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# The Big Five Personality Traits and Earnings: A Meta-Analysis

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## Abstract

The past two decades have witnessed an increasing interest in the relationship between personality and labor market outcomes, as well as the emergence of the Five-Factor Model as the reference framework for the study of personality. In this paper, we provide the first meta-analytical review of the empirical literature on the association between personal earnings and the Big Five personality traits. The analysis combines the results of 65 peer-reviewed articles published between 2001-2020, from which we retrieved 936 partial effect sizes. Overall, the primary literature provides robust support for a positive association between personal earnings and the traits of Openness, Conscientiousness, and Extraversion, while simultaneously revealing a negative and significant association between earnings and the traits of Agreeableness and Neuroticism. We find no evidence of a substantial publication bias. Meta-regression estimates suggest that Openness and Conscientiousness are positively associated with earnings even when primary researchers control for individual cognitive abilities and educational attainments. Similarly, the studies that includes labor market control variables exhibit weaker associations between earnings and Extraversion and Agreeableness. The results of the primary studies seem unaffected by the time at which the Big Five are measured, as well as by the scale and number of inventory items. Meta-regression estimates suggest that the results of the primary literature are not stable across cultures and gender, and that the ranking and academic field of the journal matter.

*JEL codes:* J24; D91.

*Keywords:* Big Five personality traits, earnings, meta-analysis.

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# 1 Introduction

Since the seminal contributions of Bowles et al. (2001a;b), the notion that personality traits can be used to explain individual labor market success has been progressively accepted within economics. In particular, Bowles and colleagues showed that the existing models of human capital can be meaningfully augmented with the inclusion of variables associated to personality – or behavioral – traits. For them, these traits would likely influence personal earnings by affecting workers’ incentive structures. The hypothesis that the labor market remunerates not only cognitive skills, but also individuals’ non-cognitive abilities, subsequently found empirical support from studies based on experimental settings using real effort tasks, as well as from large survey data analyses indicating that personality is an individual characteristic that predicts workers’ earnings and productivity (Nyhus and Pons, 2005; Hanes and Norlin, 2011; Fletcher, 2013; Carpenter, 2016; Cubel et al., 2016).

At a similar time, the notion that a five-factor structure could account for substantive co-variations in personality descriptions was gaining increasing support among personality psychologists. This led to the emergence of the Five-Factor model (FFM) as the reference framework for the study of personality. This model describes personality structure based on five orthogonal dimensions (i.e., the ‘Big Five’ traits), which has been shown to be highly stable across different cultures and languages (Allik and McCrae, 2002). These five personality traits were first identified using factor analysis techniques, and nowadays there is widespread consensus on their taxonomy. The following is a brief but detailed description of the Big Five: *(i)* Openness (sometimes referred to as Mental Openness, Openness to Experiences or Intellect) is associated with the attitude of being imaginative, creative, curious, and unconventional; *(ii)* Conscientiousness is associated with the attitude of being systematic, goal-oriented, and self-disciplined; *(iii)* Extraversion is associated with the attitude of being active and forthcoming, and desiring social relationships; *(iv)* Agreeableness is associated with the attitude of being friendly, warm, and sensitive toward others; and *(v)* Neuroticism (sometimes coded on a reversed scale and labeled as Emotional Stability) is associated with the attitude of worrying, nervousness, and emotional instability. The Big Five are typically measured using self-reported inventories that (initially) consisted of 60 items (Costa and McCrae, 1989). With the onset of large multi-purpose household surveys incorporating personality traits inventories, there has been a need to reduce the number of items, with most modern surveys relying on smaller questionnaires.

Consequently, the growing empirical literature that investigates the relationship between personality and labor market outcomes has been increasingly adopting the FFM

framework. Considering the above-mentioned taxonomy, it is a common assumption that individuals scoring high in Neuroticism are likely to report lower earnings because of their lower levels of self-confidence and/or their difficulties with remaining focused on specific tasks. Conversely, one would expect that high level of Conscientiousness (associated with efficiency, organization, ambition, and self-discipline) would likely lead to a positive association with labor market outcomes. The signs of the association between earnings and Openness, Agreeableness, and Extraversion are less straightforward. On the one hand, this is due to each trait being potentially helpful in some occupations, but detrimental for others. For example, individuals who score high in Openness are typically imaginative, artistic, curious, creative, and intellectually-oriented. While these features could well be helpful in several occupations, they might be a hindrance in occupations that penalize autonomy and non-conformity. Similarly, the attitude of desiring social relationships (or, Extraversion) may be crucial in some occupations but a limitation in others. On the other hand, different occupations pay different wages and, if personality plays a role in the selection of workers into different jobs, the association between personality and earnings is mediated by the sector of employment. For example, Agreeableness – associated with friendliness, warmth, and sensitivity – may select individuals into caring activities, which tend to pay lower-than-average wages.

This paper is the first quantitative review of the literature on personality and earnings. Based on meta-analysis and meta-regression techniques, our study deepens the understanding of the interplay between the Big Five personality traits and personal earnings, with the aim of informing the debate on a number of meaningful issues that are still in need of further exploration. Indeed, despite the consensus that personality plays a role in labor market dynamics, there is still a certain degree of disagreement on how, and to what extent, the Big Five contribute to explaining personal earnings. With the caveat in mind that only primary studies may address specific research questions, meta-analytical techniques allow us to quantitatively synthesize the results of the literature, as well as to investigate the heterogeneity of primary studies.

Our work furthers the understanding of several open issues. The first is the interplay between education and personality in the labor market. Indeed, personality can directly affect earnings while also indirectly affecting education, which is itself a strong predictor of personal income. While in the seminal model of Bowles et al. (2001b) personality directly affects individual productivity, there is a large body of evidence – well-known among psychologists – that personality predicts educational outcomes (Poropat, 2009; Duckworth et al., 2007) and, consequently, earnings. Additionally, personality can indirectly affect earnings by affecting career preferences while in education. The open issue is, therefore, whether there are personality traits (positively or negatively) associated

with earnings even when schooling is included among the control variables in the primary study. Similarly, one may test if the inclusion of a measure of cognitive abilities among the control variables of the primary studies changes the final results. If this test fails, one may suggest that personality is associated with earnings beyond the role played (directly or indirectly) by cognitive abilities.

A second open issue is whether there are labor market sectors that promote individuals with given personality traits, and/or if there are sectors where specific traits are hinderances to economic success. As mentioned above, answering this question requires us to consider both the plausible selection of workers into employment sectors that favor certain skills, and how wages change by sector. As stated previously, meta-regression can inform this topic by testing if the inclusion of the labor market as a control variable in the primary study changes the signs, or statistical significance, of the effect sizes associated with each trait.

Third, a systematic quantitative review is useful for testing the stability of the emerging association between personality traits and earnings across cultures and gender (e.g. Roberts et al., 2007; Mueller and Plug, 2006).

Fourth, meta-regression can test whether differences in how the Big Five are measured contribute to explaining the differences in the primary studies. In particular, we test whether the number of items, the scale adopted for the answer, and the time in which personality was assessed are significant predictors of the results within the primary literature. From the perspective of the economic literature, the latter aspect is particularly interesting because, if the time of the measurement of the personality traits does not help predict the primary literature's results, one may exclude that careers change – by reinforcing or undermining – some facets of personality.

Finally, meta-analytical techniques allow us to look for the presence of publication bias and to test whether the results of primary studies are correlated with the scientific reputation and the academic field of the publishing journals.

The remainder of the paper is structured as follows. Section 2 describes the selection procedure of primary studies. Section 3 illustrates our methodology for providing a quantitative synthesis of the selected literature. Section 4 presents and discusses the results of the meta-analysis and meta-regressions. Section 5 presents robustness checks and Section 6 provides our conclusions.

## 2 Selection procedure

### 2.1 Search strategy and inclusion criteria

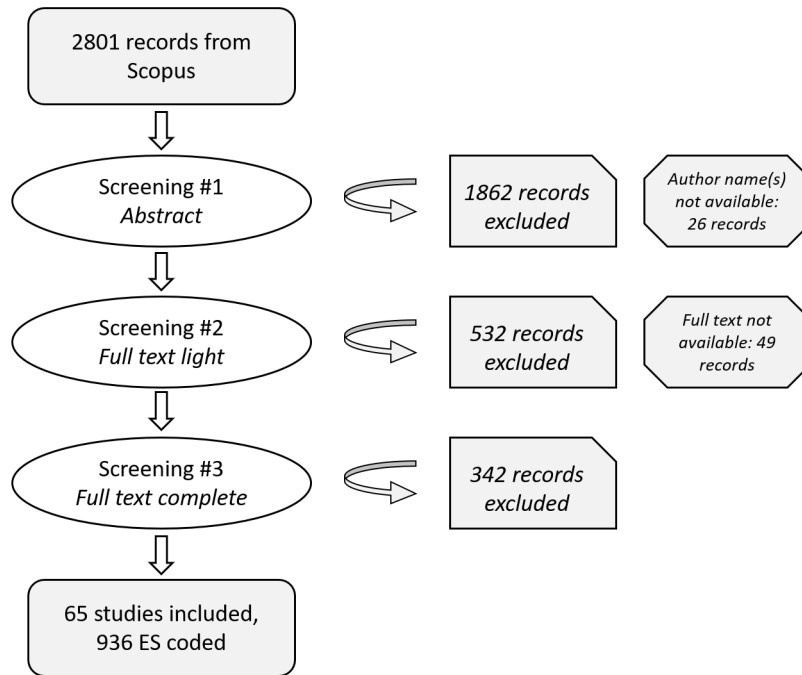
Our analysis includes all papers that empirically investigate the relationship between personal earnings and the Big Five personality traits, published before 2021 on scientific journals (in the field of economics, psychology, business studies, and social sciences), and that are indexed on the Scopus database ([www.scopus.com](http://www.scopus.com)). Scopus is the largest abstract and citation database of peer-reviewed literature, with over 60 million records which cover published articles, books, book chapters, and reviewed conference proceedings since 1970. We identified the eligible papers according to the following criteria: (1) we only considered articles written in the English language; (2) we included papers published before 2021; (3) we included studies belonging to the Scopus Subject Area of ‘Business, Management and Accounting’ (BUSI), ‘Economics, Econometrics and Finance’ (ECON), ‘Psychology’ (PSYC) or ‘Social Sciences’ (SOCI); and (4) we included those studies that contain – either in the title, abstract, or in the keywords – words or expressions related to earnings together with those related to personality or intelligence. Specifically, a paper satisfies this criterion when at least one word or expression from Lists 1 and 2 appear either in the title, abstract, or keywords. Words included in List 1 are: ‘Big Five’, ‘personality’, ‘Extroversion/Extraversion’, ‘Conscientiousness’, ‘Agreeableness’, ‘Neuroticism/Emotional Stability’, ‘Openness to experience/Mental Openness’ and ‘Intelligence/IQ.’ List 2 includes: ‘earnings’, ‘income’, ‘salary’ and every word beginning with ‘wage’. Lastly, in order to exclude clinical studies, we ruled out studies containing – either in the title, abstract, or keywords – words or expressions relating to a medical condition. In particular, we excluded all papers containing any words beginning with ‘patholog’ and ‘morbidity’. These criteria led us to 2,801 potentially eligible documents.<sup>1</sup>

