Birth order, skills, education and labour market outcomes in Madagascar *

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Abstract

Applying family-type fixed effects to the 2012 Madagasacar Youth Transition Survey's data, we examine the effect of birth order on non-cognitive and cognitive skills, education and labour market outcomes. We find that firstborns are more likely to be fixed-wage workers and show more spirit of initiative than their younger siblings. We do not find any effect of birth order on other measures of personality. The effect of birth order on cognition and education depends greatly on parent's educational level. There is no difference in school attainment for children whose none or only one parent has a primary education. On the contrary, when both parents have at least a primary education, they invest less in their later borns' schooling. The negative effect of birth order on education is common in developed countries. In the context of Madagascar, we can imagine that first children need more investments in their schooling to play the role of a safety net for the whole family once they enter the labour market.

Keywords: Birth order; non-cognitive skills; cognitive skills; educational and occupational attainments

JEL Classification: D1; I2; J1

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1 Introduction

The formation of cognitive and non-cognitive skills is strongly influenced by the context in which the individual grows up, and in particular by the investment of parents in the first years of life (Cunha et al., 2010). The way parents interact with their child varies considerably depending on the number of siblings, on the experience of the parents themselves and, in some contexts, on the gender of the child. Firstborns can, for example, benefit from more attention from parents, who have more time to dedicate to them, while last children can benefit most from their parents' experience (Zajonc, 1976; Markus and Zajonc, 1977; De Haan et al., 2014; Monfardini and See, 2016; Lehmann et al., 2018). Moreover, parents are often more strict with their first children and this could lead them to develop greater persuasive and communication skills (Black et al., 2018). Conversely, later children are likely to suffer from the comparison with their older siblings and this could induce them to develop more their creativity skills to differentiate from them (Sulloway, 1996). Child development is also influenced by the interactions with siblings: older siblings, for example, are likely to develop more their sense of responsibility (Sulloway, 1996; Black et al., 2018), their patience, as well as their pedagogical skills (Zajonc, 1976; Markus and Zajonc, 1977). All this implies that a child's birth order can have important effects on her cognitive and non-cognitive development with an indirect impact on her chances of success in her adult's professional life.

Most of the literature on the effects of birth order on cognitive and non-cognitive skills focuses on developed countries. It is unclear if results can be extended to poor countries, where budget constraints are more pronounced and thus economic motivations are likely to play a more important role for parents when they need to decide how much to invest in their child (Eirnæs and Pörtner, 2004; Emerson and Souza, 2008; Tenikue and Verheyden, 2010; De Haan et al., 2014; Lafortune and Lee, 2014). Also, these phenomena are strongly influenced by cultural and social norms, that are context-specific.

In this paper, we explore the effect of birth order on several life outcomes (i.e. cognitive and non-cognitive skills, school attainment and beginning of professional life) in Madagascar, using data on a cohort of youths interviewed in 2004 when aged 14 on average and then in 2012. In order to identify an unbiased effect of birth order on the outcomes of interest, we estimate a family type fixed effect model, as in Black et al. (2018).

Our results indicate that first and second born children develop more spirit of initiative with respect to their younger siblings and they are also more likely to earn a fixed wage. This seems to suggest that elder children are more pushed by their parents, or by the circumstances in which they grow up, to go out of their way, maybe to help their family. When we look at the heterogeneities across parents' education, we also see that more educated parents invest more in the education of their first and second born, while their latest children enter earlier in the labor market. The effect of birth order on cognitive skills is also closely interlinked with parents' education, with third and latest-borns of less educated parents having higher cognitive skills (although this effect is not robust across all specifications), probably benefiting from spillovers from their older siblings or from more maternal investment, as showed from De Haan et al. (2014) for Ecuador. A similar pattern is not observed among siblings of more educated parents.

Put together, our results suggest that, when they are both educated, Malagasy parents behave similarly to the parents in developed countries, investing less in their later-borns, who show lower school attainments, lower cognitive skills and (for the fourth and later

children) lower age at first job. The results on the spirit of initiative and on the probability to earn a fixed wage are, conversely, new in the literature and further research would be necessary to understand if they are specific to the Malgasy context or if they can be extended to other developing countries.

The rest of the paper structures as follows: section 2 presents the relevant literature, section 3 describes the data and the main variables of interest, section 4 presents the methodology, while the main results and the robustness checks are presented in section 5 and 6 respectively. The last section concludes.

2 Literature review

The effect of birth order has been tested on a diversity of outcomes (Black, 2017). In this paper, we are mostly interested in the effect of birth order on cognitive skills (Black et al., 2005; De Haan et al., 2014; Botzet et al., 2020), non-cognitive skills (Abdel-Khalek and Lynn, 2008; Barclay, 2015; Damian and Roberts, 2015; Rohrer et al., 2015; Al–Khayat and Al-Adwan, 2016; Calimeris and Peters, 2017; Black et al., 2018; Boccio and Beaver, 2019; Botzet et al., 2020), education (Black et al., 2005; De Haan et al., 2014; Botzet et al., 2020) and employment (Black et al., 2005, 2018; Botzet et al., 2020). To date, there is no consensus on the effect of birth order on those outcomes. Most differences in the results are related to the context and whether the study takes place in a developed or a developing country.

For non-cognitive skills, existing literature shows no or very little effect of birth order on personality (Damian and Roberts, 2015; Rohrer et al., 2015; Lehmann et al., 2018; Boccio and Beaver, 2019; Botzet et al., 2020). Only Black et al. (2018) find a negative effect of birth order on non-cognitive skills in Sweden. Black et al. (2018) take advantage of the military enlistment data from the Swedish War Archive. This dataset give them results to psychological tests that Swedish men used to take when they enlisted in the military [1]. Men were interviewed by a certified psychologist who had to assess their emotional stability, persistence, willingness to assume responsiblity, ability to take initiative and if they were socially outgoing. Black et al. (2018) use an overall measure of those personnality traits to conduct the analysis. They find that later born males perform significantly worse on non-cognitive skills. The effect is stronger for boys with older brothers than for boys with older sisters. Differences in personality depending on birth order and sibship's sex composition can be explained by the Sulloway (1996)'s family niche model. According to Sulloway (1996), later borns have to be creative to differentiate themselves from their older (same sex) siblings. They become more unconventional to attract parental attention. Those differences in personality seem to influence the occupational choices in Sweden, where male firstborns are more likely to be in occupations, like top manager, that require positive non-cognitive skills (Black et al., 2018). The effect of birth order on employment is also observed in Norway, where later borns earn less than first borns and later born women are less likely to work full-time (Black et al., 2005). In Indonesia, Botzet et al. (2020) do not find any effect of birth order on employment.

Concerning cognitive skills, Black et al. (2005) and Barclay (2015) find that later-borns have lower cognitive abilities than their older siblings in Norway and in Sweden. There

[1] Until 2010, all Swedish men had to enlist in the military.

is no consensus on the effect of birth order on cognitive skills for developing countries. On the one hand, in Ecuador, De Haan et al. (2014) find a positive effect of birth order on preschool cognition: later-borns perform better than firstborns. On the other hand, in Indonesia, Calimeris and Peters (2017) find that second and third born perform worse than firstborns on cognitive skills.

The effect of birth order on cognitive skills is related to the effect of birth order on education. It is generally admitted that in developed economies, later-borns have a lower educational attainment than their older siblings (e.g. Great Britain and Norway: Booth and Kee, 2009; Black et al., 2005, see Botzet et al. (2020) for a more detailed literature review of findings in developed countries). In developing economies, results are more mixed. Some authors find a negative effect of birth order on educational outcomes, as in developed countries (Schwefer, 2018; Moshoeshoe, 2019). Others find a completely opposite effect: later-borns are more educated than earlier borns (Eirnæs and Pörtner, 2004; Emerson and Souza, 2008; De Haan et al., 2014; Botzet et al., 2020). Finally, Dayioğlu et al. (2009) find a non linear effect of birth order on school enrollment in Turkey: earlier borns and later-borns are more likely to be enrolled in school than middle borns. When they drop firstborns from their analysis, they find a linear effect of birth order on school enrollment probability meaning that firstborns are the most likely to be enrolled in school. This parabolic effect is stronger for poorer families. Indeed, the effect of birth order on educational attainment depends on the household's wealth. For example, in Subsaharan Africa, earlier born children have lower education level in poor households while they are more educated than their younger siblings in wealthier families (Tenikue and Verheyden, 2010).

The intertwined relationship between wealth, birth order, education and cognitive skills is explained by the dilution theory (Blake, 1981). As sibship grows, children have to share parental resources (either time or economic resources) with their siblings. In developing countries, where budget constraints are more pronounced, inequalities in resources sharing can be exacerbated. In Indonesia, for example, Calimeris and Peters (2017) found that second and third born children eat a smaller variety of food than firstborns[2]. On the other hand, poverty can lead parents to send the earlier born child to work to provide more resources to the whole sibship or to take charge of domestic chores while both parents are working, to the detriment of their education (Eirnæs and Pörtner, 2004; Emerson and Souza, 2008; Tenikue and Verheyden, 2010; De Haan et al., 2014; Lafortune and Lee, 2014).

Parental time investment has been shown to have a strong effect on the formation of cognitive and non-cognitive skills, especially at early stages of life (Hsin, 2007; Cunha and Heckman, 2008; Carneiro and Rodrigues, 2009; Cunha et al., 2010; Lehmann et al., 2018; Attanasio et al., 2020). Literature shows that the time spent by parents with earlier and later-borns varies across countries. In the US, later-borns spend less quality time with their mother. They are less cognitively stimulated by her than earlier borns (Monfardini and See, 2016; Lehmann et al., 2018). On the contrary, in Ecuador, De Haan et al. (2014) find that later born children receive more cognitive stimulation by their mother and are breastfed longer. Lehmann et al. (2018) and De Haan et al. (2014) show that time spent with parents playing games or reading books stimulating cognition explain the effect of birth order on cognitive skills.

