with new “ “create* new” “design* innovative” “design* new” “develop* innovative” “develop* new” “fresh ideas” “generat* idea*” “generat* new “ “innovate* “ “invent* a” “invents new” “new ideas” “original think*” “originality “ “outside of the box” “outside the box” “think* creatively” “up with novel idea*”</p>
Attention-to-detail	<p><i>Attention to Detail</i> (Styles 12)</p> <p>“accurately” “assur* quality” “attention to detail*” “attention to quality” “commit* to quality” “deliver high quality” “demonstrat* accuracy” “detail orient*” “ensur* quality” “get* the details right” “insur* quality” “maintain* quality” “precisely” “quality assur*” “quality control” “quality orient*” “quality standards” “who is accurate” “with great care” “with precision”</p>
Independent work	<p><i>Independence</i> (Styles 14)</p> <p>“act* independent*” “autonomy” “demonstrat* independence” “function* independent*” “ha* freedom to” “independent action” “independent product*” “independent work” “operat* independent*” “own boss” “own hours” “produc* independent” “show* independence” “think* independent*” “under minimal supervision” “with minimal supervision” “without supervision” “work* independent*” “work* well independent*”</p>
Routine	<p>How automated is your current job? (Context 49)</p> <p>How important to your current job are continuous, repetitious physical activities (like key entry) or mental activities (like checking entries in a ledger)? (Context 51)</p> <p>“automated” “check* all” “check* the “ “computer-controlled environment” “constant, repeated” “constant, repeated” “continuous attention” “continuous basis” “continuous bending” “continuous effort” “continuous heavy” “continuous lifting” “continuous line” “continuous monitoring” “continuous operating” “continuous operation” “continuous operations “ “continuous physical” “continuous production” “continuous run” “continuous sitting” “continuous standing” “continuous stooping” “continuous use” “data entering” “data entry” “key entering” “key entry” “mechanized process” “mechanized production” “monotonous” “repeat*” “repetitious” “repetitive*” “robotic* process” “robotic* production” “unchanging” “unvaried” “without stopping”</p>
Mathematics	<p><i>Mathematics</i> (Skills 5)</p> <p><i>Mathematics</i> (Knowledge 14)</p> <p><i>Mathematical Reasoning</i> (Abilities 12)</p> <p>“add* numbers” “algebra” “analyz* data” “arithmetic” “calculat*” “calculus” “count* change” “count* the amount” “deriv* a complex” “deriv* complex” “develop* a math* model*” “develop* math* model*”</p>

	“geometry” “math* model*” “math* reasoning” “math* required” “math*ability” “mathematic* method*” “solv* math* problem*” “statistics” “to calculate” “use math*” “using math*”
Multitasking	<i>No corresponding O*NET items</i>
	“array of duties” “array of tasks” “diverse duties” “diverse tasks” “many duties” “many tasks” “multi task*” “multiple tasks” “multitask*” “numerous duties” “numerous tasks” “variable tasks” “variety of duties” “variety of task*” “various tasks” “wide-ranging duties” “wide-ranging tasks”

Notes: The table lists the O*NET constructs used to construct the task importance measures from O*NET along with their location within the O*NET modules. For each task, the table then lists the phrase dictionaries used to identify task requirements in the jobs ads. The dictionaries of phrases associated with tasks were drawn from the definitions of the corresponding O*NET constructs provided in the table. In addition, the O*NET questionnaires asking about the level of the construct required on a job give examples of these levels to respondents, and we drew on these examples to identify phrases associated with tasks. Finally, we identified the most common phrases in the job ads and assigned them to the task requirement dictionaries if they were clearly related to one of the tasks. The dictionaries were then refined by inspecting the phrases appearing in the ads with high frequency to identify false positives that could be replaced by more detailed phrases or removed entirely. The multi-tasking indicator has no corresponding O*NET items; the vast majority of references to multi-tasking in the ads are explicit references to the need for multi-tasking. The other phrases in the multi-tasking dictionary were added upon inspection of the most common phrases in the ads. To construct the O*NET task measures used in Section 2.6, we first take the average of each O*NET variable listed above across all SOC occupations mapping into a single Dorn occupation code. We then merge the occupation-consolidated O*NET data to the 5% sample of the 2000 U.S. Census using the Dorn occupation codes and appropriate cross-walks in order to produce standardized measures of each O*NET variable using this employment-weighted sample of occupations. Finally, we take the average of the employment-weighted standardized O*NET variables listed in the table above for each task requirement measure before re-standardizing the resulting measures to have mean zero and standard deviation one in the Census sample. See Brenčić and McGee (2023) for further details.

Appendix Table 2: Comparing Job Ad Sample Occupational Distribution to the Employment Distribution in the U.S.

Occupation	Share of ads in the July 2006 Monster.com sample (1)	Share of total employment in May 2006 BLS OES estimates (2)
Executive, Administrative and Managerial Occupations	0.1866147	0.0444971
Business Operations and Financial Specialist Occupations	0.1206453	0.0439928
Mathematical and Computer Scientists	0.0308927	0.0232282
Engineers, Architects, Surveyors, Engineering & Related Technicians	0.1032355	0.0183507
Physical Scientists	0.0024909	0.0035775
Social Scientists and Related Workers	0.0003634	0.003302
Life, Physical and Social Science Technicians	0.0267086	0.0024162
Counselors, Social and Religious Workers	0.001897	0.0132084
Lawyers, Judges and Legal Support Workers	0.018837	0.0073753
Teachers	0.0002571	0.0478678
Education, Training and Library Workers	0.0054339	0.0140986
Entertainers and Performers, Sports and Related Workers	0.0167184	0.0072614
Media and Communications Workers	0.1348196	0.005782
Health Diagnosing and Treating Practitioners	0.0621133	0.0306822
Health Care Technical and Support Occupations	0.0062406	0.0463147
Protective Service Occupations	0.004645	0.0228404
Food Preparation and Serving Related Occupations	0.0032621	0.0832814
Cleaning and Building Service Occupations	0.0017286	0.0331956
Entertainment Attendants and Related Workers	0.0000621	0.0048189
Funeral Related Occupations	0	0.0003104
Personal Care and Service Workers	0.000523	0.0181182
Sales and Related Workers	0.0869692	0.1065804
Office and Administrative Support Workers	0.1170907	0.1742543
Farming, fishing, and forestry occupations	0.00000886	0.0033979
Construction Trade and Extraction Workers	0.0026416	0.0504452
Installation, Maintenance and Repairs Workers	0.009742	0.0404159
Production and Operating Workers	0.0030316	0.0205111
Food Preparation Occupations	0.0002748	0.0051471
Setters, Operators and Tenders	0.0133499	0.0518785
Transportation and Material Moving Workers	0.0394025	0.0728496

Notes: The table reports the fraction of ads in each three-digit Census category in Column (1) and the fraction of workers in each three-digit Census from the May 2006 OES.

Appendix Table 3: Trait descriptive terms by trait

Trait	Terms
<u>Extroversion</u>	<p><i>active adventurous affirmative aggressive ambitious amorous assertive assured audacious aweless bigheaded big-mouthed blunt boisterous bold bossy brash brave brazen brisk broad-spoken brusque bubbly buoyant carefree chatty cheerful chitchatty clear-cut clownish cocky coherent communicative companionable competitive competitory confident conversational courageous daring dauntless definite demonstrative devil-may-care direct disguiseless dominant dynamic eager effervescent emphatic energetic enterprising enthusiastic exhibitionistic expansive explicit explosive expressive extroversion extrovert extroverted fatigueless fearless fervent flamboyant flirtatious forceful forcible forthright forward frank friendly frisky gabby gallant gregarious gushy gutsy happy-go-lucky hasty headlong hearty heroic high-spirited humorous hypersensual immodest impetuous imprudent incautious indefatigable indeliberate inexhaustible informative injudicious intrusive jocular jolly jovial lion-hearted live lively long-winded loose-tongued loud-mouthed lucid magnetic merry militant mirthful mischievous nervy noisy opportunistic optimistic out-going outspoken overbold overbrave overconfident overdaring overemphatic overhasty overintense overmerry overrash overtalkative overvaliant participative peppy perky persistent persuasive pert plain-spoken playful plucky pretenseless proud rambunctious rivalrous rollicking self-assertive self-centered self-expressive self-important self-respecting self-revealing self-satisfied sensuous sexy short-spoken show-off smooth-spoken sociable social sparkling speedy spirited spontaneous sprightly spry spunky stalwart steadfast stout-hearted straightforward sultry swellheaded talkative terse tireless ultrasensual incautious unchaste unconcealing uncontriving undevious undisguised unguarded uninhibited unreserved unrestrained unselfconscious unshrinking untiring unwary valiant valorous venturesome venturous verbal verbose vibrant vigorous vivacious vivid vocal voluptuous well-spoken witty wordy zealous zestful</i></p>
<u>Introversion</u>	<p><i>acquiescent aloof anti-social apathetic asocial bashful bendable bland boastless broody chaste clannish clingy cliquish close-mouthed cool counselable cowardly coy demure detached discourageable dispassionate distant docile doleful dull emotionless exclusive fatalistic feelingless flatterable hermitish humorless impartial impassive incongenial indefinite indifferent indirect ineloquent inexplicit inexpressive inhibited introversion introvert introverted joyless lamblike leadable lethargic lukewarm lustless malleable manipulable meek melancholic moldable morose negativistic nonegotistical nonpersistent nonvocal overmodest overquiet overserious overthoughtful overtrusting overwary passive persuadable pessimistic placid pliable pliant pouty prudish quiet reclusive reserved restrainable restrained retiring seclusive secretive sedate self-defensive serious servile shrinking shy silent sluggish solemn somber stand-offish submissive sulky sullen temptable tight-lipped timid</i></p>

timorous unaccessible *unadventurous unaffectionate unaggressive*
unanimated unapproachable unassertive unboastful uncheerful uncheery
uncommunicative uncompanionable *uncompetitive* unconfiding
undemonstrative undramatic unemphatic *unfriendly* ungallant
ungregarious unheroic *unimaginative* unlively unmirthful unneighborly
unobstrusive unostentatious unpersuasive unpresuming unpretentious
unsociable unsocial unsparkling unspeaking unstirrable *untalkative*
unventurous unvoluptuous *vague* vigorless *wary* weak-hearted weak-
kneed withdrawing *withdrawn* zealous