As illustrated in Figure 1, we subsequently followed three steps. First, during a careful examination of each paper’s title, abstract, and keywords, we performed a preliminary screening designed to exclude any studies manifestly unrelated to the effect of personality traits on personal earnings, as well as those entries for which the authors’ names were unavailable. In so doing, we excluded 1,862 documents. Second, we downloaded the remaining 939 papers and performed a ‘light’ screening based on the full text of the article. By quickly examining the introduction, conclusions, and tables, we were able to

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<sup>1</sup>The full query used for searching the Scopus database is: title-abs-key (('Big Five' or personality or Extroversion or Extraversion or Conscientiousness or Agreeableness or Neuroticism or Openness to experience or Mental Openness or Intelligence or IQ) and (Earnings or Income or Wage\* or Salary), and not (Patholog\* or Morbidit\*)) and (limit-to (subjarea, 'SOC') or limit-to (subjarea, 'BUSI') or limit-to (subjarea, 'ECON') or limit-to (subjarea, 'PSYC')) and (exclude (pubyear, 2021)). The query was launched on January 18th, 2021 and it was not case sensitive.

**Figure 1:** Selection procedure



*Notes.* The flow diagram illustrates the procedure followed by the Authors to identify the primary sample.

assess each article’s relevance to this meta-analysis. This led us to further exclude 532 entries (49 of which because we were unable to retrieve the full text). We were finally left with 407 potentially eligible documents that we read and thoroughly examined during the third and final screening. The third screening stage was performed along with the coding process, meaning that the studies that met the inclusion criteria were coded concurrently. The third screening round allowed us to include 65 studies published in 46 peer-reviewed journals before 2021, that form our final meta-analytical sample (the full list of the included studies is available in Table A1 in the Appendix). While the first paper dates back to 2001, the majority have been published more recently (Figure 2). With five articles included, the *Journal of Vocational Behavior* was the most represented outlet, followed by the *Journal of Economic Psychology*, *Labour Economics*, and *Oxford Economic Papers*, each of which published three relevant papers. Relatively speaking, the studies included in the analysis are fairly distributed among journals classified in the Scopus Subject Area as PSYC, BUSI+ECON, or SOCI (Figure 3).

During the selection and coding process, we randomly allocated the documents among the three authors, allowing for a partial overlapping in order to check the consistency of the selection and coding choices. We cross-checked approximately 30% of the papers and found no major inconsistencies. For example, there was a full overlap in terms of the selection/exclusion of the documents. Minor inconsistencies, such as those regarding the

count of the control variables included in the empirical models, were sufficiently rare and negligible in terms of their impact on the final estimates.

Since we were unable to anticipate all the issues faced during the coding procedure, we adopted a set of additional rules in the third and final step – described in the following – that were, in part, the result of an iterative process. Despite the inevitable element of subjectivity within these rules, we believe they ensure a reasonable balance between the purpose of being comprehensive (i.e., covering the largest amount of relevant primary literature) and the need to guarantee a reasonable degree of homogeneity among the selected contributions. Specifically, we included only the papers in which the dependent variable was a direct measure of the level of personal income. Hence, we excluded all studies in which the dependent variable was related to workers’ subjective status, the prestige of the role, career advancements, or to total household income. We also excluded studies where the dependent variable was measured in terms of income growth, since this seemed more closely related to career progression than to the level of earnings. However, we kept those in which the dependent variable was life-cycle income. Moreover, we selected only those studies in which income/earnings were measured by a continuous variable (e.g., US dollars) or by means of a discrete income scale (e.g., seven income classes). We excluded the studies in which personality was not measured by the Big Five. This means that we did not include investigations into the effect of the locus of control construct on earnings, and – differently from such seminal meta-analytic studies as Barrick and Mount (1991) and Tett et al. (1991) – we did not try to map other personality measures into the Big Five.

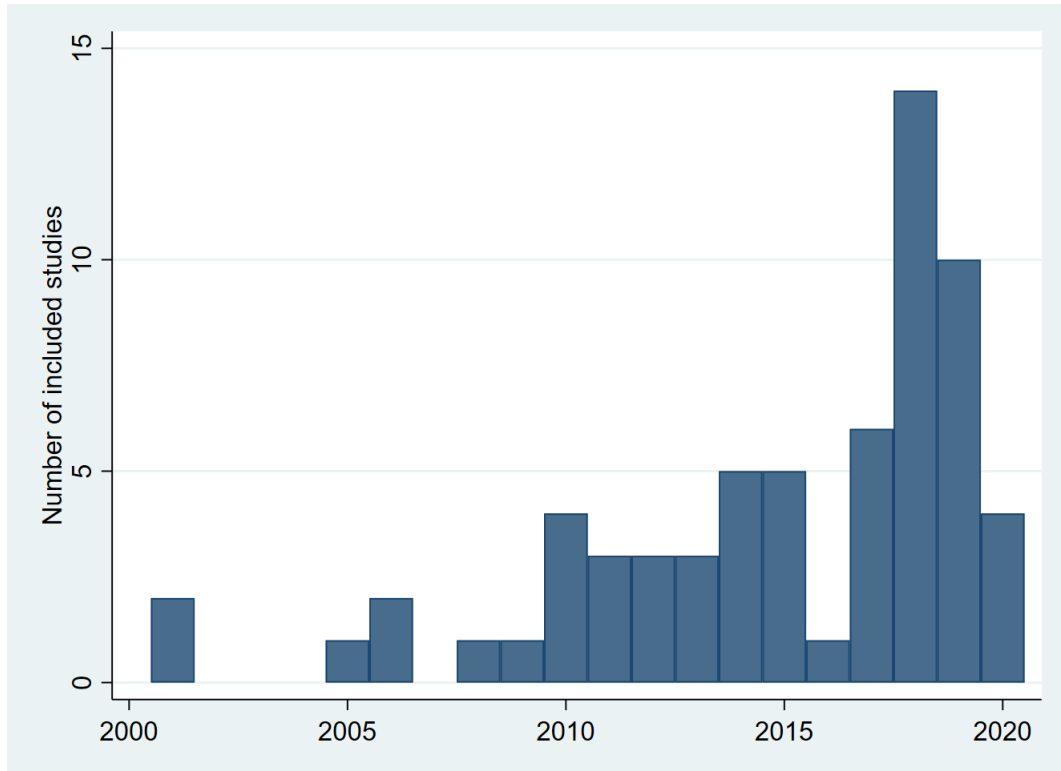
We finally coded a total of 936 effect sizes. In particular, we coded 183 effect sizes for Openness, 187 for Conscientiousness, 194 for Extraversion, 184 for Agreeableness, and 188 for Neuroticism.

## 2.2 Recurring challenges in the coding process

The coding process presented a number of challenges. While most were study-specific, we found the following to be recurring.

**Missing information in primary studies.** In some cases, the information required to retrieve effect sizes were only partially reported. For instance, approximately a dozen studies only indicated whether the estimated coefficients were significant at conventional confidence levels, without including standard errors or t-statistics. In these cases, we attempted to contact the authors. In the few occasions in which we were unanswered, we coded the effect sizes using standard critical values, i.e., imputing t-statistics equal to  $\pm 1.65$ ,  $\pm 1.96$ ,  $\pm 2.58$  for the coefficients reported to be significant at the 10, 5, and 1

**Figure 2:** Included studies by year of publication

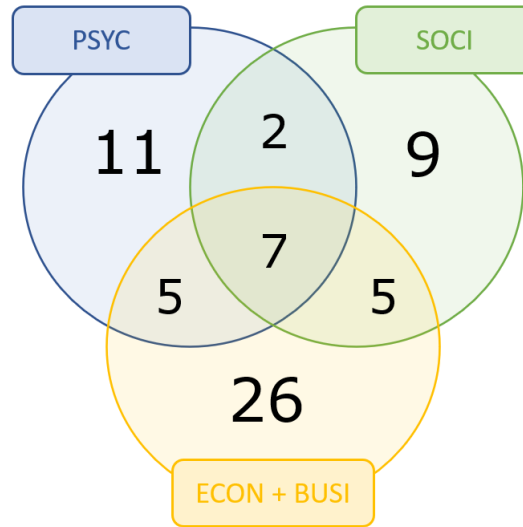


percent confidence levels. When no information of this kind was provided, and the result was known to be not significant, we assumed the p-value to be equal to 0.5 and derived the error estimates accordingly.

**Choice of the reference model.** A large portion of primary studies estimate different models on the same sample. In such cases, we coded all the available effect sizes while also identifying a ‘reference model’. When possible, we selected what seemed to be the authors’ preferred model. When the author’s preference was unclear, we choose the model that included the largest number of control variables. As we will discuss later, the ‘reference model’ has been used for our main analysis, and one of the robustness checks used all the coded effect sizes.

