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## The causal effect of paternal unemployment on children's personality

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# The Causal Effect of Paternal Unemployment on Children's Personality

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## Abstract

Using longitudinal data from the German Socio-Economic Panel (SOEP), we show that paternal unemployment has a surprisingly positive causal effect on the “Big 5” personality traits of children aged 17 to 25. In particular, our results from longitudinal value-added models for personality suggest that paternal unemployment makes children significantly more conscientious and less neurotic. Our results are robust to different estimation methods and to selection on unobservables. Furthermore, these effects are stronger for girls and for children whose mothers are employed.

JEL classification: J24, J13, J64, C33.

PsycINFO codes: 2223, 2840, 3120.

Keywords: personality traits, unemployment, household behavior, SOEP.

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# Introduction

Recent empirical evidence both in economics and in psychology shows that personality traits have strong predictive power for a wide range of socio-economic outcomes (Almlund et al., 2011, Borghans et al., 2008, Brunello and Schlotter, 2011). Personality matters for job performances and wages (Barrick and Mount, 1991, Hogan and Holland, 2003, Nyhus and Pons, 2005, Salgado, 1997), educational attainment (Borghans et al., 2008, Duncan et al., 2007, Goldberg et al., 1998, Poropat, 2009), longevity (Friedman et al., 2010, Roberts et al., 2007, Savelyev, 2014), health-related behaviors (Hampson et al., 2007) and criminal behaviors (John et al., 1994, O’Gorman and Baxter, 2002). Indeed, in their seminal work on the topic, Heckman et al. (2006) show that, by and large, the long-run effects of non-cognitive skills - among which personality is also included - on labor market outcomes and on social behavior are comparable to the ones of cognitive skills.

In spite of this evidence, surprisingly little is known about the economic determinants of non-cognitive skills, and personality in particular. According to the psychological literature, personality is still malleable until the “impressionable years” of adolescence and early adulthood, and then remains relatively stable throughout adulthood (Alwin, 1994, Costa and McCrae, 1994, Costa et al., 1980).

Several papers have investigated how the economic external conditions experienced during the “impressionable years” shape young people’s values, attitudes, beliefs, preferences and well-being (among others, see Cutler, 1974, Dennis, 1973, Easton and Dennis, 1969, Giuliano and Spilimbergo, 2014, Greenstein, 1965, Hess and Torney, 1967, Krosnick and Alwin, 1989, Sears, 1975, 1981, 1983). As far as we know, however, there is limited causal evidence about the contribution of both different socio-economic factors and (positive and negative) life events to shaping personality not only in adulthood, but also until the impressionable years.<sup>1</sup>

This paper contributes to the extant literature by estimating the causal effect of one important economic factor, paternal unemployment, on personality traits, focusing on the crucial years of their development. Indeed, several studies suggest that, by altering pre-existing socio-economic conditions of the family, paternal job loss has strong and persistent spillover effects on the life course of adolescents (Coelli, 2011, Kalil and Ziol-Guest, 2008, Kind and Haisken-DeNew, 2012, Pinger, 2012, Powdthavee and Vernoit,

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<sup>1</sup>There is evidence suggesting that personality traits are insensitive to changes in economic conditions (Cobb-Clark and Schurer, 2012) during the working age. However, the stability of personality traits in adulthood has been questioned by Roberts et al. (2006), Roberts and Mroczek (2008) and Lucas and Donnellan (2011). In a recent paper, Boyce et al. (2015) show that unemployment induces significant changes in personality, whereas re-employed individuals experience limited changes.

2013, Rege et al., 2011, Stevens and Schaller, 2011).<sup>2</sup> However, evidence about its effects on personality is still lacking. *A priori*, it is hard to sign such an effect, and empirical analysis is needed to settle the matter. On the one hand, children may suffer from paternal job loss because of unemployment-induced parental depression, (Powdthavee and Vignoles, 2008) and deteriorated economic conditions of the family, which in turn are likely to generate a status of anxiety, frustration and disillusionment (Christoffersen, 1994, McLoyd, 1989). On the other hand, unemployment may allow parents to have more time to spend with their children, which may have positive effects on their personality development (see Powdthavee and Vernoit, 2013, and the references therein). Finally, as adverse life events have the potential to foster future resilience (see Seery, 2011, Seery et al., 2010), fathers' negative experience may generate a coping mechanism on children, making them work hard and thoroughly to avoid to fall into unemployment themselves.

Our analysis is based on data from the German Socio Economic Panel (SOEP), a unique household survey about the German population collecting longitudinal information on respondents' demographics, socio-economic conditions, health, family composition, parental employment and, last but not least, personality traits. Since SOEP longitudinally tracks all original household members even in case they move out of the household, we can match children's characteristics and the evolution of their personality traits over waves with the employment conditions of their parents. Hence, the comprehensiveness and the longitudinal nature of our data allow us to identify the causal relationship between the experience of paternal unemployment and children's personality via a value-added model. More specifically, we consider all children whose fathers worked as employees in private firms at a given personality assessment, and we compare post-treatment personality traits of children whose father did and did not experience unemployment between two consecutive personality assessments, conditional on children's baseline personality traits and on a rich battery of observable characteristics of the children and their parents.