Conscientiousness

abstinent accurate aimful *alert ambitious analytical* anticipative
businesslike calculable calculating *careful cautious* changeless
clairvoyant clear-sighted *concise* **conscientiousness conscientious**
conservative consistent constrained *controlled conventional* crusading
cultured decisive dedicated *deliberate dependable* designful devout
dignified diligent *discreet* doctrinaire dogged dutiful eagle-eyed
economical efficient evangelistic exact *exacting* exhaustive farseeing
fastidious firm forbearing *foresighted* forethoughtful *formal* forward-
looking frugal god-fearing hard-working heedful high-minded high-
principled incorrupt incorruptible indivertible *industrious* invariable just
law-abiding literal *logical mannerly* matter-of-fact *mature* mechanistic
methodical *meticulous moralistic* moralizing mystical nonvariant
objective orderly organized other-worldly overambitious overcareful
overcautious overconscientious overdiligent overeearnest overfastidious
overlogical overparticular overrighteous overrigorous overscrupulous
overzealous *painstaking* particular *perfectionistic* persevering *persistent*
pious plain-dealing *planful poised practical* prayerful preachy *precise*
predictable premeditative prim *principled* productive *prompt* proper
prophetic prudent *punctual* puritanical *purposeful* purposive *rational*
refined reliable responsible rigorous ritualistic saintly self-consistent
self-denying *self-disciplined* self-restrained serious-minded single-
minded *sophisticated* spiritual *steady stern* strait-laced *strict systematic*
tenacious thorough thoroughgoing *thrifty* tidy *traditional*
ultraconservative ultrafastidious ultrareligious unadulterous
unchangeable unchanging undeviating unerring unextravagant unfailing
unfaltering unforgetful unprogressive unresting unspontaneous
unswerving untemptable unvarying unwavering unworldly *wise*
worshipful

Non-
conscientiousness

absent-minded aimless blasphemous breezy cagy canny capricious
careless changeable deceptive defiant devilish digressive discourteous
dishonest disorderly disorganized distractible double-tongued elfish
elusive *erratic* evasive exaggerative excessive *extravagant* fanciful
fancy-free fickle flighty *foolhardy* footloose foresightless *forgetful* foul-
mouthed foxy free-living *frivolous* frolicsome glib *haphazard* heedless
heretical hit-or-miss *illogical immature* immoderate impertinent impious
impish *impractical* imprecise *impulsive* inaccurate *inconsistent*
inconstant *indecisive indiscreet indulgent inefficient* inexact insolent

insubordinate intemperate irreformable irresolute *irresponsible* knavish
lackadaisical lavish lawless *lax lazy* leisurely light-hearted loud *lustful*
lusty melodramatic messy mutinous neglectful *negligent*
nonconscientious not conscientious *nonconforming* ostentatious
overcunning overcurious prankish profane purposeless rascally *rash*
rebellious reckless retortive risqué roguish rootless rowdy sassy saucy
scampish scandalmongering *scatterbrained* scheming self-destructive
self-excusing shiftless shortsighted showy slick *slipshot sloppy slothful*
slovenly sneaky snoopy thriftless *transparent* tricky *unambitious*
unaspiring unbusinesslike uncalculating uncareful unceremonious
unconscientious unconstructive *unconventional* undeliberate
undependable undiligent undisciplined unearnest uneconomical
unenterprising unfaithful unforseeing ungovernable unheedful
unindustrious unmethodical unmindful *unobservant unpredictable*
unproductive unpunctual *unreliable* unreligious *unsophisticated unstable*
unsystematic unthrifty untidy untruthful variable *wasteful* whimsical wily
wishy-washy zany

Openness

abstract accomplished affected *analytical animated* aristocratic *articulate*
artistic autonomous blasé bookish brainy *bright candid* cavalier
ceremonious chic *clever complex* complicated *contemplative*
cosmopolitan courtly *creative* cultivated *cultured* curious dapper
debonair *deep diplomatic distrustful* earthly-wise educable educated
elegant *eloquent empathetic* enlightened *ethical flaunty foresighted*
genteel graceful gracious haughty high-faluting *idealistic imaginative*
independent individualistic informed *ingenious innovative* inquiring
inquisitive insightful instructible *intellectual intelligent intense* intricate
introspective intuitive inventive jaunty know-it-all *knowledgeable*
learned literary literate many-sided *meditative* musical nimble-witted
nonconforming **openness open to experience open to experiences open**
to new experience *original* overstudious oversubtle *perceptive*
philosophical philosophizing poetic polished profound *progressive*
questioning quick-witted *refined resourceful* scholarly *scrupulous self-*
critical sensual sharp-witted shrewd smart sophisticated studious stuffy
suave *subjective* tasteful *tenacious* ultraintellectual ultrarefined
unconventional unimpressible *unpredictable* unprovincial *versatile* well-
read *wide-interests wise witty worldly* worldly-wise

Non-openness

awkward blunt-witted boorish childish childlike clumsy *commonplace*
condescending confusable *conventional* credulous deceivable *dependent*
divertible *dogmatic dull* earthly-minded graceless *ignorant imitative*
imperceptive impressible *inarticulate* incurious indelicate inelegant
inexperienced ingenuous irrational juvenile materialistic misleadable
muddle-headed narrow *narrow-interests* **nonopenness not open to**
experience overcredulous *patronizing* perspectiveless *pompous*
predictable pretentious provincial *shallow simple* superficial *surlly* thick-
headed *traditional* unaccomplished unanalytic unartistic unauthoritative
uncreative uncultivated uncultured undeliberative undignified

undiscerning undiscriminating unenlightened ungentle ungraceful
unimaginative unimpressible uninformed uningenious uninquisitive
unintellectual unintelligent unintrospective uninventive uninvestigative
unmannered *unobservant unoriginal unphilosophical unpolished*
unquestioning unreasoning unrefined *unreflective* unscholarly
unscrupulous unspiritual unstudious unthinking untrained untutored
unwise worldly-minded

Agreeableness

acceptant accessible *accommodating adaptable* adaptive adjustable
affectionate agreeableness agreeable altruistic amiable amicable
angelic *appreciative* approachable beneficent *benevolent* bighearted
bountiful broad-minded *charitable cheerful* cherubic chipper chivalrous
civil *compassionate* complacent complaisant *compliant* comradely
conciliatory congenial *conscientious considerate* consolatory constant
constructive *cooperative cordial courteous* democratic *diplomatic*
earnest earthy easy-going empathic equalitarian *ethical* fair-minded fair-
natured faithful *feminine flexible folksy forgiving friendly generous*
genial gentle gentle-hearted gentlemanlike giving good-hearted good-
humored *good-natured* good-tempered great-hearted *gullible helpful*
homespun honest hospitable humane humanitarian *humble*
impressible inaggressive *informal* ingratiating ingratiatory inirritable
intimate *jovial kind* kind-hearted kindly *lenient* long-suffering loving
loyal magnanimous *mannerly* maternal merciful mild mild-hearted
ministrative moderate *modest moral* mushy *naïve natural* neighborly
nonbelligerent noncoercive nonhostile noninterfering nonrigid
nonvolatile *obliging* open-hearted open-minded *optimistic* overcaring
overcharitable overindulgent overpatient pacifistic *passionate patient*
peaceful peacemaking philanthropic *pleasant polite praising*
prejudiceless *principled* protective quiet-spoken *reasonable relaxed*
religious respectful responsive *reverent selfless* self-sacrificing *sensitive*
sentimental simple sincere soft-hearted soft-spoken solicitous
sportsmanlike statesmanlike sugary *suggestible* sunny *sympathetic tactful*
temperate tender tender-hearted *thoughtful tolerant trustful truthful*
trusting ultrademocratic ultrasentimental unargumentative *unassuming*
unbelligerent unbiased unbigoted uncomplaining *uncritical undemanding*
understanding undespairing undiscourageable undogmatic unembittered
unenvious unexacting ungrudging unhardened unimpatient unmalicious
unmeddling unmercenary unmoralizing unpartisan unvengeful
unselfish unsuspecting unvindictive unwarlike *warm* warm-hearted well-
mannered

Disagreeableness

abrasive *abrupt abusive* acid agitative *antagonistic* arbitrary
argumentative arrogant austere authoritative autocratic balky *belligerent*
biased *bigoted bitter* blustery *boastful* brawlsome bristly *bullheaded*
bullish bullying *callous* cantankerous catty *caustic* censorial closed-
minded closefisted *coarse* coercive *cold* cold-hearted *combative*
compassionless *conceited condescending* contradictory contradictory
contrary contrary-minded corrective covetous *crabby crafty cranky*

critical cruel cunning curt cynical deceitful demanding derisive
 derogatory destructive *devious* dictatorial **disagreeable**
disagreeableness disdainful disobliging disregardful *disrespectful*
 disruptive *distrustful domineering egocentric egotistical embittered*
 exploitative *explosive* facetious factious fanatical *faultfinding* fierce fiery
 flammable *flippant greedy gruff* grumbly *grumpy* hardened *hard-hearted*
 hard-nosed hard-shelled *harsh* headstrong high-handed hostile hot-
 blooded hot-tempered hypercritical icy ill-humored ill-natured ill-
 tempered ill-willed immovable *impersonal impolite impudent*
 incompliant *inconsiderate* incontrollable inconvincible inflexible
 inharmonious inhospitable inquisitorial *insensitive insincere*
 insuppressible *intolerant* iron-hearted ironical irrepressible irrestrainable
irreverent irritable magisterial malicious *manipulative masochistic*
 mercenary *miserly* mistrustful mulish nagging narrow-minded negative
 niggardly *nonreligious* nonunderstanding *obstinate* obtrusive one-sided
opinionated ornery overbearing overcritical overgreedy overharsh
 overjealous overpartial overrigid oversevere overstrict oversuspicious
 peevish peppery persecutive petty pig-headed *pompous* precondemning
 predatory *prejudiced* presumptuous provocable *quarrelsome* quick-
 tempered *rebellious* reformative relentless remorseless reproachful
 retaliative revengeful *rigid rough rude ruthless* sadistic *sarcastic* satiric
scornful scrappy *self-indulgent selfish* self-righteous *self-seeking* self-
 willed severe sharp-tongued short-tempered shrewish *skeptical*
 slanderous *sly smug snobbish* sober-minded sour spiteful *stern stingy*
 stormy stringent strong-minded *stubborn surly suspicious tactless*
tempestuous testy *thankless thoughtless tough* tyrannical ultracritical
 unaccommodating unalterable unamiable unbendable unbending
 unbenevolent *uncharitable* unchivalrous uncomplaisant uncompromising
 unconstrainable unconstrained uncontradictable uncontrolled
uncooperative uncordial *uncouth underhanded* undiplomatic
 unforbearing *unforgiving unfriendly* ungenerous ungentle ungiving
ungracious unindulgent *unkind* unmalleable unmovable unobliging
 unpersonable unpersuadable unpitying unpleasable unpliable
 unreasonable unrelenting unrepressible unrestrainable *unruly*
 unsatisfiable *unscrupulous* unsmiling unsolicitous unsubmitive
 unswayable *unsympathetic* untamable untrustful unyielding *vain*
 vengeful *vindictive* violent *volatile* volcanic warlike wild willful
 arbitrative astute *autonomous brave calm casual* certain clear-headed
contented cool-headed *courageous* deliberative discerning discriminative
down-to-earth durable *earthy easy-going* **emotional equilibrium**
emotional stability free-minded free-thinking fretless hard-headed
 imperturbable incoercible *independent* indestructible *individualistic*
 indomitable inexcitable *informal* invincible inward judicious level-
 headed *masculine nonchalant* nonirritable observant *passionless patient*
 penetrative pensive poised realistic reflective *relaxed* rugged self-assured
 self-confident self-controlled self-examining self-possessed self-reliant