**Non-overlapping samples.** In some studies, different models were estimated on different non-overlapping samples (e.g., two different surveys, or one sample for men and one for women). In such cases, we coded multiple effect-sizes, considering different estimates as belonging to different studies.

**Figure 3:** Included studies by journal area



*Notes.* The diagram illustrates the distribution of the included studies according to the Scopus Subject Area of the journal, namely ‘Business, Management and Accounting’ (BUSI), ‘Economics, Econometrics and Finance’ (ECON), ‘Psychology’ (PSYC) and ‘Social Sciences’ (SOCI).

### 3 Methodology

#### 3.1 Meta Analysis

We relied on random effect meta-analytical models for summarizing the results within the literature. Modelling the ‘true effect’ as a random variable relaxes the assumption that each estimate measures a same effect and allows out-of-sample inferences regarding the primary literature. random effect models account for within-study sampling errors (estimated by the standard errors reported in primary studies) and for the heterogeneity of the effect estimates among studies (Borenstein et al., 2010; Stanley and Doucouliagos, 2012). We also estimated fixed effect models for the robustness checks.

We employed Pearson’s  $r$  partial correlation coefficient to compare the results of the primary literature. This effect-size index has a straightforward interpretation, and its use allowed us to focus on the correlation between the focal predictors (i.e., the Big Five personality traits) and the dependent variable (i.e., one of the above-described measures of personal earnings) while controlling for all the confounding factors that have been deemed relevant by the authors of the primary studies (Keef and Roberts, 2004; Aloe and Thompson, 2013; Aloe, 2014). In terms of practicality, an advantage of Pearson’s  $r$  partial correlation is that all the information required for its computation (as well as for the associated standard errors) is likely to be reported by most of the primary studies.

For instance, consider the following multivariate empirical model:

$$y = \beta_0 + \beta_1 x_1 + \dots + \beta_i x_i + \dots + \beta_k x_k + \varepsilon \quad (1)$$

the partial correlation coefficient between  $y$  and a generic predictor  $x_i$  can be easily calculated as:

$$r_{pc}(y, x_i) = \frac{t_{x_i}}{\sqrt{(t_{x_i})^2 + df}} \quad (2)$$

where  $t_{x_i}$  indicates the t-statistic for the significance of the predictor  $x_i$  and  $df$  stands for the degrees of freedom of the residuals. Similarly, standard errors can be computed with the formula:

$$SE(r_{pc}(y, x_i)) = \sqrt{\frac{1 - (r_{pc}(y, x_i))^2}{df}} \quad (3)$$

Section 5 shows estimates with a different effect size index.

### 3.2 Meta-regression

The second step of the analysis involved employing meta-regression techniques to investigate the sources of the heterogeneity observed in the results of the primary literature. In particular, we used four groups of moderators that we selected while taking into account the aforementioned open issues (see Section 1).

The first group of moderators related to individual features and observable characteristics that may (or may not) have been included as control variables in primary studies, thereby possibly affecting the findings. In particular, we identified three potentially relevant moderators. The first was a dummy variable equal to one if the primary study contained control variables associated with individual cognitive abilities, such as, a certain measure of intelligence. In fact, cognitive abilities are both a powerful predictor of labor market outcomes and are known to be associated with trait Openness. Therefore, we expected that the effect sizes retrieved from studies that exclude cognitive abilities among the control variables would systematically differ from those which included them – at least in the estimation of Openness. The second was a dummy variable indicating whether the empirical model of the primary study included individual-level labor market controls, such as the employment sector, experience level, or occupation. In fact, all of these variables are associated with expected earnings, but can also be related to workers' personality. Personality may influence how people choose professions (which, of course, have different rates of remuneration). For example, individuals who score highly in Ex-

traversion tend to select professions that offer more opportunities for establishing contact with other people. If these professions are relatively well-paid, we would expect that the effect sizes retrieved from studies that do not include employment sector as a control variable would differ systematically from those which do. Similarly, we may expect that those who score highly in Neuroticism may experience longer unemployment spells than their emotionally stable counterparts who display similar observable characteristics. Therefore, we would expect that the inclusion of occupation among the control variables would influence the effect sizes. We defined a dummy variable as a third moderator which is equal to one for effect sizes estimated using models that included control variables associated to the workers' educational achievements. It is worth noting that education level can predict earnings while simultaneously being correlated to personality. In particular, high scores in Mental Openness tend to signal higher-than-average levels of intelligence, which often translates into above-average educational achievements. Similarly, people who score highly in Conscientiousness will not only work more diligently, but also tend to be more scrupulous students, which often translates into more impressive educational achievements.

The second group of moderators considered between-study differences associated to how and when the personality traits were measured. In particular, in order to test whether the results of the literature were influenced by the methodology adopted to assess personality, we included a variable indicating the number of inventory items used to measure each trait (typically 3 or 4, but potentially as many as 12) and a variable indicating the scale of the inventory, namely the number of answers among which the respondent could choose (usually 4, 5, or 7). Moreover, so as to determine whether the time in which the personality traits were measured impacted the expected results, we also included a dichotomous variable that signals whether the measurement of traits precedes that of earnings.

The third group of moderators was associated with the characteristics of the samples used in the primary literature. In fact, scoring highly in a given trait may be associated with behaviors that have different connotations – and, therefore, different consequences on earnings – across cultures. Moreover, within any given cultural context, the same behavior can only be considered appropriate if the acting subject has certain attributes, such as a given seniority, gender, or profession. Through trying to partially reconcile the seemingly conflicting results within the literature based on differences of the sample employed in the primary analyses, meta-regression can test whether the findings of the primary literature are consistent with the presence of heterogeneous effects of personality traits on earnings. To do so, assuming that a shared language is a proxy for cultural proximity, we used a dummy to identify the effect sizes estimated on Anglophone samples

(in our study, this related to Australia, the United Kingdom and the United States). Moreover, in order to test if the literature’s results change according to the gender of the primary sample population, we defined a further two dummy variables indicating whether the sample consisted of exclusively females or males. While it may have been preferable to use a continuous variable indicating the percentage of men (or women) in the sample, this information was often unavailable. Nevertheless, since a fair share of effect sizes are estimated from samples of individuals of the same sex, we exploited this feature to study the gender influence on the relationship between personality and earnings.

The last group of moderators was associated with the academic field and the ranking of the journal of publication. Scholars from different disciplines are likely to share different sensibilities in terms of research questions and methodological preferences, meaning that these two aspects could well lead to different results. For example, psychology researcher may be more thorough when measuring cognitive and non-cognitive abilities, whereas economists would likely be more concerned on endogeneity and sample sizes. To account for these potential differences, we defined four dummy variables indicating the Scopus field to which the journal in question belongs: Psychology, Economics, Business & Management, or Social sciences.<sup>2</sup> Beside the outlet’s academic field, articles published on leading journals are more likely to have undergone a scrupulous review process, meaning that they would have had to comply with higher academic standards. Consequently, we defined a dummy variable that identified the articles published in journals that, in the year of their publication, belonged to the first Scimago Journal Ranking’s quartile.<sup>3</sup>

The main results were estimated using only a portion of the coded effect sizes, namely those retrieved from the aforementioned reference models (cf. Section 2.2). While we acknowledge that this choice introduces a degree of discretion, we believe that it was necessary for avoiding an uneven weighting of the primary studies. Indeed, in the light of the substantial between-study variability in the number of coded effect sizes, as well as the limited within-study variability in the values of meta-regressors, the inclusion of all the available effect sizes would have disproportionally increased the weight of the studies that tested several empirical models – especially when using large samples –, without (in term of meta-regression) significantly improving the explanatory power of the moderators. As stated earlier, the estimates obtained using all the effect sizes are reported among the robustness checks in Section 5.

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<sup>2</sup>Since one journal can belong to multiple Scopus categories (see Figure 3), there is no reference group.

<sup>3</sup>More precisely, in order to fall into this category, an article must have been published in a journal that belonged to the first quartile of each of the sub-fields assigned to the journal by Scopus in its year of publication.

## 4 Results

### 4.1 An overview of the included literature

To provide an overview of the included literature, we group the results of the primary studies according to the sign and level of significance of the partial correlation between each of the Big Five and personal earnings. As shown in Table 1, the relative frequencies appear to be substantially skewed, except for trait Openness. In particular, the correlations for Conscientiousness and Extraversion are skewed toward positive values, while the opposite is true for Agreeableness and Neuroticism. Nevertheless, from this simple vote-counting procedure, one may conclude that – according to the literature – there is no significant correlation between the Big Five and personal earnings. Indeed, regardless of the personality trait considered, the majority of the primary literature finds that the correlation between traits and earnings is not statistically significant at conventional confidence levels.

**Table 1:** Personal earnings and the Big Five: Vote counting

	Openness	Conscientiousness	Extraversion	Agreeableness	Neuroticism
Negative, significant ( $p < 1\%$ )	10.2%	1.1%	1.1%	28.4%	26.9%
Negative, significant ( $1\% < p < 5\%$ )	2.3%	2.2%	2.2%	14.8%	8.6%
Negative, not significant ( $p > 5\%$ )	30.7%	23.9%	23.3%	33.0%	35.5%
Positive, not significant ( $p > 5\%$ )	33.0%	40.2%	50.0%	19.3%	26.9%
Positive, significant ( $5\% < p < 1\%$ )	3.4%	8.7%	6.7%	2.3%	1.1%
Positive, significant ( $p < 1\%$ )	20.5%	23.9%	16.7%	2.3%	1.1%
N	88	92	90	88	93

*Notes.* The table reports the sign and level of statistical significance of the effect sizes taken from the reference models of the primary literature (cf. Section 2.2).

### 4.2 Meta-analytical results

Table 2 shows the random effect meta-analysis estimates. Differently from what can be found through conducting a simple vote-counting exercise, the literature provides overall evidence supporting a significant association between personal earnings and each of the Big Five personality traits. In particular, the association seems to be both positive and statistically significant for Openness, Conscientiousness, and Extraversion, while negative and statistically significant for Agreeableness and Neuroticism.

