



Parental non-response and students' test scores[☆]



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ABSTRACT

Using Programme of International Student Assessment (PISA) data, we show that parental non-response on a survey is negatively and significantly associated with children's test scores after controlling for the usual determinants of educational achievement. A one-standard-deviation increase in the proportion of parental non-responses decreases their children's scores by an average of 7.2 PISA points. Considering the incidence of non-response, we find that children with parents who had at least one missing or invalid item on the questionnaire scored 11.14 PISA points lower on average than children whose parents answered all of the survey questions. We present parents' personality, in particular conscientiousness, as a prominent candidate to explain our results.

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"Due to high rates of parental non-response in most countries, caution is needed when analysing this data. Non-response is unlikely to be random."

—OECD (2012), PISA 2009 Technical Report

1. Introduction

Family is commonly recognized as a key determinant of student educational achievement. Socioeconomic background and other observable characteristics (e.g., parental education, occupation or earnings) have been found to play an important role in student academic outcomes; see Chevalier, Harmon, O'Sullivan, and Walker (2013), Dahl and Lochner (2012), Delaney, Harmon, and Redmond (2011), Hanushek and Woessmann (2011) and Holmlund, Lindahl, and Plug (2011), among others. However, in addition to these observable characteristics, the literature in this field often notes the existence of other non-observable and not interpersonally comparable characteristics, such as parents' attitude, beliefs or personality, which might mediate their parenting style and affect student outcomes (Davis-Kean, 2005; Hoover-Dempsey & Sander, 1995; Todd & Wolpin, 2007). Belsky and Barends (2002) noted that individuals

scoring high in certain personality traits provide more supportive, sensitive, responsive, and intellectually stimulating parenting, which benefits their children's development. An important difficulty in studying the effects of parental personality on children's achievement is a lack of data that simultaneously provide information on parents' personality and children's academic records.

In the present paper, we use parental non-response in a survey as a measure of parents' personality and study its relationship with students' scores on a test. We base this approach on previous literature that has proposed using survey non-response as a proxy for noncognitive skills and personality traits.¹ Hedengren and Stratmann (2012) showed that survey non-response is correlated with self-reported measures of conscientiousness, while Hitt, Trivitt, and Cheng (2016) validated non-response as a proxy for noncognitive skills related to conscientiousness. Cheng, Zamorro, and Orriens (2016) found that self-reported measures of personality predict the incidence of non-response in subsequent survey waves.² Following this approach,

¹ We refer to noncognitive skills as individual abilities that are not directly related to individuals' knowledge but to their personality. Consequently, the terms personality and noncognitive skills are used interchangeably throughout the paper.

² The possibility that survey non-response might capture lower levels of cognitive and noncognitive skills was already suggested by Groves et al. (2011). Boe, May, and Boruch (2002) also proposed an association between non-response patterns and noncognitive skills. Di Chiacchio, De Stasio, and Fiorilli (2016) analysed the omitting behavior of students and its relationship with motivation and test scores. In related studies, Matters and Burnett (1999, 2003) found that skipping items on a test may also be related to personality as well as to cognitive skills.

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parental non-response serves as a valuable source of information for several reasons. First, the time-consuming nature of filling out a questionnaire provides a task-based measure. Unlike self-reports, the proposed measure is interpersonally comparable. Second, the non-challenging nature of the questionnaire disregards parental cognitive skills as determinants of parental non-response.³ Third and more importantly, this information is readily available in many educational assessments and can be easily linked to students' achievement. In our case, we use data from the Programme of International Student Assessment (PISA). Despite a lack of information on parents' personality in the PISA data, our strategy allows us to use this large and representative dataset to study the relationship between parental personality and children's test scores. We can do so for the 15 different countries that administered the parental questionnaire in the 2009 wave.

After controlling for the usual determinants of educational achievement, we show that parental non-response is negatively and significantly correlated with student test scores in all countries with available data. In our preferred (and most conservative) estimation, we find that a one-standard-deviation increase in parents' non-response is associated with a reduction of 7.2 PISA points in students' scores (ranging from 1.85 points in Korea to 13.01 points in Croatia). Using this more strict specification, our finding is statistically significant in all countries except Korea and Panama. We also study the effect of the incidence of parental non-response rather than its proportion and we find that students whose parents left at least one missing or invalid item on the questionnaire have PISA scores that are, on average, 11.14 points lower than children whose parents completed the entire questionnaire (ranging from 4.41 points in Qatar to 17.82 points in Croatia). When using the less conservative measure and standardizing all of the variables, the size of this effect was found to be comparable to that of the socioeconomic status index provided in the PISA data.⁴ These results are very robust across countries and evaluated topics. We find only a few variables that exhibit such a robust association across countries, i.e., gender, socioeconomic status and the number of books at home.