Emotional stability

Neuroticism

self-sufficient serene **stable** thick-skinned tough-minded *unassuming*
unblushing undeceivable undefeatable *undemanding* undisturbable
unemotional unexcitable unflinching unhurried unimpassionate
unshakable unstormy *weariless* wide-awake worriless
agitable alarmable *anxious bossy* busyish careworn choosy *compulsive*
crabby cranky defensive despondent easeless *emotional envious excitable*
exhaustible *extravagant faultfinding fearful* feelingful fidgety *finicky*
fluttery *fretful* frightenable fussy *gossipy grumpy gullible* hectic *high-*
strung hypersensitive *hypocritical impatient* inconfident *insecure*
intrusive irritable jealous meddling moody naïve negativistic nervous
neurotic neuroticism *nosey obsessive* overactive overemotional
overexcitable overimaginative oversensitive perturbable picky *possessive*
quarrelsome restless self-conscious *self-critical* self-deceiving self-
defeating self-deluding self-deprecating self-disparaging self-doubting
self-indulgent selfish self-pitying self-punishing self-reproachful *snobbish*
soft-shelled squeamish *suggestible* supersensitive *superstitious*
temperamental tense thin-skinned *touchy* unassured unconfident unhardy
unpoised *unstable* unsure *volatile* weak-spirited weepy whiny wishful
world-weary *worrying*

Notes: Words in bold appear in the “traits-only” list in Column (1) of Table 1. Words in italics appear in the shorter trait descriptive term list in Column (2) of Table 1 along with the words in bold. The remaining words appear in the extended list used in Column (4) of Table 1 along with all of the words in bold and italics.

Appendix Table 4: Trait summary statistics by occupation (+)

Occupation	Ext.	Con.	Ope.	Agree.	Emo. Stab.	Any trait	# of ads
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Uncategorized (0)	0.27	0.21	0.16	0.10	0.07	0.46	27383
Chief executives, public administrators, and legislators (4)	0.65	0.34	0.10	0.05	0.02	0.95	195
Financial managers (7)	0.18	0.19	0.14	0.07	0.09	0.35	57
Human resources and labor relations managers (8)	0.48	0.33	0.30	0.18	0.09	0.72	250
Managers and specialists in marketing, advert., PR (13)	0.45	0.36	0.32	0.18	0.07	0.69	14351
Managers in education and related fields (14)	0.25	0.00	0.50	0.25	0.00	1.00	4
Managers of medicine and health occupations (15)	0.59	0.14	0.14	0.09	0.00	0.64	22
Managers of properties and real estate (18)	0.40	0.31	0.17	0.15	0.07	0.61	169
Funeral directors (19)	0.00	0.00	0.33	0.00	0.00	0.33	3
Managers and administrators, n.e.c. (22)	0.36	0.31	0.26	0.14	0.08	0.62	19497
Accountants and auditors (23)	0.28	0.32	0.26	0.10	0.10	0.57	5340
Insurance underwriters (24)	0.50	0.50	0.00	0.00	0.00	0.50	4
Other financial specialists (25)	0.09	0.18	0.32	0.14	0.00	0.36	22
Management analysts (26)	0.31	0.31	0.28	0.08	0.05	0.60	7272
Personnel, HR, training, and labor rel. specialists (27)	0.37	0.24	0.20	0.13	0.05	0.56	86
Buyers, wholesale and retail trade (29)	0.25	0.00	0.00	0.25	0.00	0.25	4
Purchasing managers, agents, and buyers, n.e.c. (33)	0.36	0.35	0.32	0.11	0.08	0.62	574
Business and promotion agents (34)	0.00	0.00	0.00	0.00	0.00	0.00	1
Construction inspectors (35)	0.09	0.09	0.09	0.18	0.09	0.36	11
Inspectors and compliance officers, outside (36)	0.24	0.25	0.19	0.11	0.04	0.41	314
Management support occupations (37)	0.55	0.54	0.21	0.09	0.05	0.75	149
Architects (43)	0.27	0.21	0.24	0.06	0.04	0.50	614
Aerospace engineers (44)	0.25	0.29	0.19	0.04	0.00	0.43	68
Metallurgical and materials engineers (45)	0.21	0.18	0.21	0.03	0.03	0.42	33
Petroleum, mining, and geological engineers (47)	0.15	0.05	0.15	0.00	0.05	0.30	20
Chemical engineers (48)	0.19	0.20	0.21	0.05	0.03	0.45	159
Civil engineers (53)	0.19	0.13	0.10	0.06	0.06	0.37	454
Electrical engineers (55)	0.21	0.18	0.17	0.06	0.04	0.42	917
Industrial engineers (56)	0.32	0.51	0.43	0.10	0.05	0.69	167
Mechanical engineers (57)	0.17	0.15	0.17	0.06	0.05	0.36	629
Engineers and other professionals, n.e.c (59)	0.28	0.24	0.24	0.07	0.05	0.51	7831
Computer systems analysts and computer scientists (64)	0.13	0.20	0.20	0.00	0.00	0.47	15
Operations and systems researchers and analysts (65)	0.32	0.41	0.36	0.09	0.05	0.63	665
Actuaries (66)	0.24	0.48	0.44	0.10	0.04	0.68	50
Mathematicians and statisticians (68)	0.25	0.41	0.34	0.09	0.02	0.60	99
Physicists and astronomers (69)	0.21	0.07	0.14	0.00	0.00	0.36	14
Chemists (73)	0.22	0.30	0.35	0.08	0.10	0.57	161
Atmospheric and space scientists (74)	0.00	0.00	0.00	0.00	0.00	0.00	1
Geologists (75)	0.30	0.25	0.27	0.23	0.02	0.57	60
Agricultural and food scientists (77)	0.67	0.17	0.17	0.00	0.17	0.67	6
Biological scientists (78)	0.03	0.11	0.06	0.00	0.00	0.14	36
Foresters and conservation scientists (79)	0.00	0.00	0.00	0.00	0.00	0.00	2

Medical scientists (83)	1.00	0.00	0.00	0.00	0.00	1.00	1
Physicians (84)	0.17	0.16	0.13	0.10	0.06	0.32	1538
Dentists (85)	0.01	0.00	0.00	0.01	0.00	0.02	804
Veterinarians (86)	0.53	0.47	0.53	0.35	0.00	0.88	17
Optometrists (87)	0.17	0.00	0.17	0.17	0.00	0.17	6
Podiatrists (88)	0.00	0.00	0.00	0.00	0.00	0.00	1
Other health and therapy occupations (89)	0.00	0.00	0.00	0.00	0.00	0.00	1
Registered nurses (95)	0.15	0.15	0.08	0.13	0.07	0.36	2963
Pharmacists (96)	0.07	0.03	0.03	0.02	0.01	0.11	993
Dieticians and nutritionists (97)	0.00	0.00	0.00	0.00	0.00	0.00	5
Respiratory therapists (98)	0.14	0.07	0.09	0.07	0.25	0.55	76
Occupational therapists (99)	0.17	0.18	0.07	0.14	0.05	0.46	148
Physical therapists (103)	0.19	0.21	0.08	0.14	0.03	0.49	329
Speech therapists (104)	0.64	0.09	0.27	0.18	0.00	0.73	11
Therapists, n.e.c. (105)	0.09	0.33	0.08	0.07	0.07	0.48	90
Physicians' assistants (106)	0.12	0.04	0.04	0.04	0.00	0.16	25
Kindergarten and earlier school teachers (155)	0.52	0.22	0.43	0.48	0.04	0.78	23
Primary school teachers (156)	1.00	0.00	0.00	0.00	0.00	1.00	1
Special education teachers (158)	0.00	0.40	0.20	0.20	0.20	0.60	5
Teachers, n.e.c. (159)	0.41	0.24	0.15	0.14	0.02	0.58	567
Vocational and educational counselors (163)	0.67	0.33	0.42	0.25	0.08	0.83	12
Librarians (164)	0.19	0.16	0.22	0.03	0.06	0.47	32
Archivists and curators (165)	1.00	1.00	0.00	0.00	0.00	1.00	1
Economists, market and survey researchers (166)	0.50	0.31	0.44	0.25	0.00	0.69	16
Psychologists (167)	0.10	0.05	0.24	0.14	0.10	0.43	21
Urban and regional planners (173)	0.00	0.00	0.25	0.00	0.00	0.25	4
Social workers (174)	0.15	0.28	0.17	0.39	0.05	0.60	109
Clergy and religious workers (176)	0.03	0.90	0.90	0.88	0.05	0.98	93
Lawyers and judges (178)	0.21	0.18	0.27	0.12	0.04	0.48	1142
Writers and authors (183)	0.34	0.32	0.41	0.13	0.06	0.67	293
Technical writers (184)	0.13	0.67	0.10	0.04	0.04	0.80	359
Designers (185)	0.25	0.23	0.29	0.10	0.06	0.54	1369
Musicians and composers (186)	0.01	0.02	0.01	0.01	0.00	0.02	162
Actors, directors, and producers (187)	0.75	0.13	0.00	0.13	0.13	0.88	8
Painters, sculptors, craft-artists, and print-makers (188)	0.16	0.22	0.22	0.09	0.05	0.45	211
Photographers (189)	0.82	0.18	0.29	0.43	0.21	0.93	28
Art/entertainment performers and related occs (194)	1.00	0.00	0.00	1.00	0.00	1.00	2
Editors and reporters (195)	0.27	0.24	0.26	0.17	0.08	0.53	172
Athletes, coaches, and officials (199)	0.51	0.40	0.42	0.14	0.07	0.76	136
Clinical laboratory technologies and technicians (203)	0.41	0.30	0.23	0.22	0.05	0.60	145
Dental hygienists (204)	0.22	0.22	0.00	0.11	0.00	0.33	9
Radiologic technologists and technicians (206)	0.26	0.18	0.08	0.23	0.02	0.56	61
Licensed practical nurses (207)	0.12	0.19	0.02	0.13	0.06	0.31	52
Health technologists and technicians, n.e.c (208)	0.33	0.11	0.22	0.44	0.00	0.56	9
Engineering technicians (214)	0.35	0.15	0.25	0.05	0.06	0.61	93
Drafters (217)	0.06	0.06	0.06	0.03	0.04	0.18	592