The meta-analytical estimates indicate the true effect size is characterized by a high level of variance. Actually, the estimated standard deviation of the true effect size,  $\tau$ , is always larger than the effect size itself, which seems to justify the adoption of the random effect framework. At the same time, ranging from 82.16% in the case of Conscientiousness to 94.91% for Openness, the  $I^2$  index signals the presence of high levels of heterogeneity

among the primary studies’ results. These levels of heterogeneity are common in meta-analyses within social sciences (Tong and Guo, 2019), where the majority of empirical results are obtained from observational studies in which primary researchers have large margins of discretion in trying to make the best of the available data.

The meta-analytical setting allows us to appreciate how the literature’s results have changed over time. On the one hand, Figure 4 shows that some of the most recent studies exhibit a substantially larger statistical power than those published further in the past. This is consistent with the increasing popularity of the FFM of personality, that led to the inclusion of short Big Five’s inventories in a few national surveys (e.g., GSOEP, BHPS and HILDA), which tend to employ large and nationally representative samples, thereby allowing for more precise estimates. Conversely, the first studies were often based on smaller original data-sets directly collected by the primary researchers. However, the weighted linear trend indicates that more recent studies found smaller effect sizes (in certain) cases closer to zero. This trend emerges particularly for Openness and Neuroticism, while results tend to be more stable over time for the other traits.

Finally, our analysis suggests that the included literature is only mildly affected by publication bias. A visual inspection of the funnel plots of Figure 5 suggests that no relevant publication bias affects the meta-sample. Indeed, the funnel plots appear relatively symmetrical, and there is little evidence of any substantial truncation. Following the trim-and-fill method (Duval and Tweedie, 2000a;b), we also augmented the plots by imputing the effect sizes of studies which may have been missing due to publication bias. This method suggests the presence of a mild publication bias for Conscientiousness, Extraversion, and Neuroticism. The difference between the original and the corrected estimates<sup>4</sup>, however, turns out to be negligible. The presence of mild-to-negligible levels of publication bias is also consistent with the results of the Egger test, whose p-values are reported in Table 2. In particular, it hints at the presence of publication bias for Extraversion, Agreeableness, and Neuroticism. The test, however, never rejects the null ( $H_0$  = no publication bias) at the 1% confidence level.

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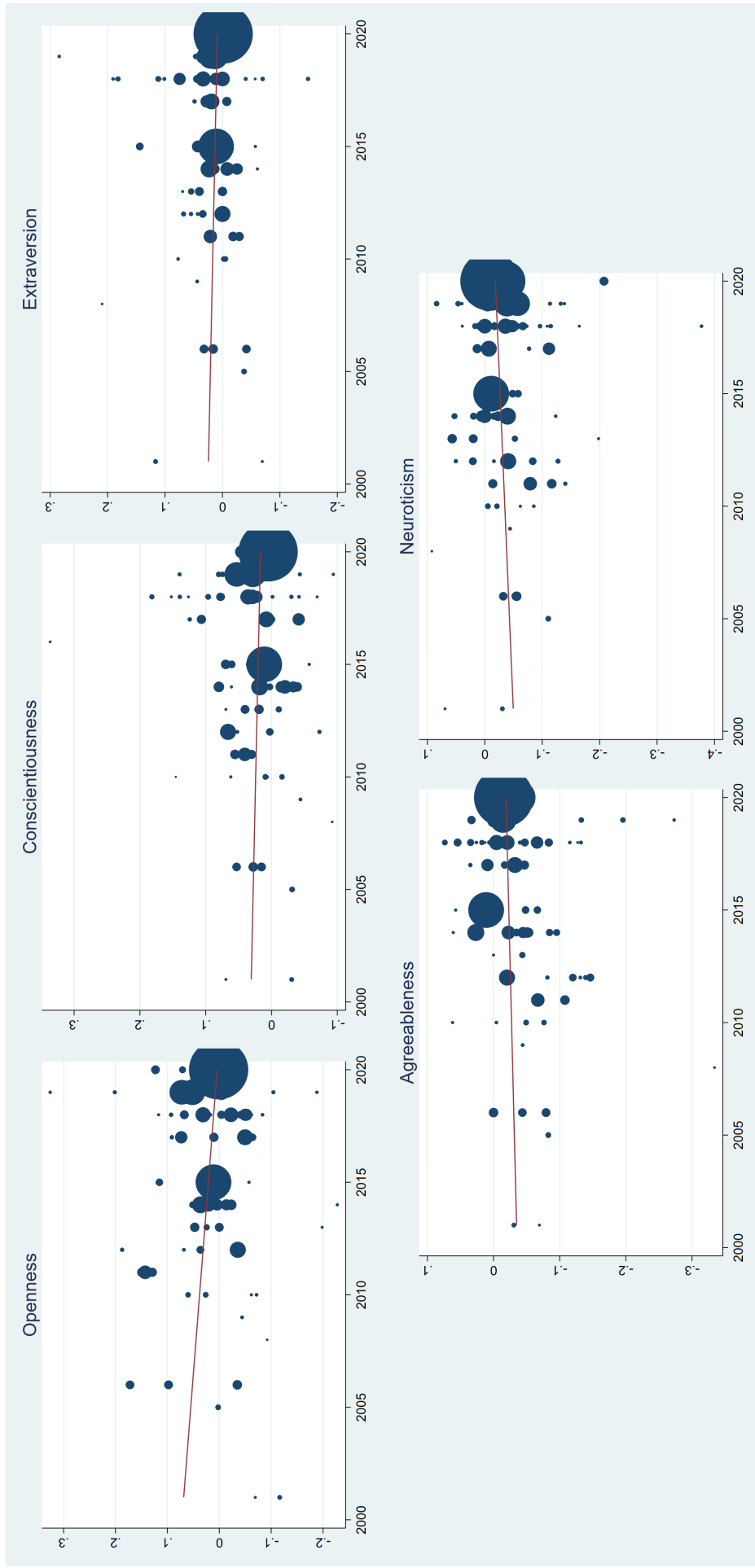
<sup>4</sup>The corrected estimates are computed using both the observed and the imputed effect sizes. While the estimates are reported in the last line of Table 2

**Table 2:** Personal earnings and the Big Five - Random effect meta-analysis

	(1)	(2)	(3)	(4)	(5)
	Openness	Conscientiousness	Extraversion	Agreeableness	Neuroticism
$\hat{\theta}_{REML}$	0.0174** (0.0071)	0.0258*** (0.0042)	0.0209*** (0.0042)	-0.0359*** (0.0052)	-0.0324*** (0.0053)
N	88	92	90	88	93
$\tau^2$	0.003216	0.000826	0.000826	0.001430	0.001615
$I^2(\%)$	94.91	82.16	82.81	89.22	89.96
Egger test ( $p$ )	0.1697	0.2028	0.0468	0.0213	0.0479
$\hat{\theta}_{REML}$ (Trim-and-Fill)	.	0.0247***	0.0193***	.	-0.0330***

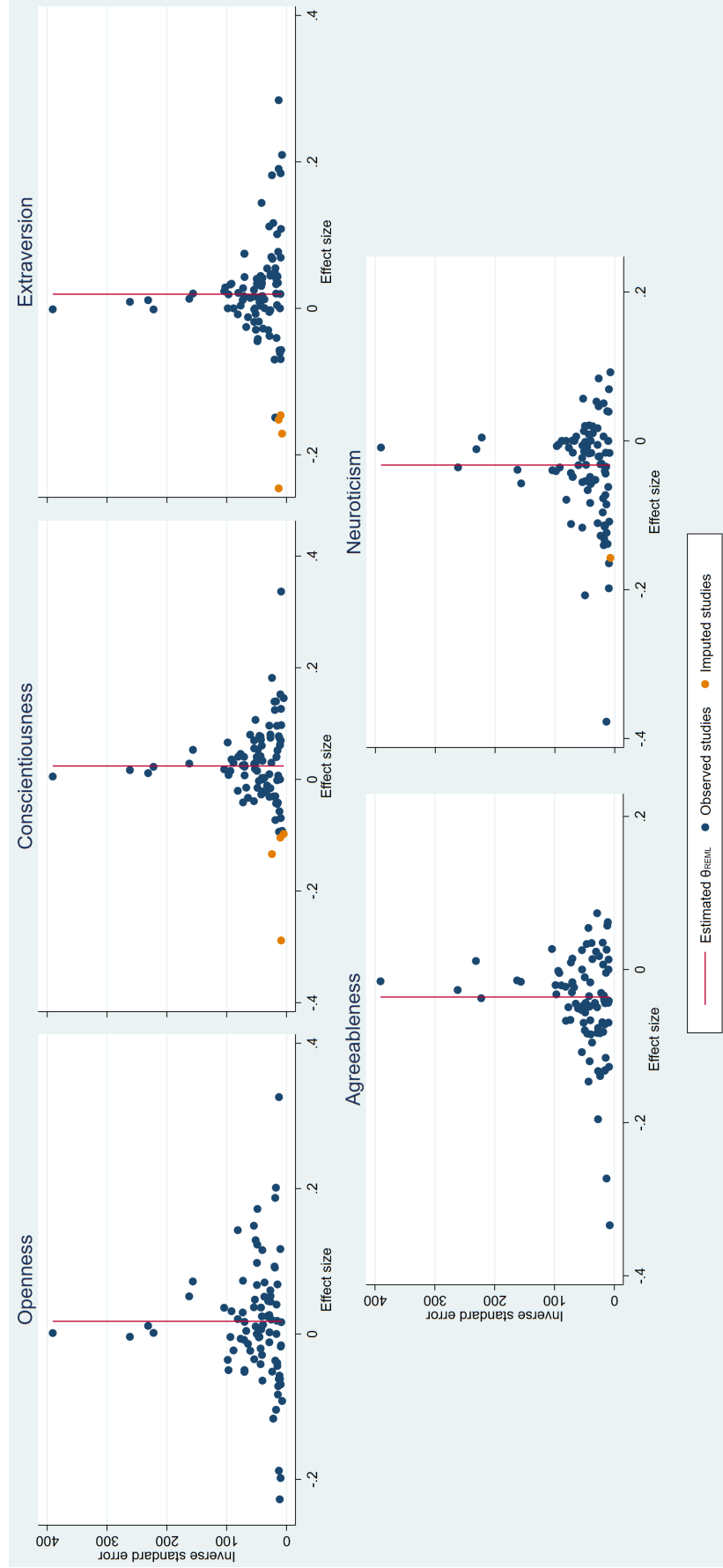
*Notes.* The table reports the results of the random effect meta-analysis for the Big Five personality traits. The estimated effect is indicated by  $\hat{\theta}_{REML}$ . The results are based on the effect sizes from reference models only (cf. Section 2.2). Standard errors in parentheses, \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

**Figure 4:** Personal earnings and the Big Five: evolution over time



*Notes.:* The figure reports the evolution over time of results of the primary literature on personal earnings and the Big Five. The area of the circles is proportional to the statistical power of the studies, which has been computed as the inverse of the square of effect sizes' standard errors and it has been use to weight the linear trend. The results are based on the effect sizes from reference models only (cf. Section 2.2).