[2]However, this difference does not drive the negative effect of birth order on cognitive skills.

Parents might also discriminate among their children depending on the sex composition of the sibship. In India, Jayachandran and Pande (2017) showed that son preference is a determinant of child stunting since parents increase family size until they have a son and provide more resources to him. In Korea, men have a higher education level when they have a higher fraction of younger female siblings (Lafortune and Lee, 2014). In Turkey, girls have a lower probability of being enrolled in school when they have a higher fraction of male siblings and live in a poor household. Conversely, they are more likely to go to school when they have relatively more brothers but come from a wealthier household (Dayioğlu et al., 2009).

Literature review showed that the evidence on the effect of birth order on non-cognitive and cognitive skills, education and labor market outcomes in developing countries is quite scarce and results are often inconsistent. In what follows, we explore those issues in Madagascar.

3 Data description

To analyze the effect of birth order on non-cognitive and cognitive skills, education and labor market outcomes in Madagascar, we use data from the 2012 Madagasacar Youth Transition Survey. This survey is a follow-up of the 2004 Madagascar Study on Academic Progress and Academic Performance (EPSPAM). The 2004 survey was based on the PASEC (Programme d'Analyse des Systèmes Éducatifs de la CONFEMEN) survey that took place in 1998 in Madagascar and was addressed to children enrolled in 2nd grade. 48 clusters were randomly selected from the original 120 PASEC clusters. 25 additional "small[3]" schools' communities were also sampled from the Ministry of Education database after stratifying on provinces. Small schools were added to the sample because PASEC schools in rural areas were larger than average rural schools. In each PASEC's cluster, 15 children surveyed in 1998 were resurveyed in 2004. As PASEC sample was school-based, only children enrolled in school in 1998 were part of the sample. To avoid selectivity bias, 15 additional children of the same cohort (i.e. born between 1988 and 1992), but who did not take part in the PASEC survey, were randomly selected within each cluster and added to the 2004 sample[4]. Although the sample was cohort-based, all household members were interviewed.

In the 2012 survey, around 1800 households from the 2004 survey were revisited (89% of the 2004 survey). The 2012 survey was designed to specifically capture the transition from adolescence to young adulthood of the individuals who were part of the PASEC cohort. Detailed questions on education, employment, health, marriage and migration were asked to the members of this cohort, that were between 20 and 24 years old in 2012. Cohort members were also asked to name and give the age of all their siblings, living either in or out of the household. Thanks to those information we are able to build the cohort members' birth order.

[3] A public primary school was considered as small when it had fewer students than the national median of about 140 students

[4] See Glick et al. (2011) for a more detailed description of the sampling method.

As we are interested in the effect of birth order on multiple outcomes, we drop only child and twins from our sample. We end up with a sample of 1,527 individuals (52.13% of females) having between 1 and 14 siblings. Cohort members have 4.4 siblings on average. Almost one third of them is firstborn (30.71%) and one quarter second born (24.75%). The share of female remains stable accross birth orders meaning that son preference is not strong in the Malagasy society (Table 4).

We have information on education and employment for the full sample but only for 1,364 cohort members' cognitive skills and 1,468 cohort members' non-cognitive skills. Concerning age at first work, only cohort members who have already worked answer the corresponding question in the survey. That is why we have this information for only 1,255 individuals.

More details on the construction of our outcomes of interest are provided below. Outcome variables and the variables used as covariates are described in table 4 in Appendix A.1.

3.1 Non-cognitive skills

Cohort member's non-cognitive skills were assessed by a 116 questions test. Respondents had to rate on a 5 points Lickert scale whether they fully disagree (rated 1) or fully agree (rated 5) that a statement describes them. Statements used are a mix of commonly used items aimed to measure non-cognitive skills[5]. For example, respondents had to declare whether they agree or not that the statement "I like to tidy" describes them.

We tried to combine the 116 items to build a commonly used taxonomy of non-cognitive abilities: the Big-5 personnality traits. According to John et al. (1999), the Big 5 "represent personality at the broadest level of abstraction, and each dimension summarizes a large number of distinct, more specific personality characteristics". Big-5 dimensions are known under the acronym OCEAN: openness, conscientiousness, extraversion, agreeableness and neuroticism. They are particularly accurate for developed countries. As warned by Laajaj and Macours (2017) and Laajaj et al. (2019), Big-5 taxonomy might not emerge in developing countries. The major issue is that in developing economies, non-cognitive skills are assessed thanks to face-to-face surveys while they are mostly assessed on computers in developed economies. Biases in responses might especially arise in face-to-face surveys in developing countries because of interactions between respondents and interviewers, items' translations and lower educational level that can make questions more difficult to understand. Specifically, acquiescence bias (tendency to agree with every statements, even when they are contradictory) might be more common. To check whether the Big-five taxonomy emerges in our data, we conducted a factorial analysis, after correcting for acquiescence bias, on our respondents' answers to the 116 items aimed at measuring non-cognitive skills. The personality traits that emerge from the factorial analysis are slightly different from the Big-five taxonomy. They are : responsibility, initiative, extraversion, emotional stability and openness (See Appendix A.6 for a detailed list of items and personality traits they belong to).

[5] A detailed list of usual scales and items used to assess non-cognitive skills is accessible at https://ipip.ori.org/

The internal consistency of our personality traits' constructs is satisfactory. For each personality trait except openness, Cronbach's Alphas are over 0.7[6]. Three of the personality traits that emerge from our factorial analysis are common to the Big-5 personality traits (extraversion, emotional stability and openness). To check whether they accurately measure extraversion, emotional stability or opennes, we also constructed a naive measurement of non-cognitive skills. We simply averaged answers to items that belong to a determined trait (See Appendix A.6 for the detailed naive classification of items within each personality traits). The naive and factorial analysis constructs of common personality traits are sufficiently correlated to each other (0.46 for openness, 0.6 for extraversion and 0.7 for emotional stability, see table 17). For the sake of simplicity, we will only use personality traits that emerged from factorial analysis when analyzing the effect of birth order on non-cognitive skills. [7]

When we compare the average scores in non-cognitive skills between firstborns and later-borns, we see that our measures of spirit of initiative and openness decrease with birth order. On the contrary, firstborns are less responsible, extroverted and emotionally stable than later borns (Table 4). However, observing the relationship between birth order and personality without controlling for family background variables might lead to spurious correlations (Black et al., 2018).

3.2 Cognitive skills, education and labour market outcomes

In the Madagascar Youth Transition Survey, cognitive skills are appraised by oral and written French and Maths assessments administered at home. Tests were designed by specialists from the Ministry of Education to compare cognitive skills among a heterogenous population. Each cohort member took the same test, regardless of her educational level. During the test, questions were progressively more complicated. To reduce the effect of the test structure on the scores, we used an Item Response Theory (IRT) methodology which gives lower weight to easier questions[8]. We will use the combined IRT Maths and French z-score for the rest of the analysis [9]. Table 4 shows that later-borns perform better than firstborns either in Maths or in French.

Concerning education, we will be interested in the effect of birth order on school attainment (highest completed grade). Half of our analysis sample (52.98%) dropped out of school before ninth grade. Firstborns completed about 0.7 grade less with respect to the second and third borns, but only 0.5 less than later borns (Table 4).

Firstborns start also to work slightly earlier than later borns. Once on the labor market, firstborns are less likely to earn fixed wage (9% vs 13%) but more likely to be own account worker (24% vs 19%) (Table 4). The rest of the analysis will focus on the effect of birth order on the probability to earn fixed wage. We consider that stability in earnings is a good proxy

[6]Cronbach's Alpha assesses the extent to which items are measuring the same underlying construct. A minimum threshold of 0.7 is often applied in the litterature. (Laajaj and Macours, 2017)

[7]Our results are robust to the use of the "naive" measurement of the personality traits

[8]See Aubery and Sahn (2019) for a more detailed presentation of cognitive skills assessment in the Madagascar Youth Transition Survey 2012

[9]We also performed our analysis on separate Maths and French scores but do not find any meaningful difference with our analysis on the combined score

for the quality of employment [10].

As noted by Black et al. (2018) these simple descriptive statistics can be misleading as they compare individuals who do not necessarily have the same family background. Table 4 shows that later-borns belong to larger sibships and have older mothers than firstborns. Their parents are more likely to be wage workers and they grew up in wealthier households. These characteristics could also influence our outcomes of interest. We present in next section the empirical strategy we adopt to identify the effect of birth order on the outcomes we described.

4 Empirical strategy

Ideally, to assess the effect of birth order on outcomes of interest, researchers would need to have information about those outcomes for several member of the sibship in a sufficiently large sample of families. In this case, researchers can use a family fixed effect model which takes into account all family characteristics that could bias the effect of birth order.

Data allowing to use family fixed effect models are quite rare. When using family fixed effect models is impossible, researchers use between-family models instead. Between family models compare firstborns to later borns coming from different families controlling for family background characteristics that could bias the effect of birth order. Important controls are sibship size, mother's age, mother's age at first birth and socio-economic controls (Black et al., 2018). Still, the effect of birth order can be biased by unobservables that simultaneously influence birth order and the outcome of interest.

Black et al. (2018) propose a third way to estimate the effect of birth order on outcomes of interest : family type fixed effect models. Black et al. (2018) assume that same size families with children born on the exact same year are sufficiently similar to be used as fixed-effects. They actually show that the negative effect of birth order on non-cognitive skills they find in Sweden using within-family models remain when they use family-type fixed effects.