Surveyors, cartographers, mapping scientists/techs (218)	0.12	0.16	0.10	0.00	0.07	0.35	69
Chemical technicians (224)	0.25	0.00	0.25	0.25	0.00	0.50	4
Other science technicians (225)	0.00	0.00	0.00	0.00	0.00	0.00	1
Airplane pilots and navigators (226)	0.40	0.40	0.40	0.35	0.45	0.65	20
Air traffic controllers (227)	0.00	0.00	0.00	0.00	0.00	0.00	398
Broadcast equipment operators (228)	0.50	0.00	0.00	0.25	0.00	0.75	4
Computer software developers (229)	0.33	0.25	0.33	0.09	0.07	0.61	2656
Programmers of numerically controlled machine tools (233)	0.00	0.00	1.00	0.00	0.00	1.00	1
Legal assistants and paralegals (234)	0.17	0.20	0.18	0.09	0.10	0.47	983
Technicians, n.e.c. (235)	0.19	0.21	0.10	0.16	0.04	0.49	3008
Sales supervisors and proprietors (243)	0.48	0.31	0.29	0.22	0.08	0.66	4645
Insurance sales occupations (253)	0.21	0.20	0.51	0.04	0.44	0.71	129
Real estate sales occupations (254)	0.52	0.21	0.35	0.08	0.09	0.67	392
Advertising and related sales jobs (256)	0.53	0.28	0.40	0.08	0.05	0.79	100
Sales engineers (258)	0.35	0.13	0.17	0.03	0.04	0.53	284
Salespersons, n.e.c. (274)	0.45	0.20	0.20	0.15	0.07	0.63	3793
Retail salespersons and sales clerks (275)	0.24	0.27	0.16	0.13	0.05	0.53	828
Cashiers (276)	0.44	0.48	0.17	0.34	0.05	0.79	197
Door-to-door sales, street sales, and news vendors (277)	0.63	0.16	0.00	0.68	0.00	0.84	19
Sales demonstrators, promoters, and models (283)	0.69	0.15	0.15	0.31	0.00	0.69	13
Office supervisors (303)	0.41	0.47	0.12	0.35	0.00	0.76	17
Computer and peripheral equipment operators (308)	0.24	0.16	0.14	0.14	0.02	0.43	63
Secretaries and stenographers (313)	0.36	0.29	0.16	0.15	0.16	0.63	3195
Typists (315)	0.38	0.44	0.06	0.38	0.13	0.56	16
Interviewers, enumerators, and surveyors (316)	0.62	0.17	0.21	0.24	0.14	0.90	29
Transportation ticket and reservation agents (318)	1.00	0.20	0.20	0.20	0.20	1.00	5
Receptionists and other information clerks (319)	0.34	0.23	0.09	0.18	0.15	0.57	1833
Human resources clerks, excl payroll and timekeeping (328)	0.33	0.00	0.00	0.00	0.33	0.33	3
Library assistants (329)	0.50	0.17	0.08	0.17	0.08	0.67	12
File clerks (335)	0.22	0.33	0.08	0.14	0.20	0.59	51
Bookkeepers and accounting and auditing clerks (337)	0.15	0.24	0.10	0.07	0.11	0.43	2374
Payroll and timekeeping clerks (338)	0.13	0.21	0.02	0.11	0.16	0.43	95
Billing clerks and related financial records processing (344)	0.26	0.34	0.10	0.10	0.12	0.50	68
Mail and paper handlers (346)	0.25	0.50	0.25	0.25	0.00	0.50	4
Telephone operators (348)	0.25	0.13	0.25	0.38	0.13	0.75	8
Other telecom operators (349)	0.00	0.00	0.00	0.00	0.00	0.00	3
Mail carriers for postal service (355)	0.00	1.00	1.00	0.00	0.00	1.00	1
Mail clerks, outside of post office (356)	0.39	0.22	0.00	0.04	0.22	0.52	23
Messengers (357)	0.43	0.36	0.57	0.50	0.14	0.79	14
Dispatchers (359)	0.28	0.28	0.09	0.14	0.09	0.55	148
Shipping and receiving clerks (364)	0.25	0.29	0.09	0.13	0.10	0.48	103
Stock and inventory clerks (365)	0.17	0.20	0.07	0.10	0.02	0.39	41
Meter readers (366)	0.00	0.00	0.00	0.25	0.25	0.50	4
Weighers, measurers, and checkers (368)	0.10	0.15	0.40	0.30	0.00	0.55	20
Material recording, sched., prod., plan., expediting cl. (373)	0.31	0.27	0.17	0.09	0.05	0.52	281
Insurance adjusters, examiners, and investigators (375)	0.31	0.23	0.12	0.08	0.15	0.62	26

Customer service reps, invest., adjusters, excl. insur. (376)	0.40	0.24	0.11	0.23	0.16	0.63	1700
Eligibility clerks for government prog., social welfare (377)	1.00	0.00	0.00	0.00	0.00	1.00	1
General office clerks (379)	0.26	0.21	0.04	0.17	0.25	0.52	84
Bank tellers (383)	0.44	0.18	0.12	0.29	0.15	0.53	34
Proofreaders (384)	0.09	0.52	0.26	0.13	0.04	0.61	23
Data entry keyers (385)	0.31	0.32	0.10	0.13	0.21	0.63	3046
Teacher's aides (387)	0.00	0.00	1.00	0.00	0.00	1.00	1
Administrative support jobs, n.e.c. (389)	0.83	0.17	0.00	0.00	0.17	1.00	6
Housekeepers, maids, butlers, and cleaners (405)	0.29	0.40	0.21	0.21	0.19	0.54	52
Laundry and dry cleaning workers (408)	0.33	0.33	0.33	0.00	0.67	1.00	3
Fire fighting, fire prevention, and fire inspection occs (417)	0.27	0.44	0.51	0.02	0.04	0.80	45
Police and detectives, public service (418)	0.19	0.01	0.00	0.00	0.00	0.19	386
Sheriffs, bailiffs, correctional institution officers (423)	0.44	0.00	0.06	0.38	0.00	0.50	16
Crossing guards (425)	0.00	0.00	0.00	0.00	0.00	0.00	4
Guards and police, except public service (426)	0.28	0.28	0.26	0.35	0.04	0.64	72
Protective service, n.e.c. (427)	1.00	0.00	1.00	1.00	0.00	1.00	1
Supervisors of food preparation and service (433)	0.00	0.00	0.00	0.00	0.00	0.00	1
Bartenders (434)	0.73	0.36	0.18	0.27	0.09	0.82	11
Waiters and waitresses (435)	0.11	0.18	0.03	0.05	0.53	0.76	38
Cooks (436)	0.50	0.09	0.23	0.18	0.06	0.67	223
Miscellaneous food preparation and service workers (444)	0.68	0.39	0.13	0.18	0.09	0.81	95
Dental Assistants (445)	0.05	0.03	0.00	0.04	0.01	0.08	223
Health and nursing aides (447)	0.25	0.15	0.03	0.11	0.01	0.40	205
Supervisors of cleaning and building service (448)	0.00	0.00	0.00	0.00	0.00	0.00	3
Gardeners and groundskeepers (451)	0.44	0.41	0.00	0.37	0.04	0.70	27
Janitors (453)	0.13	0.19	0.13	0.15	0.04	0.41	78
Pest control occupations (455)	0.40	0.11	0.09	0.09	0.09	0.49	35
Hairdressers and cosmetologists (458)	0.00	0.00	0.00	0.00	0.00	0.00	3
Guides (461)	0.50	0.00	0.00	0.00	0.50	0.50	4
Baggage porters, bellhops and concierges (464)	0.37	0.46	0.39	0.26	0.02	0.76	46
Motion picture projectionists (467)	0.00	1.00	0.00	0.00	0.00	1.00	4
Child care workers (468)	0.00	0.17	0.00	0.33	0.00	0.33	6
Animal caretakers, except farm (472)	1.00	0.00	0.00	0.00	0.00	1.00	3
Farm workers, incl. nursery farming (479)	1.00	1.00	1.00	0.00	0.00	1.00	1
Supervisors of mechanics and repairers (503)	0.00	0.00	0.00	0.00	0.00	0.00	3
Automobile mechanics and repairers (505)	0.10	0.00	0.20	0.00	0.00	0.30	10
Bus, truck, and stationary engine mechanics (507)	0.20	0.10	0.00	0.00	0.00	0.20	10
Aircraft mechanics (508)	0.00	0.00	0.00	0.00	0.00	0.00	8
Small engine repairers (509)	0.17	0.50	0.00	0.00	0.00	0.50	6
Auto body repairers (514)	0.38	0.13	0.00	0.38	0.63	0.88	8
Heavy equipment and farm equipment mechanics (516)	0.27	0.00	0.09	0.09	0.00	0.36	11
Machinery maintenance occupations (519)	0.24	0.16	0.08	0.00	0.08	0.40	25
Repairers of household appliances and power tools (526)	0.64	0.64	0.09	0.55	0.18	0.73	11
Telecom and line installers and repairers (527)	0.50	0.00	0.00	0.00	0.00	0.50	2
Repairers of electrical equipment, n.e.c (533)	0.00	0.00	0.00	0.00	0.00	0.00	35
Heating, air conditioning, and refrigeration mechanics (534)	0.58	0.04	0.04	0.00	0.00	0.64	81