**Figure 5:** Personal earnings and the Big Five: Funnel plot (with trim-and-fill imputation)



*Notes.* The figure reports the funnel plots of the meta-analyses of Table 2. The potentially missing effect sizes due to publication bias have been imputed using the trim-and-fill method (Duval and Tweedie, 2000a).

### 4.3 Meta-regression results

The meta-analysis revealed a high level of between-study heterogeneity that we investigated by using the four groups of moderators illustrated in Section 3.2. Overall, the majority of the selected moderators were found to be useful in explaining (for some traits, at least) the results in the primary literature, reducing the heterogeneity detected in the main analysis. After the moderator analysis, however, the  $I^2$  index typically remained high, falling below the 80% threshold in 7 out of 20 meta-regressions (see Tables 3, 4, 5 and 6). While less common in fields relying on controlled experiments for obtaining results, the persistence of heterogeneity observed in our study is in line with the aforementioned characteristics of meta-analyses in Social Sciences (Tong and Guo, 2019).

**Individual controls.** Table 3 displays the results of the meta-regressions based on the empirical specification choices of primary researchers. Two important findings emerged here. First, all the constant terms are (at least) significant at the 10% confidence level and retain the sign of the corresponding average effect sizes previously estimated in the meta-analysis. This indicates that the associations that we found in the meta-analysis hold after controlling for the moderators related to the salient individuals' characteristics. Second, meta-regressions show that some of the heterogeneity observed in the primary literature can be explained in terms of the specific set of control variables included in the empirical model, thereby suggesting possible answers to certain open issues. First and foremost, primary studies which control for cognitive abilities and educational attainments tend to find a weaker association between Openness and personal earnings. This is likely due to the fact that one facet of Openness correlates with intellect, which is expected to both directly and indirectly (for the latter through educational achievements) affect labor market success. Therefore, studies that fail to suitably acknowledge this aspect risk reporting spurious correlations. Likewise, even though the primary literature finds a positive correlation between Conscientiousness and earnings, our analysis indicates that the studies that control for individual educational level tend to report significantly smaller effect sizes. Hence, this finding is consistent with the hypothesis that Conscientiousness can directly impact earnings through its influence on workers' educational career. To conclude, we may underline that primary studies controlling for these two individual features still verify a positive and statistically significant association between Openness and earnings, and Conscientiousness and earnings, meaning that the association transcends education and cognitive skills. Furthermore, the moderators associated with the empirical specification can help reconcile part of the literature's results for Extraversion and Neuroticism. In particular, the inclusion of control variables associated with the labor market – including the employment sector, experience level,

or the occupation itself – significantly reduces the expected effect size of Extraversion. This result can have multiple interpretations. The first of which relies on the selection of workers in different jobs and on the fact that jobs pay different wages. For example, if extrovert individuals seek jobs requiring more social interactions, our result would be verified if these same jobs pay higher wages. A second interpretation relies on the possibility that extroverts tend to advance in their careers more quickly and, therefore, the inclusion of labor market controls may end up absorbing this (positive) indirect effect of Extraversion on earnings. As regards to Neuroticism, the meta-regression indicates that its negative association with earnings is significantly lower in studies which control for cognitive abilities and labor market experience. The former result is consistent with a negative association between the trait and cognitive performances (Ackerman and Heggestad, 1997; Soubelet and Salthouse, 2011) that, if neglected, would likely confound the estimate of the correlation between Neuroticism and earnings. The latter result can be explained by the fact that labor market experience mediates part of Neuroticism’s negative effect on earnings.

**Table 3:** Personal earnings and the Big Five - Meta-regression (individual controls)

	(1) Openness	(2) Conscientiousness	(3) Extraversion	(4) Agreeableness	(5) Neuroticism
Constant	0.0637*** (0.0181)	0.0346*** (0.0110)	0.0221** (0.0107)	-0.0265* (0.0138)	-0.0648*** (0.0134)
Cognitive abilities	-0.0329** (0.0167)	0.0144 (0.0098)	0.0098 (0.0095)	-0.0100 (0.0129)	0.0230* (0.0122)
Labor mrkt	-0.0157 (0.0170)	0.0017 (0.0099)	-0.0171* (0.0097)	-0.0200 (0.0126)	0.0284** (0.0123)
Education	-0.0356** (0.0167)	-0.0224** (0.0100)	0.0070 (0.0098)	0.0083 (0.0125)	0.0104 (0.0126)
N	88	92	90	88	93
$\tau^2$	0.00295	0.000750	0.000708	0.00145	0.00152
$I^2(\%)$	93.80	78.73	78.62	88.09	88.20

*Notes.* For each trait, the table reports the results of the random effect meta-regression on moderators associated to the set of individual controls used by primary researchers. The results are based on the effect sizes from reference models only (cf. Section 2.2). Standard errors in parentheses, \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

**Measurement.** Table 4 shows the results of meta-regressions using the way in which personality has been measured in primary studies as a moderator. Generally speaking, and in line with Gosling et al. (2003), both the number of items and the scale of the answer adopted to evaluate the Big Five do not seem to significantly impact the results of the primary literature. Indeed, only the scale of the inventory turns out to be marginally

significant in terms of predicting the results of the studies for the association between earnings and Extraversion. While not conclusive, this can be interpreted as evidence of a good level of convergence among the different inventories used to measure the FFM's personality constructs. Furthermore, other than for Agreeableness, the early measurement of the personality traits does not help predict the results of the primary literature. This, in turn, is consistent with the hypothesis that personality traits tend to be largely stable over time (Cobb-Clark and Schurer, 2012), in particular when individuals reach full maturity (McCrae and Costa, 1994), and at odds with the hypothesis that careers change – by reinforcing or undermining – certain facets of one's personality's. Also in this case, however, the evidence is suggestive but not conclusive (for an insight of the debate, see Boyce et al., 2015; Gnambs and Stiglbauer, 2019) due to the nature of the *early measurement* moderator that groups of all studies in which the measurement of the personality traits precede the assessment of the outcome variable, without making any distinction about the span of time between the two measurements.

**Table 4:** Personal earnings and the Big Five - Meta-regression (PT measures)

	(1) Openness	(2) Conscientiousness	(3) Extraversion	(4) Agreeableness	(5) Neuroticism
Constant	0.0193 (0.0403)	0.0504** (0.0209)	0.0550*** (0.0204)	-0.0192 (0.0270)	-0.0404 (0.0281)
Number of items	-0.0009 (0.0015)	0.0006 (0.0009)	-0.0006 (0.0009)	-0.0005 (0.0011)	-0.0009 (0.0011)
Scale	0.0007 (0.0063)	-0.0051 (0.0032)	-0.0056* (0.0031)	-0.0023 (0.0042)	0.0027 (0.0044)
Early measurement	0.0287 (0.0335)	0.0026 (0.0177)	0.0120 (0.0171)	-0.0435** (0.0214)	-0.0030 (0.0214)
N	76	80	77	75	80
$\tau^2$	0.00363	0.000706	0.000681	0.00141	0.00161
$I^2(\%)$	95.05	78.22	78.22	88.32	89.14

*Notes.* For each trait, the table reports the results of the random effect meta-regression on moderators associated with their measurement. The results are based on the effect sizes from reference models only (cf. Section 2.2). Standard errors in parentheses, \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

**Sample differences.** Table 5 presents the results of the meta-regressions using the main characteristics of the primary studies' samples as moderators. This analysis reveals that the results of primary studies whose samples have been collected in Anglophone countries differ significantly from those based on samples collected in other parts of the world – in model specifications that include a control variable for the gender of the primary sample. In particular, it seems that the *earning premium* associated with Con-

scientiousness and Extraversion are relatively higher in Australia, the United Kingdom, and the United States, than in other countries. However, it should be noted that the labor markets of these countries seem also to attach a higher penalty on Agreeableness. These results are not wholly unexpected. The above-mentioned countries are characterized by highly competitive labor markets. Therefore, considering the great value that competitive labor markets ascribe to individual efforts and talent, it is unsurprising that the premium earned by diligent, dedicated, and hard-working people – in other words, conscientious individuals – seems more tangible than in countries characterized by partially different sets of values, and those that rely more heavily on non-market forms of organization (for more on this topic, see Hall and Soskice, 2001). For similar reasons, it is conceivable that a talkative and assertive person is more consistently rewarded in the United States than in Germany, while scoring high in Agreeableness is more likely to be a liability in the United Kingdom’s labor market rather than in Japan’s. Finally, the meta-regressions indicate that the gender composition of primary samples can help explain the heterogeneity of the primary results. More precisely, our results show that the positive association between Openness and earnings was particularly significant in studies performed on female-only samples, while the negative association between Neuroticism and earnings was significantly smaller when estimated on samples with only males. While we are not able to provide any conclusive explanation for these specific results, the meta-regression highlights the relevance of the gender perspective on this topic.

