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Parenting Styles, Socioeconomic Status and (Non-)Cognitive Skills

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Parenting Styles, Socioeconomic Status and (Non-)Cognitive Skills

Philipp Kugler * Martin Kroczek † Anne Zühlke ‡

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Abstract: Using a novel latent class model, we investigate which parenting styles can be observed and how parenting styles are related to parents' characteristics. We identify four parenting styles. An authoritarian and an authoritative style closely resemble the styles proposed by psychologists. The two other styles are variations of these styles. The parenting styles are strongly associated with household income, education and whether a child is an only child. The results suggest that constraints in both time and (non-)cognitive skills of the parents restrict their choice. We find that children's skills, in particular non-cognitive skills, are strongly associated with the parenting style. Parenting styles that are associated with low household income and having more than one child are associated with lower skills of the child. Therefore, our results indicate that parenting styles might be an important factor in explaining the skill gap in early childhood between children from different socioeconomic origins.

Keywords: human capital, skills, parenting, child rearing, parenting style, social mobility, socio-economic status, topic modeling
JEL-Codes: J13, J24, J62
Declarations of interests: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.
Data availability statement: This paper uses data from the National Educational Panel Study (NEPS; see Blossfeld & Roßbach 2019). The NEPS is carried out by the Leibniz Institute for Educational Trajectories (LIfBi, Germany) in cooperation with a nationwide network. The data can be obtained by filing a request directly with the Lifbi. Stata and R-Scripts to replicate the study are provided in the Online Appendix.

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1 Introduction

The ambition to provide equal chances for economic and social participation to every child is broadly voiced among developed societies. Yet, a large body of literature documents a gap in non-cognitive and cognitive skills across parental income and education, even in early childhood (see Heckman & Mosso 2014, Francesconi & Heckman 2016, Attanasio 2015, for extensive reviews of the recent literature). At the same time, early childhood factors are important determinants of economic and social adult outcomes. For example, Keane & Wolpin (1997), Cunha et al. (2005) and Huggett et al. (2011) show that at least half of the lifetime income variability across individuals arises from differences in childhood characteristics, which are primarily influenced by children's environment. In this sense, Cunha et al. (2006) underline the importance of parenting, i.e. all actions taken by parents to support the development of their child. Parenting has been the subject of economic research for several decades, dating back at least to the work on families by Becker (1981) and Becker & Tomes (1986).

Various studies that analyze the behavior of parents focus on parental investment. In particular, they show how time and monetary investments affect children's skill acquisition and how such investments differ between parents with different socioeconomic status (e.g. Cunha et al. 2013, Boneva & Rauh 2016, Attanasio et al. 2020, Falk et al. 2021). Parenting styles, the broad strategy of how parents interact with their children, can be seen as another dimension of investment. However, the choice and effects of parenting styles is a rather novel topic in the economic literature (see Doepke et al. 2019, for an extensive review of the economic literature on parenting).

We supplement and extent the research on parenting styles. Our data contains a large set of measures about the parent-child interaction from six different domains, such as how parents monitor their child or how much autonomy parents leave to their child. Using Latent Dirichlet Analysis for Survey Data (LDA-S), a hierarchical model recently proposed by Munro & Ng (2022), we operationalize parenting styles as latent classes. LDA-S differs from conventional models used to recover latent factors. First, LDA-S acknowledges that the survey responses on parent-child interaction are categorical. Second, it provides an economic interpretation to the unobserved heterogeneity. Finally, LDA-S connects unobserved heterogeneity with observed characteristics and survey responses. Therefore, we can directly incorporate and analyze differences in parenting styles along parental socioeconomic status and household composition. Further, we analyze how parenting styles are associated with children's non-cognitive and cognitive skills.

Our paper connects at least three strands of literature. First, we add to the discussion on how to operationalize parenting styles. Economists analyzing parenting styles commonly refer to the theoretical foundations laid out by Baumrind (1971, 1991). The framework classifies parents' behavior into two dimensions, demandingness and responsiveness. This results in four different parenting styles. *Authoritative* parents are both demanding and responsive. This style is defined by parents monitoring and communicating clear rules and standards for their children's behavior. Parents are assertive, but not invasive or restrictive. They support their children rather than punish them with disciplinary methods and raise them to be socially responsible, self-regulated and cooperative. *Authoritarian* parents are demanding as well, but not responsive. This parenting style is

characterized by an orderly environment without explanations and a clear set of regulations. These parents are obedience- and status-oriented. In contrast, *permissive* parents are more responsive and less demanding. They allow self-regulation and avoid confrontation. This parenting style is non-traditional and tolerant. Last, *neglecting* parents are neither demanding nor responsive. This style is defined by non-supportive parents, who do not monitor their children, but actively reject them.