We measure personality in terms of the "Big-5" model (Barenbaum and Winter, 2008, Goldberg, 1993, Krueger and Johnson, 2008, Nyhus and Pons, 2005). According to this framework, personality can be summarized by 5 factors, namely Openness, Conscientiousness, Extraversion, Agreeableness and Neuroticism. We find a positive causal effect of paternal unemployment on the "Big 5" personality traits of their children during the "impressionable years" of adolescence and early adulthood: experiencing paternal unemployment makes them significantly more conscientious and less neurotic, with these effects being stronger for girls and for children whose mothers are employed at baseline. No significant effects are detected on the remaining three personality traits. These re-

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<sup>2</sup>From a macroeconomic perspective, previous research showed that recession periods affect several aspects of health (among others, see Ruhm, 2015).

sults are robust to different estimation methods and to selection on unobservables.

Our findings suggest that, despite the potentially detrimental effects on the economic conditions of the family and on subjective well-being, in the short-run experiencing a negative change in the labor status of the father stimulates young people’s emotional stability and sense of responsibility that, in turn, are likely to generate a return in adulthood.

The rest of the paper is organized as follows. Section 1 introduces the data and presents some descriptive statistics. Section 2 discusses the empirical strategy. We present the estimation results in Section 3, then conclude in Section 4 with some final considerations.

## 1 Data and descriptive analysis

We use data from the German Socio Economic Panel (SOEP - v30). The SOEP is a representative annual panel survey of the German population, interviewing every year around 22,000 individuals living in 12,000 households across Germany (see Wagner et al., 2007, for details). It started in 1984 in West Germany and in 1990, after German reunification, in East Germany.

SOEP collects a wealth of information about respondents’ demographics, health, family composition, economic conditions, labor market outcomes, subjective well-being, preferences and, last but not least, personality traits, making it a very attractive data source for our analysis. First, SOEP interviews all members of an eligible household aged 17+ at the moment of the first interview, and tracks all members even if they leave their original household. This allows us not only to match information on parental employment with information about children personality, but also to follow parents and children after they change household, for reasons that may include both nest-leaving of children or divorce of parents. Second, SOEP administered to respondents a comprehensive Big 5 personality questionnaire in three waves (2005, 2009 and 2013), allowing us to carry out a longitudinal analysis. Finally, large sample size permits to have statistical power even when looking at specific sub-groups of the population, as we do.

Our working sample is constructed as follows. We pool the 2005 and 2009 samples, that we consider as our baseline interviews, and respectively track individuals up to their 2009 or 2013 4-year follow-up interviews. We consider only respondents whose baseline interview takes place within the “impressionable years”, i.e. those aged 17 to 25 at baseline, and whose fathers are aged below 63 - the early retirement age - at baseline. We restrict our sample to consider only fathers who are present in the survey throughout the 4 years between the baseline and follow-up interviews, and who work as employees

in a private firm at baseline, since unemployment is more rare among public employees and among the self-employed. Although these criteria for sample selection are quite restrictive, we believe that they help us narrowing down our sample to consider only those truly at risk of experiencing unemployment, increasing internal validity. We also drop individuals whose mother is not in the survey, as our model makes use of information on mothers as well. After dropping observations with missing values in the children, mothers and fathers covariates included in the analysis - listed in Table 1<sup>3</sup> - our final sample consists of 893 respondents, 59.6 percent of which belongs to the 2005 baseline sample and 40.4 percent to the 2009 baseline sample. Descriptive statistics for the variables used in the analysis - measured at baseline - are reported in Table 1.

Our outcome variables are individuals' Big 5 personality factors: Openness, Conscientiousness, Extraversion, Agreeableness and Neuroticism. These are measured in SOEP by a short but well-established personality questionnaire, unaltered across different waves of the survey and reported in Table A1 in the Appendix. Respondents were presented with a list of 15 statements (three for each trait), and were asked to rate how much they agreed with each of these statements on a 7-point Likert scale. As in Caliendo et al. (2014), we treat the response scales cardinally and compute respondents' score for each personality trait by simply averaging the scores from the three different statements referring to that factor, and standardizing the resulting measure to have 0 mean and unit variance in the final sample. Therefore, descriptive statistics for personality variables are not shown in Table 1, but we report the densities of baseline and follow-up personality of children in Figure 1.

As highlighted by Borghans et al. (2008), the simplicity of this measurement approach is not exempt from critiques. In fact, while variables like height or weight can be measured directly, this is not true for personality, which must be inferred from responses to personality questionnaires like the one we use. This process is inevitably affected by measurement error. For instance, as suggested by Piatek and Pinger (2015), treating personality items cardinally can distort results if the Likert scale used has a limited support, or the distributions of the answers show high kurtosis. Furthermore, Almlund et al. (2011) highlight that cognitive skills and other non-cognitive traits and attitudes may also influence the answers to the personality questions, confounding the interpretation of the personality scores obtained in this simple way. On the one hand, there is not much we can do to address this latter problem, since contemporaneous or pre-determined measures of cognitive abilities and other non-cognitive traits are not available for the SOEP

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<sup>3</sup>Our models also control for the regional level of unemployment at the time of the baseline interview and for regional dummies. Because of small sample size by region, we have aggregated Hamburg, Mecklenburg-Vorpommern and Schleswig-Holstein, Niedersachsen and Bremen, and Saarland and Rheinland-Pfalz.



waves that we exploit. Hence, the interpretation of our results must take into consideration the fact that the personality scores we use also reflect the indirect influence that cognitive and other non-cognitive skills may have had on respondents' answers to the personality questions. On the other hand, to check the robustness of our results to problems related with the ordinal vs. cardinal treatment of the answers to personality items, we run a 5-factor Confirmatory Factor Analysis (CFA) on the personality items, and extract the latent scores for each factor. Differently from our simple methodology, which gives equal loadings to each item related to a given factor, CFA estimates the loading of each of the items from the data, allowing for more flexibility.<sup>4</sup> It turns out that the correlation between our simple average scores and the latent scores obtained via factor analysis is always around .9, and results of all the analyses are quantitatively and qualitatively similar when we use either of the two measures. Given the simpler nature of the measures obtained by averaging, we prefer to stick to these ones throughout the analysis.<sup>5</sup>