**Table 5:** Personal earnings & Big Five - Meta-regression (Samples)

	(1) Openness	(2) Conscientiousness	(3) Extraversion	(4) Agreeableness	(5) Neuroticism
Constant	0.0118 (0.0115)	0.0141** (0.0066)	0.0120* (0.0070)	-0.0140* (0.0081)	-0.0469*** (0.0086)
Anglophone country	-0.0125 (0.0141)	0.0229*** (0.0080)	0.0192** (0.0084)	-0.0276*** (0.0100)	0.0109 (0.0105)
Only females	0.0451** (0.0217)	0.0053 (0.0132)	-0.0181 (0.0137)	-0.0257 (0.0168)	0.0109 (0.0169)
Only males	0.0219 (0.0159)	-0.0059 (0.0092)	0.0003 (0.0096)	-0.0182 (0.0115)	0.0289** (0.0120)
N	88	92	90	88	93
$\tau^2$	0.00305	0.000670	0.000780	0.00125	0.00153
$I^2(\%)$	93.93	76.59	80.02	86.38	88.14

*Notes:* For each trait, the table reports the results of the random effect meta-regression on moderators associated with the sample used for the primary studies.

**Journal field and ranking.** In several instances, the journal’s field and reputation help predict the results in the primary literature (Table 6). In particular, the studies published in leading journals tend to report a stronger positive association between earnings and Conscientiousness, as well as a stronger negative association with Agreeableness. Assuming that a journal’s ranking or prestige is a valid proxy for the reliability of the studies it publishes, these two findings reinforce what we have found in the meta-analysis’ results. However, if leading journals are less likely to publish negative results, this might represent a source of publication bias. Finally, regarding the correlation between a journal’s field and the magnitude of the effect sizes, the results of the meta-regression indicate that the (positive) correlation between earnings and Conscientiousness tend to be weaker for articles published in the field of Social Sciences and Management than for those in Psychology and Economics, while articles published in Psychology and Business journals tend to report a stronger (negative) correlation between Neuroticism and personal earnings.

**Table 6:** Personal earnings & Big Five - Meta-regression (Journal field and ranking)

	(1) Openness	(2) Conscientiousness	(3) Extraversion	(4) Agreeableness	(5) Neuroticism
Constant	0.0243 (0.0211)	0.0452*** (0.0100)	0.0011 (0.0121)	-0.0142 (0.0153)	-0.0089 (0.0145)
Economics	0.0057 (0.0174)	-0.0159* (0.0084)	0.0074 (0.0100)	-0.0078 (0.0124)	0.0037 (0.0120)
Psychology	-0.0286 (0.0196)	-0.0204** (0.0092)	0.0167 (0.0113)	0.0104 (0.0133)	-0.0259** (0.0129)
Social sciences	-0.0187 (0.0165)	-0.0309*** (0.0079)	0.0079 (0.0096)	-0.0071 (0.0120)	-0.0158 (0.0112)
Business & Management	0.0032 (0.0199)	-0.0297*** (0.0100)	0.0090 (0.0118)	0.0027 (0.0147)	-0.0347** (0.0141)
Scimago Q1	0.0099 (0.0174)	0.0278*** (0.0086)	0.0118 (0.0102)	-0.0355*** (0.0126)	-0.0044 (0.0122)
N	88	92	90	88	93
$\tau^2$	0.00320	0.000396	0.000745	0.00137	0.00127
$I^2(\%)$	93.96	64.90	78.49	86.97	85.55

*Notes.* For each trait, the table reports the results of the random effect meta-regression for journal ranking and academic fields. Academic fields are not mutually exclusive. The results are based on the effect sizes from reference models only (cf. Section 2.2). Standard errors in parentheses, \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

## 5 Robustness

We integrate the results of the main analysis with a series of robustness and sensitivity checks. First, we assess whether the meta-analytical results would be robust to a different model specification. As shown in Table 7, although the coefficients estimated using a fixed

effect model are different from those of the random effect (cf. Table 2), the two models provide qualitatively consistent results. In fact, both the sign and significance level of the fixed effect estimates aligned with those of the random effect meta-analysis.

Second, we estimate the random effect meta-analysis using a different effect size index. A potential weakness of the partial correlation coefficient is that, like the simple correlation, its distribution is not normal when it takes values close to  $-1$  and  $+1$ . In such cases, the coefficient is often corrected by means of Fisher’s z-transformation, defined as:

$$z(r_{pc_i}) = \frac{1}{2} \ln \frac{1 + r_{pc_i}}{1 - r_{pc_i}} \quad SE(z(r_{pc_i})) = \frac{1}{\sqrt{n_i - 3}} \quad (4)$$

in which  $n_i$  indicates the sample size of the generic study  $i$ . However, such well-behaved distribution frustrates the ease of interpretation, which clearly favors the partial correlation coefficient. Therefore, since all the  $r_{pc}$  that we coded fell within the  $(-0.4; 0.4)$  interval, we did not use Fisher’s transformation for the main analysis. However, as shown in Table 8, we find that the results obtained with the z-transformed effect sizes are qualitatively consistent with those obtained using the simple partial correlation coefficients.

As a third check, we assess the sensitivity of the results by employing all the effect sizes that we retrieved from the primary literature instead of using only those associated with the ‘reference model’ (cf. Sections 2.2 and 3). The results of the meta-analysis are displayed in Table 9, while those of the meta-regression on the model specification, on the measurement of the traits, on the sample differences, and on the on the journal characteristics are reported in Tables 10, 11, 12 and 13, respectively. Compared to the meta-regressions based only on the effect sizes from the ‘reference model’, these meta-regressions display a relatively higher number of statistically significant coefficients, possibly due to smaller standard errors deriving from larger meta-samples. For instance, according to the results obtained using only the effect sizes from the reference models, the number of items of the Big Five inventory is not a significant moderator of the relationship between personality traits and earnings (see Table 4), while the meta-regressions with all effect sizes suggest that this may actually play a role in terms of Openness and Extraversion (see Table 11). Conversely, we observe very few cases in which some coefficients lose significance. However, all things considered, no substantial modification – a significant coefficient changing sign, for instance – was observed.

**Table 7:** Personal earnings & Big Five - Meta analysis with fixed effect

	(1) Openness	(2) Conscientiousness	(3) Extraversion	(4) Agreeableness	(5) Neuroticism
$\hat{\theta}_{FEML}$	0.0112*** (0.0013)	0.0183*** (0.0013)	0.0106*** (0.0013)	-0.0206*** (0.0013)	-0.0219*** (0.0013)
N	88	92	90	88	93

*Notes.* The table reports the results of the fixed effect meta-analysis for the Big Five personality traits. The estimated effect is indicated by  $\hat{\theta}_{FEML}$ . The results are based on the effect sizes from reference models only (cf. Section 2.2). Standard errors in parentheses, \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

**Table 8:** Personal earnings & Big Five - Meta analysis with Fisher's z-transformation

	(1) Openness	(2) Conscientiousness	(3) Extraversion	(4) Agreeableness	(5) Neuroticism
$\hat{\theta}_{REML}^z$	0.0173** (0.0071)	0.0256*** (0.0042)	0.0211*** (0.0042)	-0.036*** (0.0052)	-0.0325*** (0.0053)
N	88	92	90	88	93
$\tau^2$	0.00322	0.00084	0.00084	0.00144	0.00164
$I^2(\%)$	94.97	82.53	83.20	89.33	90.12
Egger test ( $p$ )	0.1334	0.8098	0.0351	0.0335	0.0145

*Notes.* The table reports the results of the random effect meta-analysis for the Big Five personality traits. The estimated effect is indicated by  $\hat{\theta}_{REML}^z$ . The results are based on the Fisher's z-transformed effect sizes from reference models only (cf. Section 2.2). Standard errors in parentheses, \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

**Table 9:** Personal earnings & Big Five - Meta analysis using all effect-sizes

	(1) Openness	(2) Conscientiousness	(3) Extraversion	(4) Agreeableness	(5) Neuroticism
$\hat{\theta}_{REML}$	0.0214*** (0.0040)	0.0242*** (0.0022)	0.0199*** (0.0023)	-0.0306*** (0.0044)	-0.0330*** (0.0034)
N	182	186	193	183	187
$\tau^2$	0.00207	0.00041	0.00054	0.00261	0.00136
$I^2(\%)$	94.32	76.47	81.33	95.18	91.940
Egger test ( $p$ )	0.1495	0.7429	0.0376	0.0437	0.0183

*Notes.* The table reports the results of the fixed effect meta-analysis for the Big Five personality traits. The estimated effect is indicated by  $\hat{\theta}_{FEML}$ . The results are based on all the effect sizes retrieved from the primary literature. Standard errors in parentheses, \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

**Table 10:** Personal earnings & Big Five - Meta-regression using all effect-sizes (individual controls)

	(1) Openness	(2) Conscientiousness	(3) Extraversion	(4) Agreeableness	(5) Neuroticism
Constant	0.0608*** (0.0091)	0.0228*** (0.0059)	0.0250*** (0.0048)	-0.0111 (0.0100)	-0.0456*** (0.0080)
Cognitive abilities	-0.0435*** (0.0092)	0.0106* (0.0056)	0.0143*** (0.0051)	-0.0158 (0.0103)	0.0026 (0.0080)
Labor mrkt	-0.0315*** (0.0080)	-0.0027 (0.0047)	-0.0139*** (0.0046)	-0.0360*** (0.0091)	0.0178** (0.0070)
Education	-0.0157* (0.0092)	-0.0008** (0.0059)	-0.0049 (0.0052)	0.0055 (0.0101)	0.0043 (0.0082)
N	180	184	191	181	185
$\tau^2$	0.00207	0.00040	0.00037	0.00222	0.00122
$I^2(\%)$	92.69	75.29	74.39	94.20	90.30