A potential candidate to drive our results is the personality trait of conscientiousness. This statement is built on the combination of two different streams of research. On the one hand, [Hedengren and Stratmann \(2012\)](#) and [Hitt et al. \(2016\)](#) validated survey non-response as a measure of noncognitive skills related to conscientiousness, while [Cheng et al. \(2016\)](#) found that conscientiousness (and openness to experience) is a predictor of survey non-response. On the other hand, parents' personality has been found to be associated with parenting behavior. Higher levels of conscientiousness have been associated with more supportive parenting ([Losoya, Callor, Rowe, & Goldsmith, 1997](#)), with more responsive and less power-assertive parenting ([Clark, Kochanska, & Ready, 2000](#)) and with parents' ease in facilitating adolescents' behavioral adjustments ([Oliver, Guerin, & Coffman, 2009](#)). Additionally, conscientiousness was one of the personality traits that correlated with more warmth and behavioral control in the meta-analysis by [Prinzle, Stams, Deković, Reijntjes, and Belsky \(2009\)](#). Linking these two different streams of research reveals that conscientiousness is related to both higher rates of non-response and to better parenting skills. Consequently, conscientiousness must be recognized as a prominent candidate to explain our results. Our paper contributes to this

literature by suggesting that parents who score higher on conscientiousness improve their children's competence in mathematics, science and reading. In light of the above references, this relationship is potentially mediated by better parenting behavior.

Parenting has been found to play an important role on children's development ([Baumrind, 1966](#); [Collins, Maccoby, Steinberg, Hetherington, & Bornstein, 2000](#)). [Pettit, Bates, and Dodge \(1997\)](#) found that children that enjoyed a warmth and responsive parenting, exhibit fewer aggressive and delinquent behaviors and lower levels of distress, social withdrawal and somatic symptoms. Behavioral control relates to lower levels of externalizing problems in adolescents ([Galambos, Barker, & Almeida, 2003](#)) and to lower aggressiveness ([Mazefsky & Farrell, 2005](#)). Other studies have found a direct relationship between parental personality and children's outcomes. Children whose parents report high levels of conscientiousness are less likely to manifest behavioral problems ([Nigg & Hinshaw, 1998](#); [Prinzle et al., 2005](#)). Our study fits in this second approach, as we directly relate student outcomes to a measure of parental personality. However, a relevant difference is that we find that parental personality is also related to the children's test scores.

For a better understanding of our results, we also use children's non-response on the questionnaire that accompanies the PISA test. We show that parental non-response is positively and significantly associated with children's non-response. [Cheng \(2015\)](#) and [Cheng and Zamarro \(2016\)](#) used a similar approach to study the association between teacher and student non-response. Relying on previous studies that validated non-response as a measure of conscientiousness and using quasi-experimental data, the authors found that higher levels of teacher conscientiousness improve the level of conscientiousness of their students but not their test scores. In contrast, we find that parental non-response correlates both with non-response and with the test scores of their children. This result might be interpreted as reflecting the prominent role that family plays in educational achievement. Higher levels of parents' conscientiousness correlate both with children's cognitive skills (test scores) and noncognitive skills related to conscientiousness (survey non-response). Moreover, parental non-response is found to be significantly associated with students' test scores, even after controlling for students' non-response. This result indicates that parental skills captured by their non-responses are not mediated by the same skills that are captured by students' non-response. This reinforces the idea that parents' personality may also help to develop their children's competence in mathematics, science and reading.

2. Empirical strategy

We employ the education production function approach, which has been used extensively since it was developed by [Coleman et al. \(1966\)](#). Following [Hanushek and Woessmann \(2011\)](#), we divide the determinants of educational achievement into four groups: student characteristics (X_i), family background (F_i), school inputs (S_i) and institutions (I_i). In [Table A1](#), we provide detailed information on all of the explanatory variables.

F_i is of particular relevance to our study, as it accounts for family background features (e.g., parental education or the number of books at home). Previous studies have found that F_i largely affects student achievement levels; see [Hanushek and Woessmann \(2011\)](#), among others. Family factors have often been restricted to parental socioeconomic characteristics. However, as previously noted in the literature, parents may play a role in the education of their children that goes beyond the effects captured by socioeconomic background. We intend to enrich the available set of parental information by including a task-based measure of parental personality. In particular, we consider parent non-responses to the questionnaire that accompanies the PISA test (nr_i), which has been validated as a proxy

³ This point is corroborated by the fact that lower levels of parental education do not increase the incidence of non-response.

⁴ Our most conservative non-response measure only includes missing and invalid items, whereas our less conservative measure also includes unreturned questionnaires. Students were responsible for delivering the questionnaire to their parents. Therefore, it is not possible to determine whether a lack of questionnaire delivery was attributable to the parents or the children. Consequently, we prefer the most conservative non-response measure, as only parents are held responsible.

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