Locksmiths and safe repairers (536)	0.00	0.25	0.25	0.25	0.00	0.25	4
Repairers of mechanical controls and valves (539)	0.00	0.00	0.00	0.00	0.00	0.00	1
Elevator installers and repairers (543)	0.50	0.50	0.50	0.00	0.50	0.50	2
Millwrights (544)	0.10	0.20	0.10	0.05	0.05	0.30	20
Mechanics and repairers, n.e.c. (549)	0.22	0.19	0.10	0.11	0.07	0.45	473
Supervisors of construction work (558)	0.05	0.14	0.09	0.05	0.05	0.18	22
Masons, tilers, and carpet installers (563)	0.27	0.16	0.14	0.18	0.04	0.39	56
Carpenters (567)	0.08	0.20	0.04	0.12	0.00	0.32	25
Drywall installers (573)	0.00	0.00	0.00	0.00	0.00	0.00	1
Electricians (575)	0.13	0.13	0.05	0.03	0.01	0.21	384
Electric power installers and repairers (577)	0.50	0.00	0.00	0.50	0.00	0.50	2
Plasterers (584)	0.00	0.00	0.00	0.00	0.00	0.00	2
Plumbers, pipe fitters, and steamfitters (585)	0.18	0.18	0.09	0.09	0.03	0.29	34
Glaziers (589)	0.50	0.00	0.00	0.00	0.00	0.50	2
Roofers and slaters (595)	0.33	0.33	0.00	0.00	0.00	0.67	6
Drillers of earth (598)	0.87	0.13	0.00	0.87	0.00	0.87	15
Drillers of oil wells (614)	0.00	0.00	0.00	0.00	1.00	1.00	1
Explosives workers (615)	0.00	0.00	0.00	0.00	0.00	0.00	2
Miners (616)	0.00	1.00	1.00	0.00	0.00	1.00	1
Other mining occupations (617)	0.00	0.00	1.00	1.00	0.00	1.00	2
Production supervisors or foremen (628)	0.27	0.23	0.20	0.06	0.04	0.50	342
Tool and die makers and die setters (634)	0.07	0.07	0.04	0.04	0.04	0.18	28
Machinists (637)	0.09	0.12	0.09	0.03	0.05	0.25	194
Boilermakers (643)	0.00	0.00	0.60	0.00	0.20	0.80	5
Precision grinders and fitters (644)	0.00	0.33	0.00	0.00	0.00	0.33	3
Patternmakers and model makers (645)	0.31	0.35	0.38	0.00	0.00	0.65	48
Engravers (649)	0.00	0.00	0.00	0.00	0.00	0.00	2
Other metal and plastic workers (653)	1.00	1.00	0.00	0.00	0.00	1.00	3
Cabinetmakers and bench carpenters (657)	0.40	0.00	0.00	0.20	0.00	0.60	5
Furniture/wood finishers, other prec. wood workers (658)	0.50	0.00	0.00	0.50	0.50	0.50	2
Dressmakers, seamstresses, and tailors (666)	0.71	0.00	0.00	0.14	0.00	0.71	7
Upholsterers (668)	0.00	0.00	0.00	0.00	0.00	0.00	1
Hand molders and shapers, except jewelers (675)	0.22	0.22	0.00	0.00	0.22	0.33	9
Dental laboratory and medical appliance technicians (678)	0.00	0.00	0.00	1.00	0.00	1.00	1
Butchers and meat cutters (686)	0.33	0.50	0.00	0.50	0.00	0.67	6
Bakers (687)	0.44	0.12	0.08	0.40	0.20	0.60	25
Power plant operators (695)	0.00	0.00	0.00	0.00	0.00	0.00	9
Plant and system operators, stationary engineers (696)	0.14	0.25	0.11	0.04	0.04	0.41	80
Lathe, milling, and turning machine operatives (703)	0.08	0.08	0.08	0.08	0.03	0.25	40
Punching and stamping press operatives (706)	0.00	0.00	0.00	0.00	0.00	0.00	1
Rollers, roll hands, and finishers of meta (707)	0.12	0.18	0.12	0.06	0.00	0.29	17
Drilling and boring machine operators (708)	0.00	0.00	0.00	0.00	0.00	0.00	2
Grinding, abrading, buffing, and polishing workers (709)	0.26	0.26	0.13	0.13	0.06	0.48	31
Sawing machine operators and sawyers (727)	0.00	0.00	0.00	0.00	0.00	0.00	4
Printing machine operators, n.e.c. (734)	0.00	0.00	0.00	0.00	0.00	0.00	1
Typesetters and compositors (736)	0.00	0.00	0.00	0.00	0.33	0.33	3

Winding and twisting textile and apparel operatives (738)	0.17	0.00	0.33	0.17	0.00	0.50	6
Textile sewing machine operators (744)	0.00	0.00	0.00	0.00	0.00	0.00	2
Packers, fillers, and wrappers (754)	0.14	0.17	0.06	0.09	0.04	0.39	80
Furnance, kiln, and oven operators, apart from food (766)	0.00	0.00	0.00	0.00	0.00	0.00	1
Photographic process workers (774)	0.00	0.00	0.00	0.00	0.00	0.00	1
Machine operators, n.e.c. (779)	0.11	0.15	0.05	0.03	0.11	0.31	147
Welders, solderers, and metal cutters (783)	0.08	0.17	0.06	0.07	0.05	0.30	433
Painting and decoration occupations (789)	0.44	0.34	0.34	0.13	0.06	0.59	32
Production checkers, graders, and sorters in manufacturing (799)	0.29	0.32	0.25	0.09	0.05	0.57	307
Supervisors of motor vehicle transportation (803)	0.63	0.63	0.31	0.13	0.13	1.00	16
Truck, delivery, and tractor drivers (804)	0.25	0.31	0.16	0.13	0.06	0.55	3034
Bus drivers (808)	0.17	0.67	0.00	0.33	0.00	0.83	6
Taxi cab drivers and chauffeurs (809)	0.33	0.22	0.11	0.00	0.00	0.56	9
Locomotive operators: engineers and firemen (824)	0.00	0.25	0.00	0.00	0.13	0.38	8
Ship crews and marine engineers (829)	0.00	0.11	0.11	0.00	0.11	0.33	916
Miscellaneous transportation occupations (834)	0.00	0.00	0.00	1.00	0.00	1.00	1
Crane, derrick, winch, hoist, longshore operators (848)	0.08	0.31	0.00	0.00	0.00	0.38	13
Excavating and loading machine operators (853)	0.00	0.75	0.50	0.00	0.00	0.75	4
Stevedores and misc. material moving occupations (859)	0.00	0.50	0.00	0.00	0.00	0.50	2
Helpers, constructions (865)	0.00	0.20	0.00	0.40	0.20	0.80	5
Production helpers (873)	0.00	0.50	0.00	0.00	0.00	0.50	2
Machine feeders and offbearers (878)	0.00	0.00	0.00	0.00	0.00	0.00	1
Packers and packagers by hand (888)	0.18	0.06	0.06	0.00	0.00	0.24	17
Laborers, freight, stock, and material handlers, n.e.c. (889)	0.16	0.30	0.05	0.05	0.06	0.44	111

Notes: The table reports the fraction of job ads in a given occupation in which trait descriptive terms associated with the positive trait pole in the column appear in Columns (1) to (5). Column (6) reports the fraction of ads in an occupation in which any trait descriptive terms appear, while Column (7) reports the number of job ads associated with each occupation. The occupation codes are listed in parentheses.

Appendix Table 5: Trait summary statistics by occupation (-)

Occupation	Int.	Non- Con.	Non- Ope.	Dis- Agree.	Neu.	Any trait	# of ads
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Uncategorized (0)	0.00	0.00	0.00	0.01	0.00	0.46	27383
Chief executives, public administrators, and legislators (4)	0.00	0.00	0.00	0.01	0.00	0.95	195
Financial managers (7)	0.00	0.00	0.00	0.00	0.00	0.35	57
Human resources and labor relations managers (8)	0.01	0.00	0.03	0.02	0.00	0.72	250
Managers and specialists in marketing, advert., PR (13)	0.00	0.00	0.02	0.02	0.00	0.69	14351
Managers in education and related fields (14)	0.00	0.00	0.00	0.00	0.00	1.00	4
Managers of medicine and health occupations (15)	0.00	0.00	0.00	0.00	0.00	0.64	22
Managers of properties and real estate (18)	0.01	0.00	0.01	0.01	0.00	0.61	169
Funeral directors (19)	0.00	0.00	0.00	0.00	0.00	0.33	3
Managers and administrators, n.e.c. (22)	0.00	0.00	0.01	0.01	0.00	0.62	19497
Accountants and auditors (23)	0.00	0.00	0.00	0.01	0.00	0.57	5340
Insurance underwriters (24)	0.00	0.00	0.00	0.00	0.00	0.50	4
Other financial specialists (25)	0.00	0.00	0.00	0.00	0.00	0.36	22
Management analysts (26)	0.00	0.00	0.00	0.06	0.00	0.60	7272
Personnel, HR, training, and labor rel. specialists (27)	0.01	0.00	0.00	0.01	0.00	0.56	86
Buyers, wholesale and retail trade (29)	0.00	0.00	0.00	0.00	0.00	0.25	4
Purchasing managers, agents, and buyers, n.e.c. (33)	0.00	0.00	0.00	0.01	0.00	0.62	574
Business and promotion agents (34)	0.00	0.00	0.00	0.00	0.00	0.00	1
Construction inspectors (35)	0.00	0.00	0.00	0.00	0.00	0.36	11
Inspectors and compliance officers, outside (36)	0.00	0.00	0.00	0.00	0.00	0.41	314
Management support occupations (37)	0.00	0.00	0.00	0.00	0.00	0.75	149
Architects (43)	0.00	0.00	0.00	0.04	0.00	0.50	614
Aerospace engineers (44)	0.00	0.00	0.00	0.00	0.00	0.43	68
Metallurgical and materials engineers (45)	0.00	0.00	0.00	0.03	0.00	0.42	33
Petroleum, mining, and geological engineers (47)	0.00	0.00	0.00	0.00	0.00	0.30	20
Chemical engineers (48)	0.00	0.00	0.00	0.02	0.00	0.45	159
Civil engineers (53)	0.00	0.00	0.01	0.00	0.00	0.37	454
Electrical engineers (55)	0.00	0.00	0.00	0.04	0.00	0.42	917
Industrial engineers (56)	0.00	0.00	0.00	0.02	0.00	0.69	167
Mechanical engineers (57)	0.00	0.00	0.00	0.00	0.00	0.36	629
Engineers and other professionals, n.e.c (59)	0.00	0.00	0.00	0.02	0.00	0.51	7831
Computer systems analysts and computer scientists (64)	0.00	0.20	0.00	0.00	0.00	0.47	15
Operations and systems researchers and analysts (65)	0.00	0.00	0.00	0.01	0.00	0.63	665
Actuaries (66)	0.00	0.00	0.00	0.00	0.00	0.68	50
Mathematicians and statisticians (68)	0.00	0.00	0.00	0.01	0.00	0.60	99
Physicists and astronomers (69)	0.00	0.00	0.00	0.00	0.00	0.36	14
Chemists (73)	0.01	0.00	0.00	0.01	0.00	0.57	161
Atmospheric and space scientists (74)	0.00	0.00	0.00	0.00	0.00	0.00	1
Geologists (75)	0.00	0.00	0.00	0.00	0.00	0.57	60
Agricultural and food scientists (77)	0.00	0.00	0.00	0.00	0.00	0.67	6
Biological scientists (78)	0.00	0.00	0.00	0.00	0.00	0.14	36
Foresters and conservation scientists (79)	0.00	0.00	0.00	0.00	0.00	0.00	2