*Notes:* For each trait, the table reports the results of the random effect meta-regression on moderators associated to the set of individual controls used by primary researchers. The results are based on all the effect sizes retrieved from the primary literature. Standard errors in parentheses, \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

**Table 11:** Personal earnings & Big Five - Meta-regression using all effect-sizes (PT measures)

	(1) Openness	(2) Conscientiousness	(3) Extraversion	(4) Agreeableness	(5) Neuroticism
Constant	0.0306 (0.0225)	0.0329** (0.0129)	0.0686*** (0.0127)	0.0213 (0.0243)	-0.0340* (0.0195)
Number of items	0.0011** (0.0006)	0.0003 (0.0003)	-0.0009*** (0.0003)	0.0002 (0.0006)	0.0007 (0.0005)
Scale	-0.0034 (0.0035)	-0.0020 (0.0020)	-0.0079*** (0.0020)	-0.0097** (0.0038)	0.0015 (0.0031)
Early measurement	0.0149 (0.0214)	0.0105 (0.0134)	0.0144 (0.0126)	-0.0657** (0.0193)	-0.0165 (0.0163)
N	165	169	168	165	171
$\tau^2$	0.00197	0.00039	0.00039	0.00237	0.00137
$I^2(\%)$	94.01	75.38	75.42	94.68	91.37

*Notes.* The results of the random effect meta-regression on moderators associated with their measurement for each trait. The results are based on all the effect sizes retrieved from the primary literature. Standard errors in parentheses, \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

**Table 12:** Personal earnings & Big Five - Meta-regression using all effect-sizes (Sample)

	(1) Openness	(2) Conscientiousness	(3) Extraversion	(4) Agreeableness	(5) Neuroticism
Constant	0.0350*** (0.0062)	0.0164*** (0.0033)	0.0137*** (0.0037)	-0.0088 (0.0067)	-0.0402*** (0.0052)
Anglophone country	-0.0297*** (0.0080)	0.0180*** (0.0043)	0.0180*** (0.0046)	-0.0378*** (0.0086)	0.0007 (0.0067)
Only females	0.0080 (0.0113)	0.0004 (0.0063)	-0.0174** (0.0070)	-0.0063 (0.0124)	0.0150 (0.0098)
Only males	0.0001 (0.0095)	-0.0053 (0.0054)	0.-0.0015 (0.0058)	-0.0251** (0.0104)	0.0267*** (0.0081)
N	182	186	193	183	187
$\tau^2$	0.00188	0.00036	0.00047	0.00222	0.00123
$I^2(\%)$	93.30	72.11	77.69	94.05	89.90

*Notes.* The results of the random effect meta-regression on moderators with the sample used for the analysis for each trait. The results are based on all the effect sizes retrieved from the primary literature. Standard errors in parentheses, \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

**Table 13:** Personal earnings & Big Five - Meta-regression using all effect-sizes (Outlet)

	(1) Openness	(2) Conscientiousness	(3) Extraversion	(4) Agreeableness	(5) Neuroticism
Constant	0.0336*** (0.0115)	0.0454*** (0.0060)	0.0016 (0.0060)	-0.0175 (0.0124)	-0.0128 (0.0093)
Economics	0.0045 (0.0103)	-0.0187*** (0.0054)	0.0103* (0.0054)	0.0083 (0.0109)	-0.0099 (0.0083)
Psychology	-0.0087 (0.0130)	-0.0208*** (0.0071)	0.0104 (0.0072)	0.0078 (0.0134)	-0.0369*** (0.0103)
Social sciences	-0.0254** (0.0105)	-0.0278*** (0.0056)	0.0010 (0.0057)	-0.0212* (0.0112)	-0.0072 (0.0085)
Business & Management	-0.0046 (0.0121)	-0.0280*** (0.0068)	0.0153** (0.0067)	0.0242* (0.0129)	-0.0429*** (0.0101)
Scimago Q1	-0.0084 (0.0107)	0.0254*** (0.0060)	0.0130** (0.0061)	-0.0431*** (0.0114)	0.0134 (0.0089)
N	182	186	193	183	187
$\tau^2$	0.00190	0.000275	0.000299	0.00231	0.00113
$I^2(\%)$	93.59	67.42	69.69	94.35	89.50

*Notes.* The results of the random effect meta-regression for journal area and year of publication for each trait. The results are based on all the effect sizes retrieved from the primary literature. Standard errors in parentheses, \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

## 6 Conclusions

To the best of our knowledge, this paper presents the first quantitative review of the literature that adopts the FFM to study the relationship between personality traits and personal earnings. We base our analysis on the empirical results of 65 studies published in 46 peer-reviewed journals between 2001-2020. In total, the meta-sample includes 936 effect sizes, namely 183 for Openness, 187 for Conscientiousness, 194 for Extraversion, 184 for Agreeableness and 188 for Neuroticism.

Consistently with our expectations, we find that the primary literature provides evidence in support of a positive association between personal earnings and Conscientiousness, and a negative association with Neuroticism. Moreover, we find that the literature suggests the presence of a negative association between earnings and Agreeableness, and a positive association with Extroversion and Mental Openness. Interestingly, the conclusions of the quantitative synthesis differ from those that would have emerged based on an examination of the literature from a simple vote-counting perspective, since the majority of the primary studies find no significant (partial) correlation between earnings and the Big Five. We find evidence of mild publication bias.

By exploring the presence of the systematic differences in the primary studies' findings, we partially reconcile the results of the literature and contributed to answering several open issues. In particular, by controlling for the types of covariates included by primary researchers in the empirical models, we find that Mental Openness and Conscientiousness are positively associated with earnings even when the level of education and/or a proxy for cognitive abilities are included as control variables. This result is consistent with the idea that the positive effect of Openness and Conscientiousness on earnings is not fully mediated by education and cognitive skills, which are often considered the main predictors of personal income. Likewise, we find that the studies that include labor market control variables tend to report weaker associations between earnings and Extraversion and Agreeableness.

Furthermore, the results of the primary studies do not seem significantly affected by the time at which the Big Five were measured, nor with the scale and number of inventory items. While not conclusive, this result mitigates the concerns regarding the endogeneity of the traits (in the cases in which they are measured simultaneously with the outcome variable) and the reliability of the short inventories included in large household surveys.

The meta-regression provides evidence that studies conducted in Anglophone countries show a stronger positive association between earnings and Conscientiousness, and a stronger negative association between earnings and Agreeableness. If speaking a common language is a valid indicator of cultural proximity, this result suggests that the association

between personality and economic success is unstable across cultures. The heterogeneity of the primary results can also be explained by the sample's gender composition. In particular, the positive association between Openness and earnings seems to be driven by studies with female-only samples, while studies conducted on samples of only men provide evidence for a weaker correlation between earnings and Neuroticism.

Finally, we show that the studies published in leading journals tend to report a stronger positive association between earnings and Conscientiousness, together with a stronger negative association with Agreeableness, thereby reinforcing the association found in the meta-analysis.

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## Appendix

**Table A1:** List of included studies.

Author(s)	Year	Title	Journal	O	C	E	A	N
Acosta P., Muller N., Sarzosa M.	2020	Adults' cognitive and socioemotional skills and their labor market outcomes in Colombia	Revista de Economía del Rosario	✓	✓	✓	✓	✓
Adhitya D., Mulyaningsih T., Samudro B.R.	2019	The role of cognitive and non-cognitive skills on labour market outcomes in Indonesia	Jurnal Ekonomi Malaysia	✓	✓	✓	✓	✓
Al Jahwari D.S., Sirakaya-Turk E., Tanrisever C.	2017	Efficacy of the theory of communication competence and personality traits in predicting tour guides' income	Journal of Human Resources in Hospitality and Tourism	✓	✓	✓	✓	✓
Alfonsi G., Conway M., Pushkar D.	2011	The Lower Subjective Social Status of Neurotic Individuals: Multiple Pathways Through Occupational Prestige, Income, and Illness	Journal of Personality					✓
Anývová P., Matúj P.	2018	Beauty still matters: The role of attractiveness in labour market outcomes	International Sociology	✓	✓	✓	✓	✓
Apers C., Lang J.W.B., Derous E.	2019	Who earns more? Explicit traits, implicit motives and income growth trajectories	Journal of Vocational Behavior	✓	✓	✓	✓	✓
Apers C., Lang J.W.B., Derous E.	2019	Who earns more? Explicit traits, implicit motives and income growth trajectories	Journal of Vocational Behavior	✓	✓	✓	✓	✓
Averett S.L., Bansak C., Smith J.K.	2020	Behind Every High Earning Man is a Conscientious Woman: The Impact of Spousal Personality on Earnings and Marriage	Journal of Family and Economic Issues	✓	✓	✓	✓	✓
Bühler D., Sharma R., Stein W.	2020	Occupational Attainment and Earnings in Southeast Asia: The Role of Non-cognitive Skills	Labour Economics	✓	✓	✓	✓	✓
Bergner S., Neubauer A.C., Kreuzthaler A.	2010	Broad and narrow personality traits for predicting managerial success	European Journal of Work and Organizational Psychology	✓	✓	✓	✓	✓
Côté S., Gyurak A., Levenson R.W.	2010	The Ability To Regulate Emotion Is Associated With Greater Well-Being, Income, and Socioeconomic Status	Emotion		✓			