Following Boyce et al. (2015), we describe paternal unemployment - our treatment - with a dummy variable for whether the respondent's father reports to be unemployed in any SOEP interview between the baseline (2005 or 2009) and the follow-up (2009 or 2013, respectively). Looking at Table 1, we see that 8.9 percent of respondents' fathers (that is, 79 fathers) have experienced a spell of unemployment between the two interviews.<sup>6</sup>

To gain a better understanding about the characteristics of fathers exposed or not exposed to unemployment, in Table 2 we report mean values of several paternal characteristics by treatment group. Results point to negative selection into unemployment, as fathers experiencing unemployment are on average 2.44 years older, have 1.1 less years of education, are 15.4 percentage points more likely to be in poor health, have lower life satisfaction and are 16.6 percentage points less likely to live with their child. Furthermore, their previous labor market career was also different, as they are 32.4 percent more likely to have ever experienced unemployment before the baseline interview (when they were employed), are more likely to work in smaller firms, have lower earnings and

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<sup>4</sup>On the other hand, other previous paper (see for instance Caliendo et al., 2014) carried out Exploratory Factor Analysis and have showed that the items of the personality questionnaire included in the SOEP load on different factors, which generally correspond very well to the personality traits identified ex-ante. Therefore, we do not repeat this exercise.

<sup>5</sup>We present a replication of our main results using latent factors in the Appendix. Other results are available from the authors upon request.

<sup>6</sup>Unfortunately, we do not have precise information about the duration of unemployment in our data, as we only know labor market status at the time of each interview. We have also tried to distinguish between different unemployment causes (see e.g. Kassenboehmer and Haisken-DeNew, 2009, Marcus, 2013), like lay-offs, quits, and plant closures, but the sample is too small to see enough of these instances, and we lack power to carry out these analyses.

lower tenure, and are less likely to be homeowner (a proxy for wealth).<sup>7</sup>

Table 3 reports instead the differences in children’s personality by paternal unemployment. In spite of the negative selection of fathers into unemployment, we do not detect any statistically significant difference in baseline personality among the two groups of children. In fact, the two groups of children look well-balanced not only in terms of their own personality: we have tested for differences in other child-level baseline covariates, including age, gender, immigrant status, family composition, poor health, life satisfaction and employment status, and we only detect a statistically significant difference for age, which is marginally higher among treated kids, and life satisfaction, which is instead lower in the treated group.<sup>8</sup>

Results are different, however, when we repeat this exercise looking at differences in follow-up personality of children, as we see that treated children have a significant .29 standard deviations higher level of conscientiousness. This descriptive analysis seems to suggest that paternal unemployment may have a beneficial effect on the personality of children, as it makes them become more conscientious. The econometric analysis introduced in the next section aims at verifying the robustness of this univariate association.

## 2 Empirical Methodology

We frame the identification problem in terms of potential outcomes. Our setup is such that we observe individuals for two time periods, pre and post treatment, respectively defined as  $t = 0$  and  $t = 1$ . Our treatment is defined by the dummy variable  $DadU_i$ , which indicates whether child  $i$ ’s father experiences unemployment between  $t = 0$  and  $t = 1$ . We define the vectors of the five observed personality traits of child  $i$  at  $t = 0$  and  $t = 1$  as  $Y_i^0$  and  $Y_i^1$ , respectively. On the other hand, we let  $Y_{1i}^1$  and  $Y_{0i}^1$  be the vectors of the five potential  $t = 1$  personality traits of child  $i$  in the case in which the father does or does not experience unemployment between the baseline and follow-up interview, respectively. We are interested in the identification of the Average Treatment effect on the Treated (ATT), that is defined in terms of potential outcomes at  $t = 1$  as  $E[Y_{1i}^1 - Y_{0i}^1 | DadU_i = 1]$  and measures the average effect of paternal unemployment on children’s personality for children whose fathers have experienced unemployment.

Of course, the unconditional comparison of  $t = 1$  personality of treated and untreated children, that we have carried out in the previous section, is informative about the ATT

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<sup>7</sup>We have also tested for differences in fathers’ personality at baseline, and we find that those who will experience unemployment have a significant .39 standard deviations higher level of neuroticism with respect to the control group.

<sup>8</sup>Results are not reported to save space, but are available upon request from the authors.

only if  $DadU_i$  can be considered to be as good as randomly assigned. Unfortunately, the evidence provided in Table 2 and Table 3 shows that - even if treated and control children are well-balanced in terms of their own baseline personality traits and of other observable characteristics - there are substantial differences in pre-determined observable characteristics between the fathers of the two groups of children, which may hamper a causal interpretation of our findings. In particular, we believe that negative selection of fathers into unemployment implies that the unconditional comparison of children’s personality carried out in the previous section is biased towards finding negative differences in personality between treated and control children if personality is positively associated with parental background (see Eisenberg et al., 2014). This would run against our descriptive finding of a positive effect of paternal unemployment on children’s conscientiousness. We can instead rule out reverse causality issues, since the treatment pre-dates the follow-up personality assessment.