Medical scientists (83)	0.00	0.00	0.00	0.00	0.00	1.00	1
Physicians (84)	0.00	0.00	0.01	0.00	0.00	0.32	1538
Dentists (85)	0.00	0.00	0.00	0.00	0.01	0.02	804
Veterinarians (86)	0.00	0.00	0.00	0.00	0.00	0.88	17
Optometrists (87)	0.00	0.00	0.00	0.00	0.00	0.17	6
Podiatrists (88)	0.00	0.00	0.00	0.00	0.00	0.00	1
Other health and therapy occupations (89)	0.00	0.00	0.00	0.00	0.00	0.00	1
Registered nurses (95)	0.00	0.00	0.00	0.00	0.00	0.36	2963
Pharmacists (96)	0.00	0.00	0.00	0.00	0.00	0.11	993
Dieticians and nutritionists (97)	0.00	0.00	0.00	0.00	0.00	0.00	5
Respiratory therapists (98)	0.00	0.00	0.00	0.00	0.00	0.55	76
Occupational therapists (99)	0.01	0.00	0.00	0.01	0.00	0.46	148
Physical therapists (103)	0.00	0.00	0.00	0.00	0.00	0.49	329
Speech therapists (104)	0.00	0.00	0.00	0.00	0.00	0.73	11
Therapists, n.e.c. (105)	0.00	0.00	0.00	0.01	0.00	0.48	90
Physicians' assistants (106)	0.00	0.00	0.00	0.00	0.00	0.16	25
Kindergarten and earlier school teachers (155)	0.00	0.00	0.00	0.00	0.00	0.78	23
Primary school teachers (156)	0.00	0.00	0.00	0.00	0.00	1.00	1
Special education teachers (158)	0.00	0.00	0.00	0.20	0.00	0.60	5
Teachers, n.e.c. (159)	0.00	0.00	0.01	0.00	0.01	0.58	567
Vocational and educational counselors (163)	0.00	0.00	0.00	0.00	0.08	0.83	12
Librarians (164)	0.00	0.00	0.00	0.00	0.00	0.47	32
Archivists and curators (165)	0.00	0.00	0.00	0.00	0.00	1.00	1
Economists, market and survey researchers (166)	0.00	0.00	0.00	0.00	0.00	0.69	16
Psychologists (167)	0.00	0.00	0.00	0.00	0.00	0.43	21
Urban and regional planners (173)	0.00	0.00	0.00	0.00	0.00	0.25	4
Social workers (174)	0.00	0.00	0.00	0.00	0.00	0.60	109
Clergy and religious workers (176)	0.04	0.00	0.00	0.00	0.00	0.98	93
Lawyers and judges (178)	0.00	0.00	0.00	0.02	0.00	0.48	1142
Writers and authors (183)	0.00	0.00	0.03	0.02	0.02	0.67	293
Technical writers (184)	0.00	0.00	0.00	0.01	0.00	0.80	359
Designers (185)	0.00	0.00	0.01	0.02	0.00	0.54	1369
Musicians and composers (186)	0.00	0.00	0.01	0.00	0.00	0.02	162
Actors, directors, and producers (187)	0.00	0.00	0.00	0.00	0.00	0.88	8
Painters, sculptors, craft-artists, and print-makers (188)	0.00	0.00	0.00	0.01	0.00	0.45	211
Photographers (189)	0.00	0.00	0.00	0.00	0.00	0.93	28
Art/entertainment performers and related occs (194)	0.00	0.00	0.00	0.00	0.00	1.00	2
Editors and reporters (195)	0.02	0.00	0.00	0.02	0.01	0.53	172
Athletes, coaches, and officials (199)	0.00	0.00	0.02	0.01	0.00	0.76	136
Clinical laboratory technologies and technicians (203)	0.00	0.00	0.00	0.00	0.00	0.60	145
Dental hygienists (204)	0.00	0.00	0.00	0.00	0.00	0.33	9
Radiologic technologists and technicians (206)	0.00	0.00	0.00	0.00	0.00	0.56	61
Licensed practical nurses (207)	0.02	0.00	0.00	0.00	0.00	0.31	52
Health technologists and technicians, n.e.c (208)	0.00	0.00	0.00	0.00	0.00	0.56	9
Engineering technicians (214)	0.00	0.00	0.00	0.01	0.00	0.61	93
Drafters (217)	0.00	0.00	0.00	0.00	0.00	0.18	592

Surveyors, cartographers, mapping scientists/techs (218)	0.00	0.00	0.01	0.00	0.00	0.35	69
Chemical technicians (224)	0.00	0.00	0.00	0.00	0.00	0.50	4
Other science technicians (225)	0.00	0.00	0.00	0.00	0.00	0.00	1
Airplane pilots and navigators (226)	0.00	0.00	0.05	0.00	0.00	0.65	20
Air traffic controllers (227)	0.00	0.00	0.00	0.00	0.00	0.00	398
Broadcast equipment operators (228)	0.00	0.00	0.00	0.00	0.00	0.75	4
Computer software developers (229)	0.00	0.00	0.00	0.04	0.00	0.61	2656
Programmers of numerically controlled machine tools (233)	0.00	0.00	0.00	0.00	0.00	1.00	1
Legal assistants and paralegals (234)	0.00	0.00	0.00	0.00	0.00	0.47	983
Technicians, n.e.c. (235)	0.00	0.00	0.00	0.01	0.00	0.49	3008
Sales supervisors and proprietors (243)	0.00	0.00	0.00	0.01	0.00	0.66	4645
Insurance sales occupations (253)	0.00	0.00	0.00	0.00	0.00	0.71	129
Real estate sales occupations (254)	0.00	0.00	0.00	0.00	0.00	0.67	392
Advertising and related sales jobs (256)	0.00	0.03	0.00	0.02	0.00	0.79	100
Sales engineers (258)	0.00	0.00	0.00	0.02	0.00	0.53	284
Salespersons, n.e.c. (274)	0.00	0.00	0.00	0.02	0.00	0.63	3793
Retail salespersons and sales clerks (275)	0.00	0.00	0.01	0.02	0.00	0.53	828
Cashiers (276)	0.00	0.00	0.00	0.01	0.00	0.79	197
Door-to-door sales, street sales, and news vendors (277)	0.00	0.00	0.00	0.00	0.00	0.84	19
Sales demonstrators, promoters, and models (283)	0.00	0.00	0.00	0.00	0.00	0.69	13
Office supervisors (303)	0.00	0.00	0.00	0.06	0.00	0.76	17
Computer and peripheral equipment operators (308)	0.00	0.00	0.00	0.00	0.00	0.43	63
Secretaries and stenographers (313)	0.00	0.00	0.00	0.01	0.00	0.63	3195
Typists (315)	0.00	0.00	0.00	0.00	0.00	0.56	16
Interviewers, enumerators, and surveyors (316)	0.00	0.00	0.00	0.03	0.00	0.90	29
Transportation ticket and reservation agents (318)	0.00	0.00	0.00	0.00	0.00	1.00	5
Receptionists and other information clerks (319)	0.00	0.00	0.00	0.00	0.00	0.57	1833
Human resources clerks, excl payroll and timekeeping (328)	0.00	0.00	0.00	0.00	0.00	0.33	3
Library assistants (329)	0.00	0.00	0.00	0.00	0.00	0.67	12
File clerks (335)	0.04	0.00	0.00	0.00	0.00	0.59	51
Bookkeepers and accounting and auditing clerks (337)	0.00	0.00	0.00	0.00	0.00	0.43	2374
Payroll and timekeeping clerks (338)	0.01	0.00	0.00	0.01	0.00	0.43	95
Billing clerks and related financial records processing (344)	0.00	0.00	0.00	0.00	0.00	0.50	68
Mail and paper handlers (346)	0.00	0.00	0.00	0.00	0.00	0.50	4
Telephone operators (348)	0.00	0.00	0.00	0.00	0.00	0.75	8
Other telecom operators (349)	0.00	0.00	0.00	0.00	0.00	0.00	3
Mail carriers for postal service (355)	0.00	0.00	0.00	0.00	0.00	1.00	1
Mail clerks, outside of post office (356)	0.00	0.00	0.00	0.00	0.00	0.52	23
Messengers (357)	0.00	0.00	0.00	0.00	0.00	0.79	14
Dispatchers (359)	0.00	0.00	0.00	0.00	0.01	0.55	148
Shipping and receiving clerks (364)	0.00	0.00	0.00	0.01	0.00	0.48	103
Stock and inventory clerks (365)	0.00	0.00	0.00	0.02	0.00	0.39	41
Meter readers (366)	0.00	0.00	0.00	0.00	0.00	0.50	4
Weighers, measurers, and checkers (368)	0.00	0.00	0.00	0.00	0.00	0.55	20
Material recording, sched., prod., plan., expediting cl. (373)	0.00	0.00	0.00	0.00	0.00	0.52	281
Insurance adjusters, examiners, and investigators (375)	0.00	0.00	0.00	0.00	0.00	0.62	26