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Author(s)	Year	Title	Journal	O	C	E	A	N
Cheung Y.H., Hern- don N.C., Dougherty T.W.	2015	Core self-evaluations and salary at- tainment: the moderating role of the developmental network	International Jour- nal of Human Resource Manage- ment	✓	✓	✓	✓	
Collischon M.	2020	The Returns to Personality Traits Across the Wage Distribution	Labour	✓	✓	✓	✓	✓
Damian R.I., Su R., Shanahan M., Trautwein U., Roberts B.W.	2015	Can personality traits and intelli- gence compensate for background disadvantage? Predicting status at- tainment in adulthood	Journal of Person- ality and Social Psychology	✓	✓	✓	✓	✓
de Haro J.-M., Castejn J.-L., Gilar R.	2013	General mental ability as modera- tor of personality traits as predic- tors of early career success	Journal of Voca- tional Behavior	✓	✓	✓	✓	✓
Denissen J.J.A., Blei- dorn W., Hennecke M., Luhmann M., Orth U., Specht J., Zimmermann J.	2018	Uncovering the Power of Personal- ity to Shape Income	Psychological Science	✓	✓	✓	✓	✓
Drydakis N.	2015	The effect of sexual activity on wages	International Jour- nal of Manpower	✓	✓	✓	✓	✓
Duckworth A.L., Weir D., Tsukayama E., Kwok D.	2012	Who does well in life? Conscien- tious adults excel in both objective and subjective success	Frontiers in Psy- chology	✓	✓	✓	✓	✓
Ferris G.R., Witt L.A., Hochwarter W.A.	2001	Interaction of social skill and gen- eral mental ability on job perfor- mance and salary	Journal of Applied Psychology	✓	✓	✓	✓	✓
Fletcher J.M.	2013	The effects of personality traits on adult labor market outcomes: Evi- dence from siblings	Journal of Eco- nomic Behavior and Organization	✓	✓	✓	✓	✓
Flinn C.J., Todd P.E., Zhang W.	2018	Personality traits, intra-household allocation and the gender wage gap	European Eco- nomic Review	✓	✓	✓	✓	✓
Furnham A., Cheng H.	2013	Factors influencing adult earnings: Findings from a nationally repre- sentative sample	Journal of Socio- Economics	✓	✓	✓		✓
García J.M.H., Costa J.L.C.	2014	Does Trait Emotional Intelligence Predict Unique Variance in Early Career Success Beyond IQ and Per- sonality?	Journal of Career Assessment	✓	✓	✓	✓	✓
Gelissen J., de Graaf P.M.	2006	Personality, social background, and occupational career success	Social Science Re- search	✓	✓	✓	✓	✓

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Author(s)	Year	Title	Journal	O	C	E	A	N
Gensowski M.	2018	Personality, IQ, and lifetime earnings	Labour Economics	✓	✓	✓	✓	✓
Grönlund A., Magnusson C.	2018	Do Atypical Individuals Make Atypical Choices? Examining How Gender Patterns in Personality Relate to Occupational Choice and Wages Among Five Professions in Sweden	Gender Issues	✓	✓	✓	✓	✓
Green C.T., Jame R., Lock B.	2019	Executive extraversion: Career and firm outcomes	Accounting Review			✓		
Hagmann-von Arx P., Gygi J.T., Weidmann R., Grob A.	2016	Testing relations of crystallized and fluid intelligence and the incremental predictive validity of conscientiousness and its facets on career success in a small sample of German and Swiss workers	Frontiers in Psychology		✓			
Hamilton B.H., Papageorge N.W., Pande N.	2019	The right stuff? Personality and entrepreneurship	Quantitative Economics	✓	✓	✓	✓	✓
Hamilton B.H., Papageorge N.W., Pande N.	2019	The right stuff? Personality and entrepreneurship	Quantitative Economics	✓	✓	✓	✓	✓
Heineck G.	2011	Does it pay to be nice? personality and earnings in the UK	Industrial and Labor Relations Review	✓	✓	✓	✓	✓
Heineck G., Anger S.	2010	The returns to cognitive abilities and personality traits in Germany	Labour Economics	✓	✓	✓	✓	✓
Hong-Ngam J.	2018	Earnings and engagement of seamen workers	International Journal of Economic Policy in Emerging Economies	✓	✓	✓	✓	✓
John K., Thomsen S.L.	2014	Heterogeneous returns to personality: The role of occupational choice	Empirical Economics	✓	✓	✓	✓	✓
Judge T.A., Livingston B.A., Hurst C.	2012	Do nice guys-and gals-really finish last? The joint effects of sex and agreeableness on income	Journal of Personality and Social Psychology	✓	✓	✓	✓	✓
Kajonius P.J., Carlander A.	2017	Who gets ahead in life? Personality traits and childhood background in economic success	Journal of Economic Psychology	✓	✓	✓	✓	✓
Kanazawa S., Still M.C.	2018	Is There Really a Beauty Premium or an Ugliness Penalty on Earnings?	Journal of Business and Psychology	✓	✓	✓	✓	✓

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Author(s)	Year	Title	Journal	O	C	E	A	N
Karl Scholz J., Sicinski K.	2015	Facial attractiveness and lifetime earnings: Evidence from a cohort study	Review of Economics and Statistics	✓	✓	✓	✓	✓
Lee S.Y., Ohtake F.	2018	Is being agreeable a key to success or failure in the labor market?	Journal of the Japanese and International Economies	✓	✓	✓	✓	✓
Luan Z., Poorthuis A.M.G., Hutteman R., Denissen J.J.A., Asendorpf J.B., van Aken M.A.G.	2019	Unique predictive power of other-rated personality: An 18-year longitudinal study	Journal of Personality	✓	✓			✓
Maczulskij T., Viinikainen J.	2018	Is personality related to permanent earnings? Evidence using a twin design	Journal of Economic Psychology				✓	✓
Maksimova M.A.	2019	The return to non-cognitive skills on the Russian labor market	Applied Econometrics	✓	✓	✓	✓	✓
Maksimova M.A.	2019	The return to non-cognitive skills on the Russian labor market	Applied Econometrics	✓	✓	✓	✓	✓
Mueller G., Plug E.	2006	Estimating the effect of personality on male and female earnings	Industrial and Labor Relations Review	✓	✓	✓	✓	✓
Nordman C.J., Sarr L.R., Sharma S.	2019	Skills, personality traits, and gender wage gaps: Evidence from Bangladesh	Oxford Economic Papers	✓	✓	✓	✓	✓
Nyhus E.K., Pons E.	2005	The effects of personality on earnings	Journal of Economic Psychology	✓	✓	✓	✓	✓
Nyhus E.K., Pons E.	2012	Personality and the gender wage gap	Applied Economics	✓	✓	✓	✓	✓
O'Connell M., Sheikh H.	2011	Big Five' personality dimensions and social attainment: Evidence from beyond the campus	Personality and Individual Differences	✓	✓	✓	✓	✓
Palczyńska M., Świst K.	2018	Personality, cognitive skills and life outcomes: evidence from the Polish follow-up study to PIAAC	Large-Scale Assessments in Education	✓	✓	✓	✓	✓
Paleczek D., Bergner S., Rybnicek R.	2018	Predicting career success: is the dark side of personality worth considering?	Journal of Managerial Psychology	✓	✓	✓	✓	✓
Prevoo T., ter weel B.	2015	The importance of early conscientiousness for socio-economic outcomes: Evidence from the british cohort study	Oxford Economic Papers		✓	✓	✓	✓

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Author(s)	Year	Title	Journal	O	C	E	A	N
Rammstedt B., Dan- ner D., Lechner C.	2017	Personality, competencies, and life outcomes: results from the German PIAAC longitudinal study	Large-Scale Assess- ments in Education	✓	✓	✓	✓	✓
Risse L., Farrell L., Fry T.R.L.	2018	Personality and pay: Do gender gaps in confidence explain gender gaps in wages?	Oxford Economic Papers	✓	✓	✓	✓	✓
Rode J.C., Arthaud- Day M., Ramaswami A., Howes S.	2017	A time-lagged study of emotional intelligence and salary	Journal of Voca- tional Behavior		✓			✓
Rode J.C., Arthaud- Day M.L., Mooney C.H., Near J.P., Baldwin T.T.	2008	Ability and personality predictors of salary, perceived job success, and perceived career success in the ini- tial career stage	International Jour- nal of Selection and Assessment	✓	✓	✓	✓	✓
Seibert S.E., Kraimer M.L.	2001	The Five-Factor Model of Personal- ity and Career Success	Journal of Voca- tional Behavior	✓	✓	✓	✓	✓
Semeijn J.H., van der Heijden B.I.J.M., De Beuckelaer A.	2018	Personality Traits and Types in Re- lation to Career Success: An Em- pirical Comparison Using the Big Five	Applied Psychology	✓	✓	✓	✓	✓
Shanahan M.J., Bauldry S., Roberts B.W., Macmillan R., Russo R.	2014	Personality and the reproduction of social class	Social Forces	✓	✓	✓	✓	✓
Shi Y., Moody J.	2017	Most likely to succeed: Long-run returns to adolescent popularity	Social Currents	✓	✓	✓	✓	✓
Solomon B.C., Jack- son J.J.	2014	The Long Reach of One's Spouse: Spouses' Personality Influences Oc- cupational Success	Psychological Science	✓	✓	✓	✓	✓
Sutin A.R., Costa Jr. P.T., Miech R., Eaton W.W.	2009	Personality and career success: Concurrent and longitudinal rela- tions	European Journal of Personality	✓	✓	✓	✓	✓
Viinikainen J., Kokko K., Pulkkinen L., Pehkonen J.	2010	Personality and Labour Market In- come: Evidence from Longitudinal Data	Labour	✓	✓	✓	✓	✓
Viinikainen J., Kokko K., Pulkkinen L., Pehkonen J.	2014	Labor market performance of dropouts: The role of personality	Journal of Eco- nomic Studies					✓
Williams M., Gar- diner E.	2018	The power of personality at work: Core self-evaluations and earnings in the United Kingdom	Human Resource Management Jour- nal	✓	✓	✓	✓	✓

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Author(s)	Year	Title	Journal		O	C	E	A	N
Yu F., Wang C., Shen J., Shi Y., Li T.	2017	Effect of cognitive abilities and non-cognitive abilities on labor wages: empirical evidence from the Chinese Employer-Employee Survey	China Economic Journal		✓	✓	✓	✓	✓

*Notes.* This table reports the list of the studies included in the meta-analytical samples of Openness, Conscientiousness, Extraversion, Agreeableness and Neuroticism.