In our case, our data do not allow us to use family fixed effect models as we only have 138 sibships with several cohort members. Instead, we rely on Black et al. (2018) to build family type fixed effect models. With this model we compare same size sibships where siblings are born almost on the same year. Black et al. (2018) use a large sample of Swedish data where families are smaller than in Madagascar. That is why they can compare same size families with siblings born on the exact same year. Due to our data limitations (small sample and large families), we decided to compare same size-families where siblings are born within a same 3-year cohort. Family-type fixed effects allow to take into account sibship size and child's spacing.

[10] Fixed-wage workers are mostly men (61.4% vs 46.2% for non fixed-wage worker) living in urban areas (36% of fixed-wage workers live in an urban area vs 24% for own-account or unpaid workers). They are relatively more educated as they reached grade 9 on average. They are either employees (54.55%) or low-skilled workers (32.39%). They work for private firms (48.86%), public administration (24.43%) or are domestic workers (15.91%). They mostly work in the tertiary sector (77.8%).

When we compare between family model (Table 11) with family-type fixed effects model (Table 1), we see that the effect of birth order on our outcomes of interest depends on unobservables not taken into account in the between family model. To avoid bias in our estimations, we prefer to use the family-type fixed effects model.

Formally, we estimate the following family-type fixed-effects model for individual i in sibship j :

$$Y_{ij} = \alpha + \beta Birth\_order_{ij} + \kappa \mathbf{X}_i + \lambda_{ft} + \epsilon_{ij} \tag{1}$$

Where Y_{ij} is either a z-score measuring non-cognitive or cognitive skills or a continuous variable measuring school attainment or the age at which the individual i started to work or a dummy equal to 1 if the individual i earns a fixed wage. $Birth\_order_{ij}$ is the birth order of individual i in siship j (the omitted category is firstborn child). X_{ij} is a vector of individual's background variable as gender, age, mother's age, mother's age at first birth, parent's activity (wage worker, own account worker, family worker or housewife), parent's education (no education, primary completed or college completed), place of residence and household's wealth in 2004 measured by an index built from housing conditions and belongings. Sibship size and birth spacing within sibship j are taken into account in the family-type fixed effects (λ_{ft}).

5 Results

Our results show that birth order has mainly an effect on career opportunities (Table 1, column 5). The two firstborns are more likely to earn a fixed wage than their younger siblings and, thus, less likely to be own account or family worker. As showed by Black et al. (2018), differences in career depending on birth order might come from the effect of birth order on personality. Table 7 indicates that, in Madagascar, birth order only has a negative effect on one personality trait : spirit of initiative. Third and later-borns take less initiative than their older siblings [11]. Applying a ttest on the spirit of initiative score by type of remuneration shows that fixed wage earners perform better on our spirit of initiative's measure than other type of workers (0.15 vs -0.01, the difference is significant at the 5% threshold). Although we are not able to state on the sense of the causality, we know that non cognitive abilities tend to be stable over time, so we might suppose that individuals with a higher spirit of initiative are better able to obtain a salaried job. Alternatively, looking for a job out of the household

[11] Different mechanisms can explain the effect of birth order on spirit of initiative. A possible mechanism could be related to the implication of children in different household's activities depending on their birth order. Table 9 shows that the only significant difference across siblings in time use relates to the longer time that firstborns spend to collect wood for heating or cooking. This activity could contribute to develop the spirit of initiative. However, the correlation between time spent collecting wood during childhood and spirit of initiative score is small, only 0.04. Moreover, the effect of birth order on time spent picking wood depends on parents' education: when they both went to school, they do not discriminate among their children (Table 9). There is, finally, few chances that time spent picking wood during childhood influences spirit of initiative at the beginning of adulthood.

might develop the spirit of initiative.

Despite its effect on career opportunities, birth order has no effect on school attainment when none or only one parent has at least primary education. However, more educated parents (i.e. when both parents have at least a primary education) show a preference for earlier children with respect to school attainment, as found in the existing literature for developed countries (Black et al., 2005; Booth and Kee, 2009). Table 1 indicates that children whose none or only one parent has a primary education drop out from school 3 grades earlier than children whose both parents have a primary education. This can suggest that, as the average educational level of children is already low when parents do not have a primary education, they probably have less room to discriminate among their children.

All in all, results described above seem to illustrate a logic of insurance for parents in the difference they make between their children. They encourage firstborns to work out of the household and to earn a fixed wage to be less vulnerable than the rest of the family. Some of them (i.e. educated parents), also invest more in the education of their first children, probably to maximize their chances to earn a fixed wage. As fathers are mostly (77%) own account or family worker, their job might be quite precarious. In case of shock, thanks to their fixed wage, firstborns can help the whole family. Moreover, parents are sufficiently young when their first children enter the labor market, so that they do not need them to take charge of the family enterprise. Conversely, later-borns are more likely to be called to take care of the family business when their parents will be too old to work[12]. This explanation is corroborated by the fact that 4th and later born start also to work earlier than their older siblings (Table 1), at least when both parents are educated.

When none or only one parent has a primary education, third and later-borns perform better than their older siblings on non-cognitive skills. As there is no difference in school attainment between siblings depending on their birth order, the positive effect of birth order on cognitive skills can rely on different mechanisms. First, later borns could receive more cognitive stimulation by their parents (see De Haan et al. (2014) for Ecuador) and by their older siblings. Second, later-borns might spend less time in household's activities, having more time to spend for homework or activities stimulating cognition. Table 9 shows that it is not the case[13]. Concerning households where both parents have a primary education, results presented in Table 1 show no differences in terms of cognitive skills among siblings.

Our results do not depend on the individual's gender (Table 1). Still, we tried to see how sibship's sex composition might affect the effect of birth order on our outcomes of interest. Table 6, panel A seems to indicate that firstborn males are the most likely to be fixed-wage earners. Indeed, third and later borns only have a lower probability to be fixed-wage earners when the firstborn is a male. Panel C restricts the sample to firstborns only. When the firstborn is a male and the second born a female, he has a lower probability than a firstborn male followed by another male to be a fixed-wage earner. It might indicate that

[12]When fixed-wage earners are asked why they accepted their job, 15.38% answer they took this job to meet financial needs for only 10.15% of own account or unpaid workers. Own account or unpaid workers are more likely to have inherited their current job from their parents (37.31% vs 1.78%).

[13]Still, later-borns could spend more time doing other activities that stimulate cognition like reading or playing. Unfortunately, we cannot verify this hypothesis since we do not have any information on time spent doing those activities in our data

firstborn males are the ones pushed by their parents to work out of the household only when they have younger brothers to take charge of the family enterprise. Further work needs to be done to better explore the effect of sibship's gender composition on the effect of birth order on schooling and employment.

Table 1: Effect of birth order on non-cognitive and cognitive skills, education and employment

	(1) Initiative	(2) Maths and French score	(3) School attainment	(4) Age at first work	(5) Fixed wage
Panel A. No interaction					
Birth order : Ref. firstborn					
2nd child	-0.139	0.270*	0.369	-0.663	-0.034
	(0.194)	(0.155)	(0.562)	(0.729)	(0.061)
3rd child	-0.578*	0.429*	0.194	-1.153	-0.256**
	(0.315)	(0.251)	(0.950)	(1.307)	(0.112)
4th child or more	-0.962**	0.557	1.204	-1.894	-0.408**
	(0.413)	(0.368)	(1.294)	(1.837)	(0.182)
Female	-0.031	-0.159**	-0.198	-0.233	-0.090***
	(0.104)	(0.079)	(0.253)	(0.369)	(0.032)
Adjusted R2	0.10	0.50	0.51	0.32	0.06
Adjusted within-R2	0.02	0.41	0.44	0.17	0.05
Observations	670	620	712	527	712
Panel B. Birth order and gender					
Birth order : Ref. firstborn					
2nd child	-0.264	0.433**	0.422	-0.790	-0.065
	(0.242)	(0.192)	(0.621)	(0.858)	(0.083)
3rd child	-0.785**	0.611**	-0.039	-1.351	-0.307**
	(0.356)	(0.284)	(1.016)	(1.442)	(0.123)
4th child or more	-1.036**	0.718*	1.269	-1.618	-0.456**
	(0.443)	(0.391)	(1.259)	(2.010)	(0.190)
2nd child * female	0.179	-0.253	-0.154	0.201	0.043
	(0.263)	(0.186)	(0.616)	(0.897)	(0.075)
3rd child * female	0.485	-0.367	0.632	0.504	0.107
	(0.316)	(0.234)	(0.809)	(1.261)	(0.091)
4th child or more * female	0.182	-0.273	-0.030	-0.362	0.092
	(0.279)	(0.209)	(0.782)	(0.966)	(0.090)
Female	-0.192	0.025	-0.242	-0.310	-0.136***
	(0.196)	(0.135)	(0.455)	(0.658)	(0.052)
Adjusted R2	0.10	0.50	0.51	0.32	0.06
Adjusted within-R2	0.02	0.42	0.43	0.17	0.05
Observations	670	620	712	527	712
Panel C. Birth order and parents education					
Birth order : Ref. firstborn					
2nd child	-0.114	0.261	0.411	-1.112	-0.082
	(0.214)	(0.188)	(0.676)	(0.806)	(0.073)
3rd child	-0.675**	0.634**	1.290	-0.972	-0.294**
	(0.339)	(0.280)	(1.097)	(1.350)	(0.123)
4th child or more	-1.136***	0.759*	1.999	-1.695	-0.403**
	(0.430)	(0.390)	(1.391)	(1.829)	(0.182)
2nd child * both parents have primary education	-0.055	-0.002	-0.306	1.038	0.107
	(0.217)	(0.179)	(0.667)	(0.918)	(0.074)
3rd child * both parents have primary education	0.228	-0.401*	-2.218**	-1.071	0.081
	(0.309)	(0.211)	(0.939)	(1.127)	(0.084)
4th child or more * both parents have primary education	0.442	-0.658**	-2.269*	-2.366**	-0.038
	(0.338)	(0.310)	(1.287)	(0.985)	(0.102)
Both parents went to school	0.018	0.690***	3.600***	1.017	-0.008
	(0.183)	(0.142)	(0.524)	(0.625)	(0.048)
Adjusted R2	0.11	0.45	0.46	0.33	0.06
Adjusted within-R2	0.02	0.36	0.37	0.18	0.05
Observations	670	620	712	527	712

Notes: Full sample. Control variables include gender, age, mother's age, mother's age at first birth, parents' activity and education, household's wealth in 2004 and place of residence. *** p<0.01, ** p<0.05, * p<0.1

6 Robustness checks

As robustness checks, we first restrict the sample to individuals with no missing values in any of our outcomes of interest. Table 2 shows that our results concerning spirit of initiative and the probability to earn a fixed wage are robust with respect to this restriction. With this restricted sample, we also find a stronger effect of parents education on the school attainment of their third and later-born children, who have a significantly lower school attainment with respect to their older siblings. The main difference with respect to our main results concerns cognitive skills. Panel B of Table 2 shows no more difference in test scores for children with less educated parents, while we still notice a negative and significant effect of birth order for children whose parents are both educated.