We take advantage of the longitudinal nature of our data to estimate a value-added model of personality (see Guarino et al., 2014, Todd and Wolpin, 2003). These models exploit the information about  $Y_i^0$ , a vector of children’s personality traits measured at  $t = 0$ , before the treatment took place, as a “sufficient statistic” for all pre-determined unobserved variables that may affect follow-up personality and are not included in the model. Formally, we estimate the following system of five linear equations, one for each follow-up personality trait,  $Y_{ij}^1, j = 1, \dots, 5$ :

$$Y_{ij}^1 = \alpha_j + \beta_j DadU_i + \delta'_j Y_i^0 + \gamma'_j X_i^0 + \varepsilon_{ij}, j = 1, \dots, 5, \quad (1)$$

where  $X_i^0$  is the vector of baseline covariates listed in Table 1, a dummy for belonging to the 2009 baseline sample, the regional unemployment rate at baseline, regional dummies and a vector of maternal and paternal baseline personality traits. Finally,  $\varepsilon_{ij}$  is an error term, which we allow to be correlated across equations.

Todd and Wolpin (2003) derive the (undoubtedly stringent) assumptions that relate reduced-form value-added specifications like the one described in equation (1) to a dynamic structural model of skills formation. In their set-up, OLS estimation of the reduced-form model in equation (1) is inconsistent, because of correlation between the lagged outcome and the error term of the structural model. However, this does not seem to be a first-order problem in the light of the conclusions of the simulation study carried out by Guarino et al. (2014). Indeed, they show that - even if it is never the prescribed approach under the structural cumulative effects model - by including prior achievement on the right-hand side, the dynamic OLS specification of value-added models is very effective at controlling for related sources of unobserved heterogeneity under a wide set of data generating processes, that embed different assumptions about the assignment to

treatment mechanism. In many of their simulated scenarios, OLS performs better than other estimators derived on the basis of structural modeling considerations, that instead draw attention to second-order identification concerns (e.g. endogenous lags). Hence, we do not consider the issues concerned with the dynamic component of the model and estimate the 5-equation system described in (1) via a Seemingly Unrelated OLS estimator, to take care of the correlation among the errors in the equations for the different personality traits, and use heteroskedasticity-robust standard errors.

Consequently, in our reduced-form setup, identification of the ATT from model (1) relies on the following unconfoundedness assumption:

$$E([Y_{0i}^1 | DadU_i = 1, Y_i^0, X_i^0]) = E([Y_{0i}^1 | DadU_0 = 0, Y_i^0, X_i^0]) \quad (2)$$

which implies that, conditional on the baseline covariates and on the baseline personality traits of the children, we can take the (observed) average follow-up personality scores for the control group as a plausible average counterfactual outcome for the treatment group, had it not experienced the treatment. In each of the  $j$  equations of model (1),  $j = 1, \dots, 5$ , the coefficient  $\beta_j$  - associated with the treatment dummy  $DadU_i$  - identifies the ATT of paternal unemployment on the  $j$ -th personality trait.

As anticipated in the introduction, the aim of our empirical exercise is to sign and quantify the  $\beta$  coefficients. Indeed, as much as in other important domains (including educational achievements and life satisfaction), paternal job loss may reasonably exert both positive (mainly related to children's resilience and time spent with their parents) and negative (due to deteriorated economic conditions and parental depression and anxiety) influences on personality traits and we believe that our approach is ideal to identify and quantify the net effect of these counterbalancing forces.

It is worth underlining that the set of baseline covariates included in  $X_i^0$  is unusually rich, as it includes a comprehensive set of paternal characteristics, and in particular a thorough description of paternal labor market history (earnings, tenure, firm size, occupation, previous experience of unemployment), characteristics of the mother, of the family of origin, and of the child. Together with indicators of baseline personality of both the parents and the child, we hope these are sufficient to grant conditional independence of the treatment. Indeed, in the light of the wide evidence about the stability of personality traits (see Cobb-Clark and Schurer, 2012, for recent evidence), we believe specification (1) to be demanding enough so that any effect that should survive could be interpreted as a causal effect. Nevertheless, we also carry out a set of tests aimed at gauging the robustness of our results to selection on unobservables, based on the estimators proposed by Altonji et al. (2005) and by Oster (2015).

Finally, we also show that our estimates are qualitatively similar when we use semi-

parametric estimators based on propensity score weighting (see Hirano et al., 2003) and on entropy balance weighting (see Hainmueller, 2012).

### 3 Results

Table 4 reports our main results. In each column we report the ATT of paternal unemployment on each of the Big 5 personality traits, estimated as described in the previous section. The four columns report results when we progressively add a richer set of controls to the model. In particular, Column (1) includes only the baseline personality traits of the child, Column (2) adds wave dummies, regional dummies, and child and parents' baseline covariates (listed in Table 1), Column (3) adds parental baseline personality traits, and Column (4) adds the baseline employment status of the child.

Our main result is that paternal unemployment increases children's level of conscientiousness by .203 to .228 standard deviations, depending on the specification adopted. This difference is not only statistically significant but also relevant in magnitude. For instance, looking at the fathers' sample, we observe a raw difference in conscientiousness of similar magnitude between fathers with secondary education or more than secondary education. The result confirms the descriptive evidence presented in the previous section, and is qualitatively and quantitatively robust to the inclusion of a progressively more demanding set of controls. We also find that paternal unemployment reduces children's neuroticism by -.132 to -.187 standard deviations, but this effect is only marginally significant, and its magnitude is more dependent on the set of controls included in the model. The other personality traits are instead not affected by the experience of paternal unemployment.