Customer service reps, invest., adjusters, excl. insur. (376)	0.00	0.00	0.00	0.00	0.00	0.63	1700
Eligibility clerks for government prog., social welfare (377)	0.00	0.00	0.00	0.00	0.00	1.00	1
General office clerks (379)	0.00	0.00	0.00	0.00	0.00	0.52	84
Bank tellers (383)	0.00	0.00	0.00	0.00	0.00	0.53	34
Proofreaders (384)	0.00	0.00	0.00	0.00	0.00	0.61	23
Data entry keyers (385)	0.00	0.00	0.00	0.00	0.00	0.63	3046
Teacher's aides (387)	0.00	0.00	0.00	0.00	0.00	1.00	1
Administrative support jobs, n.e.c. (389)	0.00	0.00	0.00	0.00	0.00	1.00	6
Housekeepers, maids, butlers, and cleaners (405)	0.00	0.00	0.00	0.00	0.00	0.54	52
Laundry and dry cleaning workers (408)	0.00	0.00	0.00	0.00	0.00	1.00	3
Fire fighting, fire prevention, and fire inspection occs (417)	0.00	0.00	0.00	0.02	0.00	0.80	45
Police and detectives, public service (418)	0.00	0.00	0.00	0.00	0.00	0.19	386
Sheriffs, bailiffs, correctional institution officers (423)	0.00	0.00	0.00	0.00	0.00	0.50	16
Crossing guards (425)	0.00	0.00	0.00	0.00	0.00	0.00	4
Guards and police, except public service (426)	0.07	0.00	0.01	0.00	0.00	0.64	72
Protective service, n.e.c. (427)	0.00	0.00	0.00	0.00	0.00	1.00	1
Supervisors of food preparation and service (433)	0.00	0.00	0.00	0.00	0.00	0.00	1
Bartenders (434)	0.09	0.00	0.18	0.00	0.00	0.82	11
Waiters and waitresses (435)	0.00	0.00	0.00	0.00	0.00	0.76	38
Cooks (436)	0.00	0.00	0.01	0.03	0.00	0.67	223
Miscellaneous food preparation and service workers (444)	0.00	0.00	0.00	0.00	0.00	0.81	95
Dental Assistants (445)	0.00	0.00	0.00	0.00	0.00	0.08	223
Health and nursing aides (447)	0.00	0.00	0.00	0.00	0.00	0.40	205
Supervisors of cleaning and building service (448)	0.00	0.00	0.00	0.00	0.00	0.00	3
Gardeners and groundskeepers (451)	0.00	0.00	0.07	0.00	0.00	0.70	27
Janitors (453)	0.00	0.00	0.00	0.00	0.00	0.41	78
Pest control occupations (455)	0.00	0.00	0.00	0.03	0.00	0.49	35
Hairdressers and cosmetologists (458)	0.00	0.00	0.00	0.00	0.00	0.00	3
Guides (461)	0.00	0.00	0.00	0.00	0.50	0.50	4
Baggage porters, bellhops and concierges (464)	0.00	0.00	0.00	0.00	0.00	0.76	46
Motion picture projectionists (467)	0.00	0.00	0.00	0.00	0.00	1.00	4
Child care workers (468)	0.00	0.00	0.00	0.00	0.00	0.33	6
Animal caretakers, except farm (472)	0.00	0.00	0.00	0.00	0.00	1.00	3
Farm workers, incl. nursery farming (479)	0.00	0.00	0.00	0.00	0.00	1.00	1
Supervisors of mechanics and repairers (503)	0.00	0.00	0.00	0.00	0.00	0.00	3
Automobile mechanics and repairers (505)	0.00	0.00	0.00	0.00	0.00	0.30	10
Bus, truck, and stationary engine mechanics (507)	0.00	0.00	0.00	0.00	0.00	0.20	10
Aircraft mechanics (508)	0.00	0.00	0.00	0.00	0.00	0.00	8
Small engine repairers (509)	0.00	0.00	0.00	0.00	0.00	0.50	6
Auto body repairers (514)	0.00	0.00	0.00	0.00	0.00	0.88	8
Heavy equipment and farm equipment mechanics (516)	0.00	0.00	0.09	0.00	0.00	0.36	11
Machinery maintenance occupations (519)	0.00	0.00	0.00	0.00	0.00	0.40	25
Repairers of household appliances and power tools (526)	0.00	0.00	0.00	0.00	0.00	0.73	11
Telecom and line installers and repairers (527)	0.00	0.00	0.00	0.00	0.00	0.50	2
Repairers of electrical equipment, n.e.c (533)	0.00	0.00	0.00	0.00	0.00	0.00	35
Heating, air conditioning, and refrigeration mechanics (534)	0.00	0.00	0.00	0.01	0.00	0.64	81

Locksmiths and safe repairers (536)	0.00	0.00	0.00	0.00	0.00	0.25	4
Repairers of mechanical controls and valves (539)	0.00	0.00	0.00	0.00	0.00	0.00	1
Elevator installers and repairers (543)	0.00	0.00	0.00	0.00	0.00	0.50	2
Millwrights (544)	0.00	0.00	0.00	0.00	0.00	0.30	20
Mechanics and repairers, n.e.c. (549)	0.00	0.00	0.00	0.00	0.00	0.45	473
Supervisors of construction work (558)	0.00	0.00	0.00	0.00	0.00	0.18	22
Masons, tilers, and carpet installers (563)	0.00	0.00	0.02	0.00	0.00	0.39	56
Carpenters (567)	0.00	0.00	0.00	0.00	0.00	0.32	25
Drywall installers (573)	0.00	0.00	0.00	0.00	0.00	0.00	1
Electricians (575)	0.00	0.00	0.00	0.00	0.00	0.21	384
Electric power installers and repairers (577)	0.00	0.00	0.00	0.00	0.00	0.50	2
Plasterers (584)	0.00	0.00	0.00	0.00	0.00	0.00	2
Plumbers, pipe fitters, and steamfitters (585)	0.00	0.00	0.00	0.00	0.00	0.29	34
Glaziers (589)	0.00	0.00	0.00	0.00	0.00	0.50	2
Roofers and slaters (595)	0.00	0.00	0.00	0.00	0.00	0.67	6
Drillers of earth (598)	0.00	0.00	0.00	0.00	0.00	0.87	15
Drillers of oil wells (614)	0.00	0.00	0.00	0.00	0.00	1.00	1
Explosives workers (615)	0.00	0.00	0.00	0.00	0.00	0.00	2
Miners (616)	0.00	0.00	0.00	0.00	0.00	1.00	1
Other mining occupations (617)	0.00	0.00	0.00	0.00	0.00	1.00	2
Production supervisors or foremen (628)	0.00	0.00	0.00	0.00	0.01	0.50	342
Tool and die makers and die setters (634)	0.00	0.00	0.00	0.00	0.00	0.18	28
Machinists (637)	0.00	0.00	0.00	0.00	0.00	0.25	194
Boilermakers (643)	0.00	0.00	0.00	0.00	0.00	0.80	5
Precision grinders and fitters (644)	0.00	0.00	0.00	0.00	0.00	0.33	3
Patternmakers and model makers (645)	0.00	0.00	0.00	0.19	0.00	0.65	48
Engravers (649)	0.00	0.00	0.00	0.00	0.00	0.00	2
Other metal and plastic workers (653)	0.00	0.00	0.00	0.00	0.00	1.00	3
Cabinetmakers and bench carpenters (657)	0.00	0.00	0.00	0.00	0.00	0.60	5
Furniture/wood finishers, other prec. wood workers (658)	0.00	0.00	0.00	0.00	0.00	0.50	2
Dressmakers, seamstresses, and tailors (666)	0.00	0.00	0.14	0.00	0.00	0.71	7
Upholsterers (668)	0.00	0.00	0.00	0.00	0.00	0.00	1
Hand molders and shapers, except jewelers (675)	0.00	0.00	0.00	0.00	0.00	0.33	9
Dental laboratory and medical appliance technicians (678)	0.00	0.00	0.00	0.00	0.00	1.00	1
Butchers and meat cutters (686)	0.00	0.00	0.00	0.00	0.00	0.67	6
Bakers (687)	0.00	0.00	0.00	0.00	0.00	0.60	25
Power plant operators (695)	0.00	0.00	0.00	0.00	0.00	0.00	9
Plant and system operators, stationary engineers (696)	0.00	0.00	0.00	0.00	0.01	0.41	80
Lathe, milling, and turning machine operatives (703)	0.00	0.00	0.00	0.00	0.00	0.25	40
Punching and stamping press operatives (706)	0.00	0.00	0.00	0.00	0.00	0.00	1
Rollers, roll hands, and finishers of meta (707)	0.00	0.00	0.00	0.00	0.00	0.29	17
Drilling and boring machine operators (708)	0.00	0.00	0.00	0.00	0.00	0.00	2
Grinding, abrading, buffing, and polishing workers (709)	0.00	0.00	0.00	0.00	0.00	0.48	31
Sawing machine operators and sawyers (727)	0.00	0.00	0.00	0.00	0.00	0.00	4
Printing machine operators, n.e.c. (734)	0.00	0.00	0.00	0.00	0.00	0.00	1
Typesetters and compositors (736)	0.00	0.00	0.00	0.00	0.00	0.33	3

Winding and twisting textile and apparel operatives (738)	0.00	0.00	0.00	0.00	0.00	0.50	6
Textile sewing machine operators (744)	0.00	0.00	0.00	0.00	0.00	0.00	2
Packers, fillers, and wrappers (754)	0.00	0.00	0.00	0.03	0.00	0.39	80
Furnance, kiln, and oven operators, apart from food (766)	0.00	0.00	0.00	0.00	0.00	0.00	1
Photographic process workers (774)	0.00	0.00	0.00	0.00	0.00	0.00	1
Machine operators, n.e.c. (779)	0.00	0.00	0.00	0.01	0.00	0.31	147
Welders, solderers, and metal cutters (783)	0.00	0.00	0.00	0.01	0.00	0.30	433
Painting and decoration occupations (789)	0.00	0.00	0.00	0.00	0.00	0.59	32
Production checkers, graders, and sorters in manufacturing (799)	0.00	0.00	0.00	0.02	0.00	0.57	307
Supervisors of motor vehicle transportation (803)	0.00	0.00	0.00	0.00	0.00	1.00	16
Truck, delivery, and tractor drivers (804)	0.00	0.00	0.02	0.04	0.00	0.55	3034
Bus drivers (808)	0.00	0.00	0.00	0.17	0.00	0.83	6
Taxi cab drivers and chauffeurs (809)	0.00	0.00	0.00	0.00	0.00	0.56	9
Locomotive operators: engineers and firemen (824)	0.00	0.00	0.00	0.00	0.00	0.38	8
Ship crews and marine engineers (829)	0.11	0.00	0.00	0.00	0.00	0.33	916
Miscellaneous transportation occupations (834)	0.00	0.00	0.00	0.00	0.00	1.00	1
Crane, derrick, winch, hoist, longshore operators (848)	0.00	0.00	0.00	0.00	0.00	0.38	13
Excavating and loading machine operators (853)	0.00	0.00	0.00	0.00	0.00	0.75	4
Stevedores and misc. material moving occupations (859)	0.00	0.00	0.00	0.00	0.00	0.50	2
Helpers, constructions (865)	0.00	0.00	0.00	0.00	0.00	0.80	5
Production helpers (873)	0.00	0.00	0.00	0.00	0.00	0.50	2
Machine feeders and offbearers (878)	0.00	0.00	0.00	0.00	0.00	0.00	1
Packers and packagers by hand (888)	0.00	0.00	0.06	0.00	0.00	0.24	17
Laborers, freight, stock, and material handlers, n.e.c. (889)	0.00	0.00	0.01	0.00	0.00	0.44	111

Notes: The table reports the fraction of job ads in a given occupation in which trait descriptive terms associated with negative trait pole in the column appear in Columns (1) to (5). Column (6) reports the fraction of ads in an occupation in which any trait descriptive terms appear, while Column (7) reports the number of job ads associated with each occupation. The occupation codes are listed in parentheses.