As a second robustness checks, we restricted our sample to individuals coming from sibship where there were no multiple births (Table 3). This restriction allows us to have a "pure" measure of birth order. Table 3 indicates that results are similar to the ones on the restricted sample, described above.

Table 2: Effect of birth order on non-cognitive skills, harmonized sample

	(1) Initiative	(2) Maths and French score	(3) School attainment	(4) Age at first work	(5) Fixed wage
Panel A. No interaction					
Birth order : Ref. firstborn					
2nd child	-0.433	0.186	0.207	-0.061	-0.007
	(0.286)	(0.209)	(0.638)	(0.792)	(0.095)
3rd child	-1.035**	0.409	0.232	0.031	-0.256
	(0.459)	(0.338)	(1.255)	(1.505)	(0.175)
4th child or more	-1.720***	0.639	0.943	0.418	-0.293
	(0.590)	(0.498)	(1.706)	(2.016)	(0.298)
Female	-0.101	-0.226**	-0.169	-0.560	-0.131***
	(0.133)	(0.096)	(0.301)	(0.406)	(0.045)
Adjusted R2	0.12	0.43	0.47	0.33	0.12
Adjusted within-R2	0.02	0.40	0.42	0.19	0.07
Observations	423	423	423	423	423
Panel B. Birth order and gender					
Birth order : Ref. firstborn					
2nd child	-0.484	0.419*	0.774	-0.156	-0.074
	(0.311)	(0.239)	(0.710)	(0.927)	(0.119)
3rd child	-1.217**	0.616*	0.478	-0.140	-0.300
	(0.491)	(0.370)	(1.313)	(1.636)	(0.182)
4th child or more	-1.933***	0.859	1.535	0.870	-0.370
	(0.679)	(0.544)	(1.746)	(2.286)	(0.322)
2nd child * female	0.019	-0.403*	-1.063	0.201	0.121
	(0.332)	(0.227)	(0.694)	(0.950)	(0.105)
3rd child * female	0.413	-0.445	-0.255	0.781	0.072
	(0.411)	(0.297)	(0.950)	(1.482)	(0.123)
4th child or more * female	0.326	-0.390	-0.913	-0.426	0.121
	(0.382)	(0.271)	(1.062)	(1.111)	(0.133)
Female	-0.223	0.020	0.320	-0.669	-0.196***
	(0.215)	(0.149)	(0.469)	(0.699)	(0.068)
Adjusted R2	0.12	0.43	0.47	0.33	0.12
Adjusted within-R2	0.02	0.41	0.42	0.18	0.06
Observations	423	423	423	423	423
Panel C. Birth order and parents education					
Birth order : Ref. firstborn					
2nd child	-0.436	0.176	-0.003	-0.494	-0.070
	(0.285)	(0.227)	(0.691)	(0.864)	(0.104)
3rd child	-1.190***	0.490	0.416	-0.038	-0.317*
	(0.457)	(0.352)	(1.302)	(1.515)	(0.179)
4th child or more	-1.762***	0.679	0.783	0.584	-0.268
	(0.590)	(0.501)	(1.723)	(1.995)	(0.279)
2nd child * both parents have primary education	-0.038	-0.117	-0.575	0.639	0.151
	(0.268)	(0.230)	(0.737)	(0.966)	(0.108)
3rd child * both parents have primary education	0.401	-0.582*	-3.154***	-1.144	0.150
	(0.415)	(0.306)	(1.182)	(1.334)	(0.128)
4th child or more * both parents have primary education	0.034	-0.920**	-4.066**	-3.376**	-0.292*
	(0.592)	(0.410)	(1.776)	(1.302)	(0.150)
Both parents went to school	0.016	0.708***	3.093***	1.506**	0.023
	(0.214)	(0.165)	(0.570)	(0.667)	(0.063)
Adjusted R2	0.12	0.39	0.42	0.34	0.14
Adjusted within-R2	0.01	0.37	0.37	0.20	0.09
Observations	423	423	423	423	423

Notes: Harmonized sample. Control variables include gender, age, mother's age, mother's age at first birth, parents' activity and education, household's wealth in 2004 and place of residence. *** p<0.01, ** p<0.05, * p<0.1

Table 3: Effect of birth order on non-cognitive skills, no multiple births within the sibship

	(1) Initiative	(2) Maths and French score	(3) School attainment	(4) Age at first work	(5) Fixed wage
Panel A. No interaction					
Birth order : Ref. firstborn					
2nd child	-0.283	0.214	0.345	-0.284	-0.034
	(0.216)	(0.159)	(0.606)	(0.742)	(0.068)
3rd child	-0.858**	0.300	0.102	-0.568	-0.264**
	(0.358)	(0.272)	(1.079)	(1.392)	(0.126)
4th child or more	-1.236**	0.364	1.090	-2.195	-0.509***
	(0.488)	(0.433)	(1.537)	(1.954)	(0.192)
Female	-0.033	-0.158*	-0.306	-0.068	-0.094***
	(0.107)	(0.083)	(0.269)	(0.375)	(0.035)
Adjusted R2	0.08	0.49	0.52	0.32	0.06
Adjusted within-R2	0.02	0.43	0.45	0.20	0.06
Observations	602	559	641	484	641
Panel B. Birth order and gender					
Birth order : Ref. firstborn					
2nd child	-0.374	0.384*	0.414	-0.388	-0.092
	(0.265)	(0.198)	(0.689)	(0.875)	(0.091)
3rd child	-1.032***	0.481	-0.124	-0.856	-0.333**
	(0.393)	(0.304)	(1.148)	(1.501)	(0.137)
4th child or more	-1.306**	0.517	1.299	-1.955	-0.564***
	(0.522)	(0.460)	(1.493)	(2.127)	(0.202)
2nd child * female	0.123	-0.270	-0.168	0.142	0.089
	(0.280)	(0.193)	(0.618)	(0.912)	(0.079)
3rd child * female	0.401	-0.366	0.694	0.794	0.135
	(0.326)	(0.255)	(0.855)	(1.333)	(0.095)
4th child or more * female	0.175	-0.274	-0.210	-0.258	0.103
	(0.303)	(0.227)	(0.850)	(0.993)	(0.090)
Female	-0.164	0.032	-0.324	-0.192	-0.160***
	(0.208)	(0.145)	(0.479)	(0.672)	(0.057)
Adjusted R2	0.08	0.49	0.51	0.32	0.06
Adjusted within-R2	0.02	0.43	0.45	0.19	0.06
Observations	602	559	641	484	641
Panel C. Birth order and parents education					
Birth order : Ref. firstborn					
2nd child	-0.202	0.199	0.465	-0.702	-0.075
	(0.229)	(0.191)	(0.677)	(0.814)	(0.078)
3rd child	-0.904**	0.482	1.170	-0.448	-0.295**
	(0.372)	(0.298)	(1.168)	(1.420)	(0.133)
4th child or more	-1.415***	0.506	1.783	-1.957	-0.510***
	(0.510)	(0.455)	(1.600)	(1.947)	(0.192)
2nd child * both parents have primary education	-0.161	-0.062	-0.815	0.824	0.105
	(0.228)	(0.181)	(0.670)	(0.922)	(0.076)
3rd child * both parents have primary education	0.114	-0.518**	-3.006***	-1.001	0.092
	(0.325)	(0.221)	(0.972)	(1.128)	(0.086)
4th child or more * both parents have primary education	0.406	-0.691**	-3.041**	-2.557**	0.029
	(0.368)	(0.322)	(1.309)	(1.041)	(0.094)
Both parents went to school	0.039	0.756***	3.835***	1.133*	0.000
	(0.197)	(0.149)	(0.565)	(0.648)	(0.051)
Adjusted R2	0.09	0.45	0.47	0.33	0.05
Adjusted within-R2	0.02	0.38	0.39	0.21	0.05
Observations	602	559	641	484	641

Notes: Individuals who do not have any multiple births in their sibship. Control variables include gender, age, mother's age, mother's age at first birth, parents' activity and education, household's wealth in 2004 and place of residence. *** p<0.01, ** p<0.05, * p<0.1

7 Conclusions

In this paper we examine the effect of birth order on non-cognitive and cognitive skills, school attainment and the beginning of professional life for young Malagasy people.

Our work contributes to analyze the effect of birth order on life outcomes in developing countries, an issue that is under explored in poor countries. The existing literature is in fact scarce and provide contrasting evidence. To the best of our knowledge, we are the first to examine the effect of birth order on skills, education and work in Madagascar.