All in all, our main results suggest that paternal unemployment improves children's personality. This evidence is consistent with the psychological literature on the effects of negative events on personality (see Seery, 2011, for a review), which has shown that, while experiencing no or high level of adversity has negative consequences on the development of the individual, moderate levels of adversity, such as paternal job loss, can actually be beneficial by building resilience.

Before presenting results from sub-group analysis, we describe some tests to verify the robustness of our main results.

As a first robustness check, we replicate our main analysis using personality scores obtained by extracting latent factors via a confirmatory factor analysis instead of using the raw means, as described in Section 2. Results - presented in Table A.2 in the Appendix - are qualitatively and quantitatively similar to those presented in Table 4, although in this case the negative effect on neuroticism is larger in magnitude and more

strongly significant when we add the full set of controls.

Second, to verify the robustness of our main results to the linear parametric specification of our model, we also exploit semi-parametric estimation methods based on propensity score weighting (see Hirano et al., 2003), and entropy balance weighting (see Hainmueller, 2012).<sup>9</sup> The former method uses Horowitz-Thompson weights estimated on the basis of a propensity score to re-weight the data and achieve balancing on the observables. Since this method relies on an *estimated* propensity score, it may fail to improve balancing in finite samples. The latter method, instead, overcomes this drawback by using a maximum entropy reweighting scheme, that weighs each unit in the control group in such a way that the covariates distributions in the reweighted data have the same means as in the treatment group, thereby obtaining a reweighted sample that is *perfectly* balanced on the means of the included observable covariates, even in small samples. Obtaining similar results with OLS, propensity score weighting and entropy balance weighting should be reassuring about the robustness of our results to different parametric specifications of the model. Results that use the same controls included in Column (4) of Table (4) - our most comprehensive specification - are reported in Table A.3 in the Appendix, and portray a very similar picture to the one reported in Table 4. We still find a statistically significant positive effect of paternal unemployment on children's follow-up level of conscientiousness, and we also still find a negative effect of paternal unemployment on neuroticism, but this effect is not significant when we use Entropy Balancing. Also in this case, the ATT on other personality traits is close to zero in magnitude and not statistically significant.

Third, although our estimates control for a very rich set of observables, it could still be the case that other unobserved characteristics of the child, the mother or the father that are correlated with selection into unemployment could be driving our results. Hence, following Altonji et al. (2005) and Nunn and Wantchekon (2011), we use selection on observables to assess the potential bias of our estimates presented in Table 4 from unobservable omitted variables. To do so, we compare the effects estimated in Column (1),  $\hat{\beta}^R$ , that only controls for a restricted set of covariates (children's baseline personality), and Column (4),  $\hat{\beta}^F$ , that includes the full set of controls, by computing the following ratio:  $\hat{\beta}^F / (\hat{\beta}^R - \hat{\beta}^F)$ . This ratio is informative about how strong should selection on unobservables be, with respect to selection on observables, to entirely account for the estimated effects. On the one hand, the larger is  $\hat{\beta}^F$ , the larger the effect that needs to be explained by selection on unobservables. On the other hand, the smaller is the denominator the less our estimate is affected by selection on observables, and the stronger selection on unobservables needs to be to explain away the entire effect. For

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<sup>9</sup>We do not use system estimation in this analysis.

conscientiousness - the only trait for which we estimate a consistently significant ATT - we compute a ratio equal to 12.76. Hence, selection on unobservables should be at least 12 times stronger than selection on observables to explain away the *entire* effect of paternal unemployment on conscientiousness, putting us in a safe position.<sup>10</sup>

In a recent study, Oster (2015) extends the arguments of Altonji et al. (2005) about estimating the degree of selection on unobservables that would be required to drive the ATT to zero (called  $\delta$ ) to consider both coefficient movements *and* movements in R-squared values after the inclusion of controls. In fact, coefficient changes are informative about omitted variables bias only if these are *rescaled* by the movement in R-squared, i.e., by the additional fraction of variance of the outcome that is explained by the included controls. If this fraction is large, then the remaining variance of the outcome that can be explained by selection on unobservables, and thus bias coefficients, is negligible. Contrarily, changes in coefficients are less informative about the effects of unobservables' selection if this fraction is small. To apply this method, we need to set a maximum *attainable* value of the R-squared,  $Rmax$ , that indicates the maximum share of variance of the outcome that could be explained by *any* set of observable and unobservable covariates. Assuming that there is at least some random noise in empirical data, a value of  $Rmax = 1$  is viewed by Oster as too conservative. We follow the rule proposed by Oster of setting  $Rmax$  equal to 1.3 times the R-squared of the model that includes all covariates.<sup>11</sup> In our case, this implies to set  $Rmax = 0.42$  for conscientiousness and  $Rmax = 0.38$  for neuroticism. For conscientiousness, we compute that  $\delta_{0.42} = 4.66$ , that is way above the suggested threshold of 1. Indeed, our results would be robust even with higher values of  $Rmax$ . For instance, setting  $Rmax = 0.9$  would still leave us with  $\delta_{0.9} = 1.06$ .<sup>12</sup>

Our final analysis investigates whether the effects that we have estimated are heterogeneous by subgroups of the population. We estimate heterogeneous effects with linear models akin to (1), by interacting the treatment dummy with two dummies, one for each of the groups that we are interested in, and by excluding the constant from the model.