Appendix Table 6: Summary statistics for the NLSY97 samples

	Full sample (1)	2004 to 2008 (2)	2015 to 2019 (3)
Extraversion	0.04 (1.00)	0.03 (1.00)	0.04 (1.00)
Conscientiousness	0.01 (0.98)	0.01 (0.98)	0.01 (0.98)
Openness	0.03 (0.97)	0.03 (0.98)	0.03 (0.97)
Agreeableness	0.02 (0.99)	0.02 (0.99)	0.02 (0.99)
Emotional stability	0.03 (0.97)	0.03 (0.98)	0.04 (0.97)
Fraction of ads in occupation requiring extraversion	0.25 (0.11)	0.25 (0.11)	0.23 (0.10)
Fraction of ads in occupation requiring conscientiousness	0.22 (0.07)	0.22 (0.07)	0.22 (0.07)
Fraction of ads in occupation requiring openness	0.15 (0.09)	0.15 (0.09)	0.16 (0.09)
Fraction of ads in occupation requiring agreeableness	0.16 (0.09)	0.16 (0.09)	0.16 (0.10)
Fraction of ads in occupation requiring emotional stability	0.08 (0.04)	0.08 (0.04)	0.08 (0.04)
Years of education	13.32 (1.63)	13.24 (1.54)	13.86 (1.84)
Years of related experience	1.85 (1.35)	1.80 (1.29)	2.28 (1.51)
Years of classroom training	0.51 (0.44)	0.50 (0.43)	0.61 (0.48)
Years of on the job training	0.59 (0.49)	0.58 (0.49)	0.70 (0.52)
Communication	-0.27 (0.97)	-0.29 (0.94)	0.04 (0.98)
Interpersonal interaction	-0.28 (0.99)	-0.29 (0.98)	-0.02 (0.97)
Teamwork	-0.03 (0.88)	-0.04 (0.86)	0.12 (0.95)
Caring and service	-0.07 (0.95)	-0.08 (0.94)	0.09 (0.99)
Leadership and decision-making	-0.21 (0.91)	-0.24 (0.88)	0.07 (0.96)
Reasoning	-0.29 (0.96)	-0.32 (0.92)	0.04 (0.99)
Creative tasks	-0.27 (0.98)	-0.29 (0.96)	0.04 (0.97)

Attention-to-detail	-0.19 (1.03)	-0.20 (1.02)	0.01 (1.01)
Independent work	-0.18 (1.08)	-0.20 (1.08)	0.05 (0.99)
Routine tasks	0.00 (1.03)	0.00 (1.04)	-0.03 (0.97)
Mathematical tasks	-0.22 (0.93)	-0.23 (0.92)	-0.01 (0.97)
Executive, Administrative and Managerial Occupations	0.05	0.04	0.11
Business Operations and Financial Specialist Occupations	0.03	0.03	0.05
Mathematical and Computer Scientists	0.02	0.02	0.03
Engineers, Architects, Surveyors, Engineering & Related Technicians	0.01	0.01	0.01
Physical Scientists	0.00	0.00	0.00
Social Scientists and Related Workers	0.00	0.00	0.00
Life, Physical and Social Science Technicians	0.00	0.00	0.00
Counselors, Social and Religious Workers	0.02	0.02	0.02
Lawyers, Judges and Legal Support Workers	0.01	0.01	0.01
Teachers	0.04	0.04	0.05
Education, Training and Library Workers	0.01	0.01	0.01
Entertainers and Performers, Sports and Related Workers	0.02	0.02	0.01
Media and Communications Workers	0.01	0.01	0.01
Health Diagnosing and Treating Practitioners	0.02	0.01	0.04
Health Care Technical and Support Occupations	0.05	0.05	0.05
Protective Service Occupations	0.02	0.02	0.03
Food Preparation and Serving Related Occupations	0.10	0.10	0.05
Cleaning and Building Service Occupations	0.04	0.03	0.03
Entertainment Attendants and Related Workers	0.01	0.01	0.00
Personal Care and Service Workers	0.04	0.05	0.04
Sales and Related Workers	0.14	0.14	0.09
Office and Administrative Support Workers	0.16	0.16	0.14
Construction Trade and Extraction Workers	0.06	0.07	0.05
Installation, Maintenance and Repairs Workers	0.03	0.03	0.03
Production and Operating Workers	0.01	0.01	0.01
Food Preparation Occupations	0.00	0.00	0.00
Setters, Operators and Tenders	0.04	0.04	0.04
Transportation and Material Moving Workers	0.07	0.07	0.07
Number of person-year observations	88,913	29,067	15,759

Notes: Columns (1) through (3) report means for the NLSY97 samples. Standard deviations are given in parentheses. The sample in Column (1) includes all person-year observations after a respondent turned 18 for individuals who completed the personality items and whose occupation is observed at the time of the interview excluding those in farming, fishing, and forestry occupations. The samples in Columns (2) and (3) are further restricted to the person-year observations between 2004 and 2008 and between 2015 and 2019, respectively. The personality measures are standardized to have mean zero and standard deviation one within the sample of respondents completing the personality items. The education, experience, and training measures are at the four-digit occupation level and are merged to the NLSY97 from O*NET. The occupation variables indicate the proportion of person-year observations in each three-digit occupation.

Appendix Table 7: Big Five trait distributions by occupation in the NLSY97

Occupation	N	Extroversion		Conscientious		Openness		Agreeableness		Emotional stability	
		(1) \bar{X}	S.D.	(2) \bar{X}	S.D.	(3) \bar{X}	S.D.	(4) \bar{X}	S.D.	(5) \bar{X}	S.D.
Executive, Administrative & Managerial	626	0.22	(0.99)	0.05	(0.92)	0.03	(0.97)	0.00	(0.98)	0.15	(0.97)
Management Related	318	0.24	(0.99)	0.20	(0.86)	-0.08	(0.94)	0.10	(1.01)	0.22	(0.90)
Mathematical & Computer Scientists	153	-0.21	(1.01)	-0.07	(0.88)	0.05	(0.91)	-0.12	(1.01)	0.22	(0.84)
Engineers, Architects, Surveyors, & Related	78	0.19	(1.02)	-0.06	(0.97)	0.23	(0.76)	-0.22	(0.91)	0.28	(0.93)
Counselors, Social & Religious Workers	137	0.07	(1.00)	-0.04	(0.88)	-0.14	(1.01)	0.21	(0.90)	-0.09	(0.96)
Lawyers, Judges & Legal Support Workers	62	0.31	(1.01)	0.24	(0.91)	0.12	(0.75)	0.08	(0.87)	0.14	(0.80)
Teachers	336	0.13	(1.00)	0.09	(0.94)	0.02	(0.93)	0.19	(0.99)	0.16	(0.94)
Entertainers, Performers, Sports & Related	87	0.20	(1.06)	0.06	(1.03)	0.41	(0.80)	0.14	(0.97)	0.11	(1.08)
Media & Communications Workers	70	0.11	(1.18)	-0.20	(1.00)	0.22	(0.93)	0.23	(1.10)	-0.03	(0.96)
Health Diagnosing and Treating Practitioners	219	0.09	(0.97)	0.18	(0.97)	0.03	(0.88)	0.43	(0.97)	0.13	(0.92)
Health Care Technical & Support	351	0.10	(0.94)	0.10	(0.97)	-0.02	(1.04)	0.11	(0.95)	-0.10	(0.98)
Protective Service	175	-0.00	(0.86)	0.05	(0.88)	-0.14	(1.05)	-0.04	(0.91)	0.19	(0.85)
Food Preparation and Serving Related	363	-0.03	(1.04)	-0.15	(1.10)	0.17	(0.98)	0.06	(1.02)	-0.16	(1.05)
Cleaning & Building Service	220	-0.26	(1.02)	0.04	(1.10)	-0.14	(1.18)	-0.07	(1.04)	-0.20	(1.07)
Personal Care & Service Workers	220	0.05	(1.08)	0.07	(0.99)	0.09	(1.04)	0.12	(1.06)	0.01	(0.97)
Sales & Related Workers	589	0.18	(0.93)	-0.05	(1.01)	0.13	(0.92)	-0.01	(0.97)	0.11	(0.96)
Office & Administrative Support Workers	902	-0.03	(0.97)	0.05	(0.94)	-0.05	(0.94)	0.05	(0.94)	-0.04	(0.97)
Construction Trade & Extraction Workers	350	-0.10	(0.98)	-0.12	(1.00)	-0.00	(1.06)	-0.19	(0.87)	0.03	(1.00)
Installation, Maintenance & Repair Workers	224	-0.15	(0.89)	-0.19	(0.90)	-0.03	(0.97)	-0.11	(1.04)	0.21	(0.93)
Production & Operating Workers	97	-0.30	(0.88)	-0.01	(1.04)	0.04	(0.95)	-0.34	(0.87)	-0.16	(0.90)
Setters, Operators and Tenders	236	-0.15	(0.94)	-0.00	(0.99)	-0.01	(0.97)	-0.05	(0.96)	-0.02	(0.90)
Transportation & Material Moving Workers	418	-0.11	(0.94)	-0.04	(1.01)	-0.09	(0.99)	-0.24	(0.96)	0.02	(1.00)

Notes: The table reports the mean and standard deviation for each Big 5 personality trait for workers in broad occupational categories for occupations in which more than 50 respondents were observed using one observation per respondent between the ages of 32 and 34 (N=6,419) for individuals who were employed and not serving in the military.

Appendix Table 8: Performance pay models in the NLSY97

	(1)	(2)	(3)	(4)
Extroversion	0.025*** (0.003)	0.020*** (0.003)	0.009*** (0.002)	0.009*** (0.002)
Conscientiousness	-0.009*** (0.003)	-0.009*** (0.003)	-0.004* (0.002)	-0.003 (0.003)
Openness	0.006** (0.003)	0.009*** (0.003)	0.005** (0.002)	0.005** (0.003)
Agreeableness	-0.005* (0.003)	-0.004 (0.003)	-0.002 (0.002)	-0.004 (0.003)
Emotional stability	0.008*** (0.003)	0.003 (0.003)	0.003 (0.002)	0.003 (0.003)
<u>Controls:</u>				
Human capital & demographics		X	X	X
Occupation			X	X
AFQT				X

Notes: The table reports marginal effects of NLSY97 respondents' personality traits from Probit regressions. The dependent variable is an indicator for whether an NLSY97 respondent reported being paid for performance through either tips, commissions, bonuses, or incentive pay when interviewed. The sample in Columns (1) to (3) includes 81,722 person-year observations after a respondent turned 18 for individuals who completed the personality items and whose occupation is observed at the time of the interview excluding those in farming, fishing, and forestry occupations with non-missing values for the human capital (highest grade completed indicators, and quartics in experience and tenure with the employer) and demographic (race, gender, marital status, region of residence, urban residence) controls. The sample in Column (4) is further restricted to the 67,372 person-year observations with non-missing values for the percentile score on the Armed Forces Qualification Test (AFQT). The fraction of person-year observations being paid for performance in Columns (1) to (3) is 0.22.

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