Using a family-type fixed effects model proposed by Black et al. (2018), we find that the two firstborns have a less precarious situation than their younger siblings on the labour market and show more spirit of initiative. The difference in career opportunities depending on birth order might reflect a logic of insurance for the whole family. Firstborns are likely to be more pushed by their parents, or by the circumstances in which they grow up, to work out of the household to financially help their family. When we look at the heterogeneities across parents' education, we also see that more educated parents invest more in the education of their first and second born, while their latest children enter earlier in the labor market. The effect of birth order on cognitive skills is also closely interlinked with parents' education: third and latest-borns of less educated parents have higher cognitive skills than their younger siblings, while it is not the case for children of more educated parents.

Measuring the effect of birth order is quite data-demanding as, ideally, we should compare siblings belonging to the same sibship. Thanks to the family-type fixed effects and despite our relatively small sample, we find quite consistent results. We still need to deepen our analysis concerning the influence of sibship's sex composition on the birth order effects we found on skills, education and occupation.

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A Appendix

A.1 Descriptive statistics

Table 4: Descriptive statistics

	Full sample	Analysis sample	First child	Second child	Third child	Fourth child or more
Outcome variables						
Non-cognitive skills						
Initiative	-0,00	0,01	0,05	0,02	-0,02	-0,05
	(1,00)	(1,01)	(1,03)	(0,98)	(1,06)	(0,98)
Responsible	0,00	0,01	-0,05	-0,03	0,16	0,03
	(1,00)	(1,01)	(1,04)	(1,03)	(1,02)	(0,92)
Extraversion	0,00	0,00	-0,05	0,04	0,02	0,02
	(1,00)	(0,99)	(0,96)	(1,06)	(0,96)	(0,99)
Emotional Stability	0,00	-0,00	-0,06	0,01	0,02	0,05
	(1,00)	(1,00)	(0,97)	(0,94)	(1,01)	(1,06)
Openness	-0,00	-0,00	0,04	0,02	0,01	-0,08
	(1,00)	(0,99)	(0,93)	(1,03)	(0,95)	(1,05)
Observations	1,648	1,468	466	367	244	391
Cognitive skills						
Maths and French	-0,00	0,01	-0,11	0,02	0,06	0,10
	(1,00)	(1,00)	(1,02)	(1,01)	(0,94)	(0,99)
Observations	1,533	1,364	420	342	231	371
French	-0,00	0,01	-0,10	0,01	0,06	0,09
	(1,00)	(1,00)	(1,02)	(0,99)	(0,93)	(1,01)
Observations	1,541	1,372	424	345	231	372
Maths	-0,00	0,01	-0,11	0,02	0,06	0,10
	(1,00)	(1,00)	(1,02)	(1,01)	(0,95)	(0,99)
Observations	1,563	1,390	426	348	236	380
Education and Employment						
School attainment	7,69	7,72	7,29	7,93	8,03	7,83
	(3,88)	(3,88)	(3,96)	(3,85)	(3,90)	(3,77)
Age at first work	14,21	14,17	14,00	14,14	14,51	14,19
	(4,00)	(3,97)	(3,86)	(4,04)	(4,14)	(3,93)
Fixed wage	0,11	0,11	0,09	0,13	0,11	0,13
	(0,32)	(0,32)	(0,28)	(0,34)	(0,31)	(0,34)
Own account worker	0,21	0,21	0,24	0,19	0,18	0,19
	(0,41)	(0,40)	(0,43)	(0,39)	(0,39)	(0,39)
Unpaid	0,38	0,39	0,40	0,37	0,36	0,39
	(0,49)	(0,49)	(0,49)	(0,48)	(0,48)	(0,49)
Observations	1,719	1,527	480	379	258	410

Table 4, continued

	Full sample	Analysis sample	First child	Second child	Third child	Fourth child or more
Time use (hours per week)						
Domestic chores	6,85	6,30	7,72	6,30	5,02	5,50
	(21,75)	(7,96)	(9,00)	(7,63)	(7,53)	(6,97)
Observations	1,448	1,305	403	323	227	352
Collecting water	3,00	2,98	3,63	2,86	2,84	2,44
	(4,29)	(4,36)	(6,09)	(3,25)	(3,65)	(3,02)
Observations	1,457	1,314	406	324	231	353
Collecting wood	1,77	1,71	2,02	1,48	1,71	1,58
	(3,36)	(3,24)	(3,75)	(2,55)	(3,19)	(3,21)
Observations	1,457	1,314	406	324	231	353
Care for children and elders	0,86	0,89	1,27	1,06	0,47	0,56
	(3,79)	(3,93)	(3,76)	(5,55)	(3,36)	(2,28)
Observations	1,457	1,314	406	324	231	353
Homework	57,75	6,69	6,33	6,89	6,52	6,52
	(44,31)	(5,22)	(4,92)	(5,75)	(4,81)	(5,26)
Observations	1,170	1,045	307	270	181	287
Background variables						
Sibship size	5,02	5,35	4,40	4,59	5,36	7,17
	(2,57)	(2,34)	(1,97)	(1,91)	(2,01)	(2,26)
Observations	1,719	1,527	480	379	258	410
Age	21,96	21,94	22,06	21,90	21,91	21,86
	(1,28)	(1,28)	(1,15)	(1,40)	(1,33)	(1,26)
Observations	1,719	1,527	480	379	258	410
Female	0,52	0,52	0,55	0,53	0,47	0,53
	(0,50)	(0,50)	(0,50)	(0,50)	(0,50)	(0,50)
Observations	1,719	1,527	480	379	258	410
Mother's age	50,12	50,07	45,38	49,03	51,81	54,93
	(6,85)	(6,86)	(5,67)	(6,05)	(5,60)	(5,70)
Observations	1,429	1,297	391	315	228	363
Mother's age at first birth	23,26	22,95	23,34	23,63	23,49	21,57
	(5,69)	(5,47)	(5,62)	(5,51)	(5,24)	(5,17)
Observations	1,406	1,276	391	312	221	352
Mother has no education	0,52	0,52	0,53	0,49	0,52	0,53
	(0,50)	(0,50)	(0,50)	(0,50)	(0,50)	(0,50)
Observations	1,719	1,527	480	379	258	410
Mother is a wage worker	0,09	0,08	0,06	0,09	0,11	0,09
	(0,28)	(0,28)	(0,24)	(0,29)	(0,32)	(0,29)
Observations	1,662	1,478	465	367	248	398

Table 4, continued

	Full sample	Analysis sample	First child	Second child	Third child	Fourth child or more
Father has no education	0,43	0,43	0,46	0,40	0,42	0,42
	(0,50)	(0,49)	(0,50)	(0,49)	(0,49)	(0,49)
Observations	1,719	1,527	480	379	258	410
Father is a wage worker	0,22	0,23	0,18	0,25	0,27	0,23
	(0,41)	(0,42)	(0,38)	(0,43)	(0,45)	(0,42)
Observations	1,670	1,492	467	370	252	403
Household's wealth in 2004	22,83	22,97	20,19	23,56	25,19	24,29
	(20,60)	(20,64)	(20,09)	(21,67)	(21,31)	(19,58)
Observations	1,719	1,527	480	379	258	410

Notes: The table presents mean values for the full sample and birth order. Standard deviations are within parentheses.

A.2 The effect of birth order on non-cognitive and cognitive skills, education and employment

Table 5: Effect of birth order on non-cognitive and cognitive skills, education and employment

	(1) Initiative	(2) Maths and French score	(3) School attainment	(4) Age at first work	(5) Fixed wage
Birth order : Ref. firstborn					
2nd child	-0.139	0.270*	0.369	-0.663	-0.034
	(0.194)	(0.155)	(0.562)	(0.729)	(0.061)
3rd child	-0.578*	0.429*	0.194	-1.153	-0.256**
	(0.315)	(0.251)	(0.950)	(1.307)	(0.112)
4th child or more	-0.962**	0.557	1.204	-1.894	-0.408**
	(0.413)	(0.368)	(1.294)	(1.837)	(0.182)
Female	-0.031	-0.159**	-0.198	-0.233	-0.090***
	(0.104)	(0.079)	(0.253)	(0.369)	(0.032)
Year of birth	0.064	-0.078	0.119	-0.169	0.018
	(0.056)	(0.049)	(0.183)	(0.260)	(0.021)
Mother's year of birth	-0.040	0.041	0.228	-0.208	-0.044*
	(0.080)	(0.064)	(0.230)	(0.322)	(0.026)
Mother's age at first birth	-0.030	0.042	0.254	-0.201	-0.042
	(0.079)	(0.064)	(0.234)	(0.324)	(0.026)
Father's activity : Ref. wage worker					
Own account worker	0.347**	-0.061	-0.034	-0.713	-0.045
	(0.172)	(0.112)	(0.404)	(0.650)	(0.048)
Family worker	0.387**	0.367**	0.576	-0.090	-0.044
	(0.193)	(0.161)	(0.515)	(0.788)	(0.064)
Father's education : Ref. no education					
Primary completed	-0.094	0.351**	1.858***	0.755	0.047
	(0.180)	(0.142)	(0.464)	(0.624)	(0.049)
College completed	0.023	0.661***	3.805***	1.293**	-0.011
	(0.168)	(0.133)	(0.452)	(0.637)	(0.049)
Mother's activity : Ref. wage worker					
Own account worker	0.495**	-0.071	0.318	0.723	0.086
	(0.250)	(0.168)	(0.722)	(0.989)	(0.062)
Family worker	0.408*	0.131	1.035	0.594	0.124*
	(0.247)	(0.195)	(0.742)	(1.021)	(0.069)
Housewife	0.290	-0.128	-0.057	2.768**	0.032
	(0.283)	(0.182)	(0.829)	(1.158)	(0.069)
Mother's education : Ref. no education					
Primary completed	0.059	0.316**	0.939**	-0.502	0.080*
	(0.159)	(0.131)	(0.438)	(0.584)	(0.046)
College completed	0.098	0.477***	1.382**	0.835	0.084
	(0.193)	(0.149)	(0.538)	(0.785)	(0.057)
Household's wealth in 2004	0.005	0.015***	0.044***	0.028**	0.000
	(0.003)	(0.003)	(0.009)	(0.013)	(0.001)
Urban	0.093	-0.023	0.376	1.516**	0.024
	(0.149)	(0.124)	(0.431)	(0.611)	(0.048)
Constante	-48.464	73.120	-686.283	762.995	50.702
	(187.056)	(143.643)	(498.155)	(659.680)	(49.392)
Adjusted R2	0.10	0.50	0.51	0.32	0.06
Adjusted within-R2	0.02	0.41	0.44	0.17	0.05
Observations	670	620	712	527	712