To understand whether there are gender differences in coping behavior, we first report heterogeneous effects by gender in Table 5. It is interesting to notice that the effects on both conscientiousness and neuroticism are larger in magnitude and statistically significant only for females. Although as shown by the p-values reported in Table 5 the effects

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<sup>10</sup>The ratio is equal to -3.475 for neuroticism. A negative ratio means that, if anything, the estimated effect is biased downwards by selection on unobservables, so long as selection on observables and selection on unobservables are positively correlated - a tenable assumption.

<sup>11</sup>This is computed by Oster as the value that would allow 90 percent of *randomized control-trial* studies published in the Top 5 economics journals between 2008 and 2013 to survive in rejection-of-zero tests like the one we are using.

<sup>12</sup>Even in this case, we compute a negative value of  $\delta$  for neuroticism, since  $\delta_{0.38} = -1.99$  and - in the extreme case where  $Rmax = 0.9$  -  $\delta_{0.9} = -.37$

by gender are not statistically different, these results suggest that our main results are mostly driven by women. This finding is rather surprising, given that several studies (Matud, 2004, Stratta et al., 2012, see for instance) find that males are generally better at coping with stressful events than females.

On the other hand, Table 6 shows a similar pattern as far as maternal employment status at baseline is concerned, since the effects are only statistically significant for the group of children whose mothers were employed at baseline.<sup>13</sup> This latter finding is also intriguing, as it may shed light about the mechanisms behind our main results. In fact, a potential interpretation of this finding is that unemployed fathers whose wives were employed at baseline may have had more time to search for an appropriate job, given the income support from their spouses, being thus more present in the family life while unemployed, with potentially positive effects on their children’s personality.

## 4 Conclusions

Using longitudinal data about the German population, we are the first to identify the effects of paternal unemployment on the Big 5 personality traits during adolescence and early adulthood. Our estimates from value-added models suggests that paternal unemployment has a surprisingly positive causal effect on children’s personality, as it improves their conscientiousness and decreases their levels of neuroticism. The former result is robust to a large set of specification checks and tests for bias due to selection on unobservables, while the latter result is less robust. Since in the models of Heckman (2007) and Conti et al. (2010) conscientiousness affects the educational, labor market and health behavior choices made by individuals, an increased level of conscientiousness in young age might lead to a virtuous “self-productivity cycle”, resulting in improved health and socioeconomic conditions throughout the life-cycle.

Two aspects of our results are worth of further discussion. First, it is not difficult to explain why we detect an effect of paternal job loss on conscientiousness and neuroticism of children, exclusively. Indeed, among the Big 5 dimensions, these two traits are the most related to children’s work vision and the ability to deal with their uncertain future. Second, our findings are in line with several psychological studies (see Seery, 2011, for a review) that show how experiencing moderate levels of adversity, such as paternal job loss, can be beneficial to the individual development by building resilience.

In addition to our previous results, our subgroup analysis has revealed that the effects of paternal unemployment are stronger for females and for children whose mothers were

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<sup>13</sup>Even in this case, however, the differences in the effects are not statistically significant.



employed at baseline. This further finding is rather surprising since males are generally found to be better able to cope with stressful events than females (Matud, 2004, Stratta et al., 2012).

Needless to say, several mechanisms can be at play to explain both our main results and those from subgroup analysis, such as the time spent by unemployed parents with their children or the negative role models from which children shy away, and further research that uses more extensive data should investigate this important aspect. Nevertheless, we believe that our findings provide empirical evidence in favor of the invoked necessity to consider non-cognitive skills in the design of educational systems. For instance, our results suggest a different justification for the practice of targeting scholarships and subsidies to the social and economic conditions of students' families. While traditionally motivated by fairness and justice concerns, our study suggests that targeting educational aids towards the worse-off can have efficiency implications as well, as it could promote the school attendance of students with conspicuous stocks of non-cognitive skills, so long as children with unemployed fathers are more likely to belong to this group.

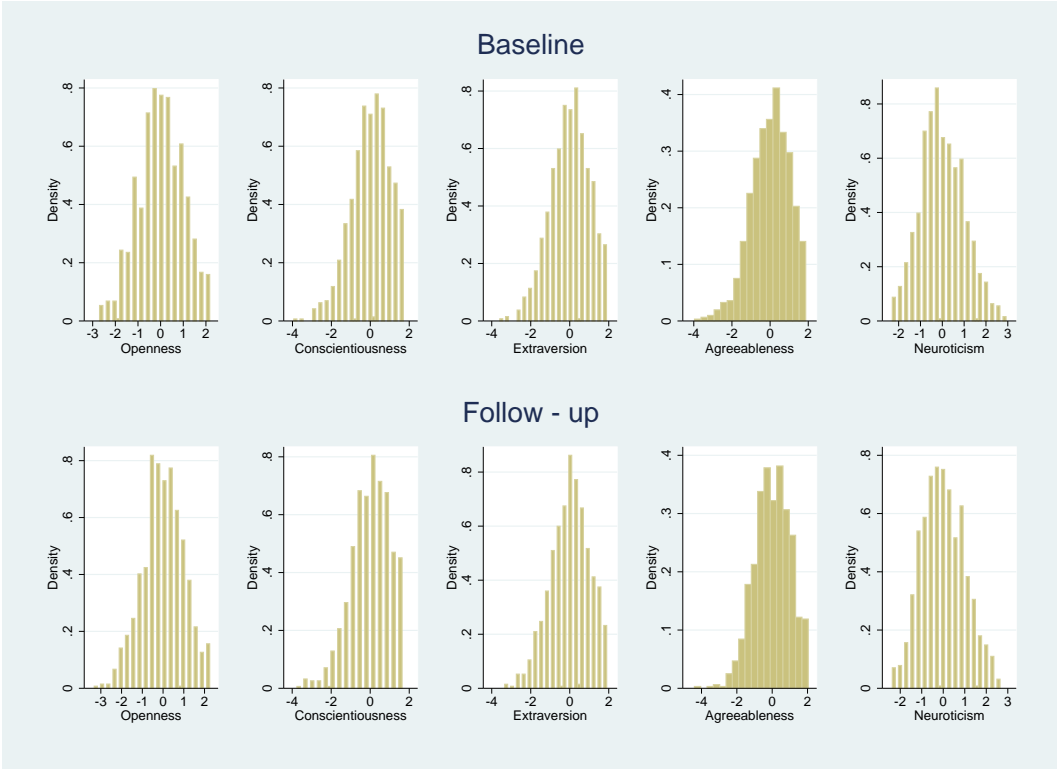
Finally, it is worth noticing that, by exporting value-added modelling from research on educational attainment to the field of personality studies, our paper also provides a new methodological framework to study the causal effect of socio-economic factors on personality development, that we hope will be fruitfully applied in future research.

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# Figures

Figure 1: Distribution of personality traits at baseline and follow-up



# Tables

Table 1: Descriptive Statistics - Number of Observations: 893

	Mean	SD	Min	Max
DadU	0.088	0.284	0	1
Child baseline controls				
Female	0.462	0.499	0	1
Age	20.646	2.453	17	25
Immigrant	0.054	0.226	0	1
Firstborn child	0.064	0.245	0	1
Has siblings	0.887	0.317	0	1
Poor health	0.037	0.189	0	1
Life satisfaction	7.439	1.560	1	10
Employed	0.604	0.489	0	1
Unemployed	0.039	0.194	0	1
In education	0.330	0.471	0	1
Mother baseline controls				
Age	47.287	4.809	35	68
Employed	0.793	0.406	0	1
Years of education	12.232	2.458	7	18
Immigrant	0.078	0.269	0	1
Poor health	0.114	0.318	0	1
Life satisfaction	7.058	1.681	0	10
Does not live with the child	0.160	0.367	0	1
Father baseline controls				
Age	49.685	5.015	34	62
Years of education	12.450	2.618	7	18
Immigrant	0.078	0.269	0	1
Poor health	0.125	0.331	0	1
Life satisfaction	6.946	1.746	0	10
Does not live with the child	0.178	0.383	0	1
Never unemployed before baseline	0.637	0.481	0	1
Employed in firm $\leq$ 200 employees	0.508	0.500	0	1
ln(labour earnings)	10.573	0.665	6.802	13.039
Tenure in the firm	15.513	10.737	0	45
Homeowner	0.742	0.438	0	1
Living in urban area	0.625	0.484	0	1

Table 2: Mean of selected father controls at baseline - by paternal unemployment

	Mean Employed Father	Unemployed - Employed Father
Age	49.469	2.442*** (0.622)
Years of education	12.547	-1.098*** (0.225)
Immigrant	0.075	0.039 (0.037)
Poor health	0.112	0.154*** (0.051)
Life satisfaction	7.053	-1.205*** (0.259)
Never unemployed before baseline	0.666	-0.324*** (0.056)
Does not live with the child	0.163	0.166*** (0.055)
Employed in firm $\leq 200$ employees	0.484	0.276*** (0.051)
ln(labour earnings)	10.621	-0.562*** (0.090)
Tenure in the firm	16.107	-6.716*** (1.179)
Homeowner	0.759	-0.190*** (0.058)
Lives in urban area	0.633	-0.088 (0.059)

Notes: Robust standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Table 3: Mean children personality traits at baseline and follow-up, by paternal unemployment

	Mean Employed Father	Unemployed - Employed Father
Baseline		
Openness	0.002	-0.017 (0.121)
Conscientiousness	-0.011	0.125 (0.112)
Extraversion	0.010	-0.116 (0.105)
Agreeableness	0.011	-0.121 (0.110)
Neuroticism	-0.007	0.079 (0.133)
Follow-up		
Openness	-0.005	0.057 (0.124)
Conscientiousness	-0.026	0.291*** (0.097)
Extraversion	0.000	-0.003 (0.114)
Agreeableness	-0.007	0.085 (0.129)
Neuroticism	0.008	-0.096 (0.117)

Notes: Robust standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Table 4: Main results

	(1)	(2)	(3)	(4)
Openness	0.057 (0.102)	0.058 (0.114)	0.061 (0.114)	0.054 (0.113)
Conscientiousness	0.228*** (0.081)	0.203** (0.088)	0.211** (0.090)	0.211** (0.090)
Extraversion	0.044 (0.107)	0.055 (0.119)	0.050 (0.118)	0.052 (0.117)
Agreeableness	0.132 (0.109)	0.116 (0.111)	0.113 (0.110)	0.106 (0.108)
Neuroticism	-0.132 (0.099)	-0.187* (0.108)	-0.181* (0.107)	-0.185* (0.106)
Child's baseline personality	Yes	Yes	Yes	Yes
Child and parents' baseline covariates	No	Yes	Yes	Yes
Parents' baseline personality	No	No	Yes	Yes
Child's baseline employment status	No	No	No	Yes
Observations	893	893	893	893

Notes: The table reports the effect of *DadU* on each personality trait. Controls included in each model are listed at the bottom of the table. The equations for the different personality traits in each model are estimated jointly, using seemingly unrelated estimation. Robust standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Table 5: Heterogeneous effects by gender of the child