Notes: Full sample. Control variables include age, mother's age, mother's age at first birth, parents' activity and education and household's wealth in 2004. *** p<0.01, ** p<0.05, * p<0.1

Table 6: Gender and the effect of birth order on non-cognitive and cognitive skills, education and employment

	(1) Initiative	(2) Maths and French score	(3) School attainment	(4) Age at first work	(5) Fixed wage
Panel A. Heterogeneity by firstborn's gender					
Birth order : Ref. firstborn					
2nd child	-0.186	0.282	0.674	-1.158	-0.052
	(0.255)	(0.182)	(0.542)	(0.794)	(0.076)
3rd child	-0.505	0.304	0.936	-1.723	-0.308***
	(0.341)	(0.232)	(0.726)	(1.153)	(0.099)
4th child or more	-0.713*	0.383	2.135**	-3.348**	-0.389***
	(0.370)	(0.289)	(0.999)	(1.322)	(0.148)
2nd child * female firstborn	0.284	-0.276	-0.143	0.270	0.091
	(0.270)	(0.188)	(0.690)	(1.005)	(0.084)
3rd child * female firstborn	0.368	-0.367	-0.514	-0.291	0.246**
	(0.367)	(0.249)	(0.968)	(1.291)	(0.103)
4th child or more * female firstborn	0.198	-0.538**	-0.633	1.578	0.176*
	(0.347)	(0.247)	(1.050)	(1.205)	(0.106)
Firstborn is a female	-0.246	0.271*	-0.071	-0.076	-0.069
	(0.230)	(0.163)	(0.547)	(0.779)	(0.062)
Adjusted R2	0.10	0.50	0.51	0.32	0.07
Adjusted within-R2	0.01	0.41	0.43	0.17	0.06
Observations	670	620	712	527	712
Panel B. Birth order among same gender siblings					
Birth order : Ref. firstborn among same gender siblings					
2nd child	-0.150	0.113	0.024	-0.136	-0.039
	(0.163)	(0.126)	(0.461)	(0.606)	(0.061)
3rd child	-0.324	0.393*	0.666	-0.007	-0.051
	(0.259)	(0.211)	(0.649)	(0.905)	(0.089)
4th child or more	-0.178	0.480**	0.086	-3.285**	-0.251**
	(0.368)	(0.239)	(1.108)	(1.388)	(0.110)
2nd child * female	0.186	-0.066	0.400	0.295	0.057
	(0.205)	(0.154)	(0.565)	(0.810)	(0.066)
3rd child * female	0.156	-0.400	-0.432	-1.990*	0.048
	(0.347)	(0.248)	(0.994)	(1.135)	(0.110)
4th child or more * female	0.601	-0.174	0.338	-0.425	0.257
	(0.416)	(0.277)	(1.919)	(1.968)	(0.198)
Female	-0.104	-0.102	-0.311	-0.117	-0.115***
	(0.132)	(0.098)	(0.337)	(0.480)	(0.041)
Adjusted R2	0.10	0.50	0.51	0.32	0.04
Adjusted within-R2	0.01	0.41	0.43	0.17	0.03
Observations	670	620	712	527	712
Panel C. Two first borns' gender (firstborns sample)					
2nd born is different gender than firstborn	0.278	0.102	1.137	0.738	-0.165**
	(0.363)	(0.233)	(0.730)	(1.080)	(0.083)
2nd born is different gender than firstborn * female	-0.259	-0.165	-2.440**	0.159	0.212**
	(0.481)	(0.283)	(0.951)	(1.322)	(0.097)
Female	-0.071	0.133	0.784	-0.150	-0.218***
	(0.341)	(0.198)	(0.691)	(1.020)	(0.072)
Adjusted R2	-0.07	0.54	0.54	0.09	-0.02
Adjusted within R2	-0.03	0.53	0.55	0.06	0.05
Observations	198	176	209	170	209

Notes: Full sample. Control variables include age, mother's age, mother's age at first birth, parents' activity and education and household's wealth in 2004. *** p<0.01, ** p<0.05, * p<0.1

A.3 The effect of birth order on non-cognitive skills

Table 7: The effect of birth order on non-cognitive skills

	(1) Initiative	(2) Responsibility	(3) Extraversion	(4) Emotional stability	(5) Openness
Panel A. No interaction					
Birth order : Ref. firstborn					
2nd child	-0.139	0.151	0.224	0.204	-0.091
	(0.194)	(0.204)	(0.215)	(0.192)	(0.169)
3rd child	-0.578*	0.134	0.169	0.217	-0.085
	(0.315)	(0.310)	(0.324)	(0.316)	(0.284)
4th child or more	-0.962**	0.012	0.018	-0.120	0.163
	(0.413)	(0.456)	(0.450)	(0.449)	(0.433)
Female	-0.031	-0.120	0.052	-0.418***	-0.147
	(0.104)	(0.090)	(0.099)	(0.100)	(0.092)
Adjusted R2	0.10	0.16	0.13	0.16	0.19
Adjusted within-R2	0.02	0.04	-0.02	0.07	0.05
Observations	670	670	670	670	670
Panel B. Birth order and parents education					
Birth order : Ref. firstborn					
2nd child	-0.114	0.236	0.400*	0.178	-0.185
	(0.214)	(0.231)	(0.224)	(0.208)	(0.208)
3rd child	-0.675**	0.156	0.086	0.253	-0.038
	(0.339)	(0.369)	(0.327)	(0.353)	(0.308)
4th child or more	-1.136***	0.067	-0.053	-0.028	0.216
	(0.430)	(0.471)	(0.467)	(0.458)	(0.435)
2nd child * both parents have primary education	-0.055	-0.132	-0.387*	0.002	0.189
	(0.217)	(0.229)	(0.234)	(0.229)	(0.233)
3rd child * both parents have primary education	0.228	-0.011	0.165	-0.139	-0.100
	(0.309)	(0.322)	(0.264)	(0.316)	(0.264)
4th child or more * both parents have primary education	0.442	-0.130	0.194	-0.299	-0.178
	(0.338)	(0.352)	(0.347)	(0.311)	(0.270)
Both parents went to school	0.018	0.430**	-0.102	-0.036	0.451***
	(0.183)	(0.194)	(0.179)	(0.182)	(0.159)
Adjusted R2	0.11	0.13	0.15	0.15	0.20
Adjusted within-R2	0.02	0.01	0.00	0.06	0.06
Observations	670	670	670	670	670

Notes: Full sample. Control variables include age, mother's age, mother's age at first birth, parents' activity and education and household's wealth in 2004. *** p<0.01, ** p<0.05, * p<0.1

Table 8: Gender and the effect of birth order on non-cognitive skills

	(1) Initiative	(2) Responsibility	(3) Extraversion	(4) Emotional stability	(5) Openness
Panel A. Heterogeneity by firstborn's gender					
Birth order : Ref. firstborn					
2nd child	-0.186	0.031	0.097	0.189	-0.070
	(0.255)	(0.206)	(0.248)	(0.202)	(0.209)
3rd child	-0.505	-0.002	0.075	0.217	0.157
	(0.341)	(0.245)	(0.278)	(0.275)	(0.238)
4th child or more	-0.713*	-0.241	-0.172	-0.102	0.373
	(0.370)	(0.320)	(0.350)	(0.330)	(0.365)
2nd child * firstborn is female	0.284	0.093	0.132	0.033	0.103
	(0.270)	(0.238)	(0.261)	(0.239)	(0.253)
3rd child * firstborn is female	0.368	0.015	-0.041	0.053	-0.200
	(0.367)	(0.337)	(0.296)	(0.343)	(0.303)
4th child or more * firstborn is female	0.198	0.163	0.076	0.008	0.026
	(0.347)	(0.301)	(0.312)	(0.322)	(0.288)
Firstborn is female	-0.246	-0.149	-0.037	-0.151	0.121
	(0.230)	(0.193)	(0.213)	(0.204)	(0.189)
Adjusted R2	0.10	0.16	0.13	0.16	0.19
Adjusted within-R2	0.01	0.04	-0.02	0.07	0.05
Observations	670	670	670	670	670
Panel B. Birth order among same gender siblings					
Birth order : Ref. firstborn among same gender siblings					
2nd child	-0.150	-0.180	0.068	0.079	0.040
	(0.163)	(0.152)	(0.156)	(0.159)	(0.146)
3rd child	-0.324	0.088	-0.072	-0.072	0.255
	(0.259)	(0.203)	(0.262)	(0.237)	(0.182)
4th child or more	-0.178	-0.192	-0.119	0.317	0.282
	(0.368)	(0.243)	(0.457)	(0.482)	(0.295)
2nd child * female	0.186	0.258	0.277	0.062	0.134
	(0.205)	(0.197)	(0.197)	(0.194)	(0.189)
3rd child * female	0.156	0.065	0.291	0.245	-0.373
	(0.347)	(0.285)	(0.311)	(0.392)	(0.319)
4th child or more * female	0.601	-0.055	-0.256	-0.067	-0.423
	(0.416)	(0.282)	(0.387)	(0.610)	(0.422)
Female	-0.104	-0.195*	-0.047	-0.461***	-0.142
	(0.132)	(0.116)	(0.129)	(0.126)	(0.121)
Adjusted R2	0.10	0.16	0.14	0.15	0.19
Adjusted within-R2	0.01	0.04	-0.01	0.07	0.05
Observations	670	670	670	670	670
Panel C. Two first borns' gender (firstborns sample)					
2nd born is different gender than firstborn	0.278	-0.210	0.106	-0.011	0.043
	(0.363)	(0.259)	(0.266)	(0.310)	(0.270)
Interactive with firstborn is female	-0.259	0.180	-0.123	0.252	-0.132
	(0.481)	(0.348)	(0.350)	(0.414)	(0.361)
Female	-0.071	-0.222	-0.039	-0.617**	0.028
	(0.341)	(0.248)	(0.267)	(0.303)	(0.253)
Adjusted R2	-0.07	0.08	-0.07	0.05	0.06
Adjusted within R2	-0.03	0.08	0.02	0.04	0.06
Observations	198	198	198	198	198