	(1)	(2)	(3)
	Males	Females	Difference (p-value)
Openness	0.093 (0.153)	0.009 (0.158)	0.697
Conscientiousness	0.151 (0.119)	0.282** (0.124)	0.428
Extraversion	0.143 (0.145)	-0.055 (0.176)	0.367
Agreeableness	0.064 (0.136)	0.156 (0.165)	0.655
Neuroticism	-0.055 (0.143)	-0.338** (0.148)	0.153
Child's baseline personality	Yes	Yes	
Child and parents' baseline covariates	Yes	Yes	
Parents' baseline personality	Yes	Yes	
Child's baseline employment status	Yes	Yes	
Observations	893	893	

Notes: The table reports the heterogeneous effects of *DadU* on each personality trait for males and females. The effects are estimated by running a model interacting *DadU* with dummies for males and females, and omitting the constant. The p-value for the significance of the difference in the effects across genders is also reported. The specification adopted is equal to the one shown in Column 4 of Table 4. The equations for the different personality traits are estimated jointly, using seemingly unrelated estimation. Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Table 6: Heterogeneous effects by maternal employment at baseline

	(1)	(2)	(3)
	Not employed	Employed	Difference (p-value)
Openness	0.165 (0.220)	0.007 (0.126)	0.524
Conscientiousness	0.141 (0.156)	0.241** (0.104)	0.584
Extraversion	-0.061 (0.221)	-0.101 (0.130)	0.512
Agreeableness	0.183 (0.200)	0.073 (0.127)	0.634
Neuroticism	-0.037 (0.187)	-0.281** (0.123)	0.141
Child's baseline personality	Yes	Yes	
Child and parents' baseline covariates	Yes	Yes	
Parents' baseline personality	Yes	Yes	
Child's baseline employment status	Yes	Yes	
Observations	893	893	

Notes: The table reports the heterogeneous effects of *DadU* on each personality trait, by employment status of the mother. The effects are estimated by running a model interacting *DadU* with dummies for employed and unemployed mothers, and omitting the constant. The p-value for the significance of the difference in the effects by maternal employment is also reported. The specification adopted is equal to the one shown in Column 4 of Table 3. The equations for the different personality traits are estimated jointly, using seemingly unrelated estimation. Robust standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .



# Appendix

Table A.1: SOEP personality questionnaire

Big 5 personality factor	Statement
	I see myself as someone who...
Openness	... is original, comes up with new ideas
Openness	... values artistic experiences
Openness	... has an active imagination
Conscientiousness	... does a thorough job
Conscientiousness	... does things effectively and efficiently
Conscientiousness (reversed)	... tends to be lazy
Extraversion	... is communicative, talkative
Extraversion	... is outgoing, sociable
Extraversion (reversed)	... is reserved
Agreeableness	... has a forgiving nature
Agreeableness	... is considerate and kind to others
Agreeableness (reversed)	... is sometimes somewhat rude to others
Neuroticism	... worries a lot
Neuroticism	... gets nervous easily
Neuroticism (reversed)	... is relaxed, handles stress well

Notes: respondents were asked to state how much they agreed with each statement on a 7-point Likert scale. Some items' scales are reversed when computing the personality scores.

Table A.2: Robustness test - personality traits obtained via confirmatory factor analysis

	(1)	(2)	(3)	(4)
Openness	0.094 (0.100)	0.082 (0.111)	0.085 (0.111)	0.081 (0.110)
Conscientiousness	0.224*** (0.080)	0.234*** (0.089)	0.249*** (0.091)	0.251*** (0.090)
Extraversion	0.054 (0.102)	0.066 (0.112)	0.060 (0.112)	0.063 (0.111)
Agreeableness	0.124 (0.103)	0.106 (0.104)	0.115 (0.102)	0.105 (0.101)
Neuroticism	-0.146 (0.100)	-0.207* (0.109)	-0.207* (0.109)	-0.214** (0.108)
Child's baseline personality	Yes	Yes	Yes	Yes
Child and parents' baseline covariates	No	Yes	Yes	Yes
Parents' baseline personality	No	No	Yes	Yes
Child's baseline employment status	No	No	No	Yes
Observations	893	893	893	893

Notes: The table reports the effect of *DadU* on each personality trait. Controls included in each model are listed at the bottom of the table. The equations for the different personality traits in each model are estimated jointly, using seemingly unrelated estimation. Robust standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Table A.3: Robustness test - Inverse Probability Weighting and Entropy Balancing

	(1)	(2)
	IPW	EBAL
Openness	-0.029 (0.148)	0.047 (0.154)
Conscientiousness	0.368*** (0.139)	0.293** (0.149)
Extraversion	-0.110 (0.129)	0.001 (0.140)
Agreeableness	0.132 (0.152)	0.071 (0.159)
Neuroticism	-0.272** (0.122)	-0.225 (0.139)
Child's baseline personality	Yes	Yes
Child and parents' baseline covariates	Yes	Yes
Parents' baseline personality	Yes	Yes
Child's baseline employment status	Yes	Yes
Observations	893	893

Notes: The table reports the effects of *DadU* on each personality trait using different semiparametric estimators. Column 1 balances treated and control units using Inverse Probability Weights obtained via propensity score estimation. The covariates included in the model for the propensity score are listed at the bottom of the table. Inference is carried out as in Cattaneo, 2010. Column 2 presents results obtained via entropy balancing (see Hainmueller, 2012) to balance the means of the same covariates included in the estimation of the propensity score in Column 1. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

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