Notes: Full sample. Control variables include age, mother's age, mother's age at first birth, parents' activity and education and household's wealth in 2004. *** p<0.01, ** p<0.05, * p<0.1

A.4 The effect of birth order on time use in 2004

Table 9: Effect of birth order on time use in 2004

	(1) Time for domestic chores	(2) Time for water	(3) Time for wood	(4) Time for care (children and elders)	(5) Time for homework
Panel A. No interaction					
Birth order : Ref. firstborn					
2nd child	-1.833	-2.382	-1.238*	-0.535	-0.009
	(1.611)	(2.561)	(0.744)	(0.565)	(1.056)
3rd child	-2.940	-3.474	-1.899*	-0.702	-0.541
	(2.246)	(5.025)	(1.091)	(0.750)	(1.924)
4th child or more	-1.240	-4.880	-2.309*	-0.368	-0.497
	(2.956)	(5.708)	(1.287)	(0.970)	(2.426)
Female	6.601***	-0.091	-1.970***	0.750***	0.736
	(0.816)	(0.437)	(0.439)	(0.277)	(0.631)
Adjusted R2	0.25	0.11	0.16	0.28	0.26
Adjusted within-R2	0.21	0.02	0.15	-0.00	0.10
Observations	660	666	666	666	461
Panel B. Birth order and parents education					
Birth order : Ref. firstborn					
2nd child	-2.924	-2.269	-1.912*	-0.444	-0.122
	(1.775)	(2.109)	(0.976)	(0.575)	(1.434)
3rd child	-3.304	-3.678	-3.186**	-0.519	-0.624
	(2.535)	(4.101)	(1.392)	(0.706)	(2.335)
4th child or more	-1.930	-4.451	-3.217**	-0.261	-0.865
	(3.197)	(5.242)	(1.375)	(0.960)	(2.577)
2nd child * both parents have primary education	2.094	-0.220	1.342*	-0.135	0.463
	(1.729)	(1.370)	(0.752)	(0.669)	(1.495)
3rd child * both parents have primary education	0.828	0.302	2.573**	-0.350	0.358
	(2.079)	(2.204)	(1.135)	(0.588)	(1.842)
4th child or more * both parents have primary education	1.697	-1.483	2.049**	-0.217	0.538
	(2.469)	(1.271)	(0.925)	(0.578)	(2.173)
Both parents have primary education	-0.841	0.833	-0.586	0.030	-0.264
	(1.410)	(0.970)	(0.512)	(0.579)	(1.059)
Adjusted R2	0.25	0.12	0.18	0.28	0.25
Adjusted within-R2	0.21	0.02	0.17	-0.00	0.09
Observations	660	666	666	666	461

Notes: Full sample. Control variables include age, mother's age, mother's age at first birth, parents' activity and education and household's wealth in 2004. *** p<0.01, ** p<0.05, * p<0.1

A.5 Between family models

Table 10: Between family model, non-cognitive skills

	Dep Var: Non-cognitive skills				
	(1) Initiative	(2) Responsible	(3) Extraversion	(4) Emotional stability	(5) Openness
Birth order : Ref. firstborn					
2nd child	-0.066	-0.040	0.110	0.068	0.015
	(0.085)	(0.087)	(0.089)	(0.082)	(0.084)
3rd child	-0.143	0.081	0.063	0.056	-0.018
	(0.119)	(0.110)	(0.109)	(0.112)	(0.107)
4th child or more	-0.147	-0.104	0.147	0.108	-0.053
	(0.141)	(0.134)	(0.153)	(0.147)	(0.142)
R-squared	0.03	0.04	0.02	0.07	0.07
Observations	1,166	1,166	1,166	1,166	1,166
Panel B. Birth order and parents education					
Birth order : Ref. firstborn					
2nd child	-0.040	-0.021	0.210*	0.085	-0.001
	(0.108)	(0.115)	(0.112)	(0.104)	(0.115)
3rd child	-0.111	0.164	0.041	0.078	0.148
	(0.145)	(0.135)	(0.135)	(0.132)	(0.132)
4th child or more	-0.121	-0.037	0.067	0.052	-0.031
	(0.157)	(0.144)	(0.163)	(0.161)	(0.163)
2nd child * both parents have primary education	-0.055	-0.029	-0.232	-0.044	0.046
	(0.157)	(0.161)	(0.167)	(0.150)	(0.149)
3rd child * both parents have primary education	-0.042	-0.154	0.025	-0.057	-0.399**
	(0.188)	(0.181)	(0.180)	(0.179)	(0.161)
4th child or more * both parents have primary education	0.017	-0.040	0.145	0.157	-0.013
	(0.158)	(0.149)	(0.155)	(0.163)	(0.155)
Both parents went to school	-0.003	0.231**	0.008	-0.039	0.330***
	(0.119)	(0.117)	(0.111)	(0.112)	(0.105)
R2	0.02	0.04	0.02	0.07	0.07
Observations	1,166	1,166	1,166	1,166	1,166

Notes: Full sample. Control variables include sibship size, age, mother's age, mother's age at first birth, parents' activity and education, place of residence and household's wealth in 2004.

Table 11: Between family model, cognitive skills, education and employment

	(1) Maths and French score	(2) School attainment	(3) Age at first work	(4) Fixed wage
Birth order : Ref. firstborn				
2nd child	0.068	0.258	0.032	0.022
	(0.067)	(0.245)	(0.343)	(0.028)
3rd child	0.164*	0.421	0.476	-0.024
	(0.085)	(0.322)	(0.470)	(0.035)
4th child or more	0.276**	0.558	0.047	-0.017
	(0.113)	(0.421)	(0.589)	(0.046)
R-squared	0.43	0.45	0.17	0.04
Observations	1,094	1,213	992	1,213
Panel B. Birth order and parents education				
Birth order : Ref. firstborn				
2nd child	0.143	0.542	-0.119	0.016
	(0.096)	(0.346)	(0.400)	(0.033)
3rd child	0.313***	1.187***	0.562	-0.039
	(0.111)	(0.429)	(0.535)	(0.038)
4th child or more	0.442***	1.373***	0.196	-0.020
	(0.129)	(0.479)	(0.629)	(0.044)
2nd child * both parents have primary education	-0.134	-0.650	0.519	0.022
	(0.128)	(0.461)	(0.662)	(0.052)
3rd child * both parents have primary education	-0.310**	-1.797***	-0.196	0.050
	(0.141)	(0.562)	(0.778)	(0.056)
4th child or more * both parents have primary education	-0.320**	-2.204***	-0.433	0.040
	(0.131)	(0.490)	(0.647)	(0.051)
Both parents went to school	0.780***	3.585***	0.596	0.008
	(0.092)	(0.339)	(0.469)	(0.035)
R2	0.37	0.37	0.17	0.04
Observations	1,094	1,213	992	1,213

Notes: Full sample. Control variables include sibship size, age, mother's age, mother's age at first birth, parents' activity and education, place of residence and household's wealth in 2004.

A.6 Measurement of Personality

Table 12: Responsibility measurement (Cronbach's Alpha =0.95)

	Mean	SE	Factor loading	"Naive" classification
I am always up to my tasks	3,99	0,74	0,64*	Conscientiousness
I like to step up to the plate	4,06	0,73	0,63*	Conscientiousness
I keep my promises	4,04	0,75	0,60*	Agreeableness
I always keep my word	4,03	0,72	0,60*	Agreeableness
I know how to keep calm	3,96	0,71	0,60*	Emotional stability
I like order and regularity	4,15	0,68	0,59*	Conscientiousness
I am Agreeablenessperson who sets goals	4,09	0,73	0,58*	Conscientiousness
I like to tidy	4,17	0,67	0,57*	Conscientiousness
I like when everything is in its place	4,18	0,66	0,57*	Conscientiousness
I do my job without waiting	3,83	0,78	0,57*	Conscientiousness
I take the initiative of conversations	3,79	0,8	0,56*	Extraversion
I do the work with conviction	4,18	0,66	0,55*	Conscientiousness
I immediately begin the tasks to be done	3,89	0,72	0,55*	Conscientiousness
I respect group decisions	4,08	0,7	0,55*	Agreeableness
I get to work without waiting	3,87	0,78	0,55*	Conscientiousness
I stand in solidarity with the members of my group	3,96	0,78	0,54*	Extraversion
I do not assume my responsibilities	4,09	0,77	0,54*	Conscientiousness
I never get bored	3,81	0,81	0,54*	Openness
I know how to take up challenges	3,74	0,84	0,54*	Conscientiousness
I get involved in collective/community activities	4	0,82	0,53*	Extraversion
I leave it to others to take the initiative	3,83	0,88	0,53*	Extraversion
I know how to keep the secrets	4,11	0,75	0,52*	Agreeableness
I never leave Agreeablenessjob without completing it	3,9	0,81	0,52*	Conscientiousness
I'm always busy with something interesting	3,67	0,83	0,52*	Openness
I do things by following Agreeablenessplan	3,81	0,77	0,51*	Conscientiousness
I like to put order	4,15	0,69	0,50*	Conscientiousness
I sometimes feel dishonest	4,18	0,77	0,50*	Agreeableness
I leave my stuff lying around	4,05	0,8	0,50*	Conscientiousness
I never leave work (to be done)	3,64	0,87	0,50*	Conscientiousness
I am easily intimidated	3,96	0,83	0,49*	Extraversion
I quickly realize the tasks to do	3,65	0,8	0,49*	Conscientiousness
I enjoy my work	3,72	0,85	0,48*	Conscientiousness
I am consumed by my own problems	3,69	0,91	0,48*	Emotional stability
I like to tidy up all around	3,85	0,77	0,48*	Conscientiousness
I do things quickly	3,79	0,82	0,48*	Conscientiousness
I leave my room in disorder	4,18	0,76	0,47*	Conscientiousness
I can clearly articulate ideas	3,61	0,8	0,47*	Conscientiousness
I am always ready	4,24	0,74	0,47*	Conscientiousness
I delight in disorder	4,23	0,8	0,47*	Conscientiousness
I am true to my own values	3,87	0,86	0,47*	Agreeableness
I exaggerate with my troubles	3,91	0,84	0,47*	Emotional stability
I pay attention to details	3,83	0,81	0,46*	Conscientiousness
I'm easily discouraged	3,98	0,84	0,46	Conscientiousness
I give up easily	3,96	0,84	0,45	Conscientiousness
I leave it to others to decide	3,71	0,93	0,45	Extraversion
I leave my things hanging out	4,03	0,84	0,45	Conscientiousness
I seldom associate myself with others	3,96	0,85	0,44	Extraversion
I finish the tasks whatever the obstacles encountered	3,55	0,9	0,44	Conscientiousness
I believe that honesty is the foundation of trust	4,12	0,84	0,43	Agreeableness

Table 12, continued

	Mean	SE	Factor loading	"Naive" classification
I like to belong to Agreeablenessgroup	3,73	0,88	0,43	Extraversion
I do not get distracted when I work	3,71	0,87	0,42	Conscientiousness
The disorder does not bother me	3,98	0,89	0,41	Conscientiousness
I do not know how to seize opportunities	3,37	0,94	0,41	Openness
I do not finish what I started	3,88	0,88	0,41	Conscientiousness
I know how to handle difficult situations	3,56	0,98	0,40	Conscientiousness
It's difficult for me to make decisions	3,48	0,99	0,40	Conscientiousness
I am interested in very few things	3,67	0,88	0,39	Openness
I am Agreeablenessworkaholic	3,47	0,93	0,39	Conscientiousness
I feel comfortable with people	3,88	0,81	0,38	Extraversion
I always act first	3,66	0,82	0,37	Extraversion
I forget to put things in their place	3,66	0,9	0,36	Conscientiousness
It's often hard for me to have fun	3,61	0,98	0,36	Openness
I forget to put things in their place	3,63	0,91	0,34	Conscientiousness
I have trouble expressing my feelings	3,29	0,98	0,32	Extraversion
I am uncomfortable in group work	3,79	0,93	0,31	Extraversion
I do not continue with what I decided to do before	3,54	0,96	0,30	Conscientiousness
Disorganized people don't bother me	3,83	1	0,30	Conscientiousness
I interact with different people during meetings	2,25	0,8	-0,46	Openness

Notes: Items used to build responsibility measurement. According to Attanasio et al. (2020), only items which have a contribution (factor loading) higher than the average contribution in absolute terms are used for the factor's interpretation. They are noted by a star. All items are corrected for acquiescence bias and reverse coded for the ones who needed it.

Table 13: Initiative measurement (Cronbach's Alpha = 0.71)

	Mean	SE	Factor loading	"Naive" classification
I have trouble getting to work	3,35	0,96	0,58*	Conscientiousness
I need a boost to start work	3,05	1,01	0,57*	Conscientiousness
I have trouble starting my tasks	3,31	0,95	0,56*	Conscientiousness
I wait for others to point the way	3,4	0,98	0,45*	Extraversion
I'm afraid the worst will happen	3,21	1,08	0,41	Emotional stability
I am a planner	3,23	0,98	0,38	Conscientiousness
I'm afraid to call attention to myself	3,29	1,03	0,32	Extraversion
I have mood swings	2,29	0,88	0,27	Emotional stability

Notes: Items used to build initiative measurement. According to Attanasio et al. (2020), only items which have a contribution (factor loading) higher than the average contribution in absolute terms are used for the factor's interpretation. They are noted by a star. All items are corrected for acquiescence bias and reverse coded for the ones who needed it.

Table 14: Extraversion measurement (Cronbach's Alpha = 0.7)

	Mean	SE	Factor loading	"Naive" classification
I do not speak alot	2,95	0,99	0,60*	Extraversion
I am not talkative	2,94	0,98	0,60*	Extraversion
I am not often talkative	2,89	0,96	0,55*	Extraversion
I talk easily	3,25	1,02	0,38*	Extraversion
I do not like taking the lead	2,67	0,97	0,37*	Extraversion
I avoid drawing attention to myself	3,13	1,14	0,37*	Extraversion
I'm not very curious about what's going on in the world	3,29	1,04	0,36*	Openness
I like to lead groups	3,16	1,06	0,35*	Extraversion
I am competent in several fields	3,03	0,99	0,33	Openness
I work best when I'm alone	2,94	1,02	0,32	Extraversion
I am a difficult person to understand	3,17	1	0,31	Emotional Stability
I stay away from strangers	3,45	1	0,28	Extraversion
I differ from the unpleasant tasks	3,05	0,98	0,26	Conscientiousness
I prefer to do it alone	3,45	0,96	0,26	Extraversion
I lie to get out of things	3,91	0,96	-0,36*	Agreeableness

Notes: Items used to build extraversion measurement. According to Attanasio et al. (2020), only items which have a contribution (factor loading) higher than the average contribution in absolute terms are used for the factor's interpretation. They are noted by a star. All items are corrected for acquiescence bias and reverse coded for the ones who needed it.

Table 15: Emotional stability measurement (Cronbach's Alpha = 0.74)

	Mean	SE	Factor loading	"Naive" classification
I am often sad	3,49	1,05	0,58*	Emotional stability
I rarely worry	3,25	0,93	0,50*	Emotional stability
I am often worried	3,21	1,05	0,49*	Emotional stability
I feel hopeless	3,78	0,96	0,47*	Emotional stability
I am unflappable	3,23	1,04	0,44*	Conscientiousness
I rarely get angry	3,22	1,1	0,42*	Emotional stability
I am not often worried	3,21	1,04	0,41	Emotional stability
I panic easily	3,64	0,92	0,41	Emotional stability
I get frustrated quickly	3,71	0,89	0,40	Emotional stability
I panic easily	3,79	0,91	0,40	Emotional stability
I have bad presentiments	3,75	0,98	0,36	Emotional stability
I see problems everywhere	3,52	0,95	0,32	Emotional stability
I am not enjoying	3,77	0,92	0,30	Emotional stability
I have a lot of fun	2,99	0,95	0,28	Emotional stability

Notes: Items used to build emotional stability measurement. According to Attanasio et al. (2020), only items which have a contribution (factor loading) higher than the average contribution in absolute terms are used for the factor's interpretation. They are noted by a star. All items are corrected for acquiescence bias and reverse coded for the ones who needed it.

Table 16: Openness measurement (Cronbach's Alpha = 0.64)

	Mean	SE	Factor loading	"Naive" classification
I am very interested in other countries and their cultures	3,24	1,06	0,52*	Openness
In any situation I can find something interesting	3,13	0,9	0,47*	Openness
I like to draw attention to myself	2,82	1	0,45*	Extraversion
I think my life is very interesting	3,29	0,91	0,37	Openness
I always have something to say	2,73	0,91	0,37	Extraversion
I know how to captivate people's attention	3,17	0,92	0,36	Extraversion
I find the world very interesting	3,44	1,03	0,34	Openness
I am interested in many things	3,15	0,98	0,26	Openness

Notes: Items used to build openness measurement. According to Attanasio et al. (2020), only items which have a contribution (factor loading) higher than the average contribution in absolute terms are used for the factor's interpretation. They are noted by a star. All items are corrected for acquiescence bias and reverse coded for the ones who needed it.

Table 17: Correlation Matrix of Personality Traits

	Constructs from PCA					Naive constructs				
	Responsible	Initiative	Extraversion	Emotional stability	Openness	Openness	Conscientiousness	Extraversion	Agreeableness	Emotional stability
Constructs from PCA										
Responsible	1.000									
Initiative	0.054**	1.000								
Extraversion	-0.071***	-0.074***	1.000							
Emotional Stability	-0.087***	-0.093***	0.132***	1.000						
Openness	-0.049*	-0.047*	0.065**	0.092***	1.000					
Naive constructs										
Openness	0.579***	0.238***	0.284***	0.071***	0.463***	1.000				
Conscientiousness	0.919***	0.218***	0.009	0.038	0.094***	0.622***	1.000			
Extraversion	0.617***	0.188***	0.605***	0.073***	0.170***	0.638***	0.641***	1.000		
Agreeableness	0.809***	-0.069***	-0.093***	-0.014	-0.096***	0.412***	0.698***	0.444***	1.000	
Emotional stability	0.507***	0.184***	0.008	0.703***	0.057**	0.410***	0.559***	0.442***	0.398***	1.000

Notes: z-scores are used. *** p<0.01, ** p<0.05, * p<0.1