Doepke & Zilibotti (2017) develop a theory that rationalizes the choice between Baumrind's parenting styles. The equilibrium of the model results in different parenting styles depending on parental preferences and the socioeconomic environment. Other theoretical models capture key features of Baumrind's parenting styles. For example, Burton et al. (2002) model parenting styles as parent's patience when the child misbehaves. Lundberg et al. (2009) model parenting styles as the control of the parents on the child's decision-making. The model proposed by Cobb-Clark et al. (2019) captures the closeness of the parent-child relationship and the degree of monitoring parents employ. In empirical studies, the parenting styles are commonly modeled as continuous latent factors coming from factor analysis. Cobb-Clark et al. (2019) obtain two indices to measure parenting styles. One capturing whether parents respect the child's views and opinions, the other how much the parents monitor the child. Falk et al. (2021) rely on three domains of parent-child interaction, i.e. (i) parental warmth, (ii) parental interest and monitoring, and (iii) parental psychological and behavioral control. They recover one latent factor, for which higher values reflect warm and child-oriented parenting but also a high degree of monitoring, while a lower value is associated with a higher degree of punishment. Fiorini & Keane (2014) identify two latent factors. One is an index of warmth and affection, the other can be interpreted as the effectiveness of imposing discipline.

The second major literature we connect to is that on the relation between parental investment and socioeconomic status. Recent literature established a strong link between both and discusses potential causal channels. Parental time and monetary investment may hinge on parents' objective, resource constraints and incorrect beliefs about the child's production function of human capital (Attanasio 2015, Dizon-Ross 2016, Doepke & Zilibotti 2017). Evidence on the link between parenting styles and socioeconomic status is scarce. In their theoretical framework, Cobb-Clark et al. (2019) model parenting styles as parental investments. The investment depends not only on time and income but on mental effort required to pay attention to engage with, monitor and supervise the child. Their model links socioeconomic status to parental investment by allowing the endowment of a household's attention to depend on socioeconomic status. They empirically support the key features of their model and find that the extent to which parents monitor their children decreases with socioeconomic status. Falk et al. (2021) also link socioeconomic status and parenting styles. They find that parents with low socioeconomic status more often resort to parenting with a higher degree of punishment and less often to warm and child-oriented parenting. In this sense, Weinberg (2001) argues that, because of the scarcity of means, low-income parents have limited access to create incentives for the child. Therefore, they more often resort to authoritarian methods, such as corporal punishment. Doepke & Zilibotti (2017) find similar evidence. They show that parental education is associated with a lower probability to be a neglecting or authoritarian parent. In contrast, the probability to be an authoritative parent increases.[1] Despite the notion

[1]Doepke & Zilibotti (2017) classify parents into Baumrind's (1991) four parenting styles using two questions asking children whether their parents are (i) supportive and (ii) strict/demanding.

of Becker et al. (1960) that a larger number of children tends to lower investment in each individual child, the link between the household composition and the choice of parenting style is less considered. For parents with more than one child, it may not be possible to follow a warm and child-oriented style due to constraints.

The third and last strand of literature we contribute to is about the link between parenting styles and children's cognitive and non-cognitive skills. In psychology, many studies have attempted to establish this relationship. Often, such studies focus on achievement in school, the child's personality or non-cognitive skills (see for example Aunola et al. 2000, Aunola & Nurmi 2005, Alegre 2011, Masud et al. 2015). Most commonly, they find that an authoritative style, or the features that an authoritative style exhibits, are associated with the most favorable outcomes. The economic literature provides similar evidence. Doepke & Zilibotti (2017) show that authoritative parenting is associated with better performance in school and higher educational attainment. Cobb-Clark et al. (2019) find a positive association between respectful parenting and the child's educational outcomes as well as on non-cognitive skills in youth (internal locus of control and less risky behavior). Higher parental monitoring is associated with less risky behavior. Fiorini & Keane (2014) and Falk et al. (2021) study the association between parenting styles and early childhood skills. Falk et al. (2021) analyze the link between the parenting style and the child's patience, risk aversion, behavior, altruism and IQ. They find positive effects of a warmer and more child-oriented parenting style on all these outcomes. Fiorini & Keane (2014) show that non-cognitive skills like behavioral problems, social skills, and emotional problems are especially sensitive to the parenting style. They find that a parenting style combining effective discipline and parental warmth, i.e. an authoritative style in the sense of Baumrind, leads to the most favorable non-cognitive outcomes. In contrast to Falk et al. (2021), they find that cognitive skills are less sensitive to the parenting style.

We contribute to the literature in many ways. First, we apply a novel method which can handle a large set of measures on parent-child interactions. Therefore, we are able to describe parenting styles in more detail than previous studies. This allows us to separate styles that differ only in terms of a few but important dimensions. Second, the theoretical framework of LDA-S provides an economically interpretable link between parent-child interactions and parents' socioeconomic environment. Third, in contrast to continuous latent factors, latent classes more easily refer to theoretical models such as Baumrind (1971, 1991). In this way, the data-driven approach can be embedded into theoretical frameworks. Fourth, we fill the gap on the link between parenting styles and household composition. Fifth, rich data on children's (non-)cognitive skills allow us to explore the association between parenting styles and children's skills. Finally, we are able to analyze the role of parenting styles in the emergence of skill gaps between children from different socio-economic environments in early childhood.

Applying LDA-S results in four parenting styles. Two styles closely resemble Baumrind's (1991) authoritative and authoritarian style. The two other styles can be interpreted as variations. One style is very similar to an *authoritative* style, which we call *democratic-loving*. The democratic-loving style differs from the authoritative style as such parents do not enforce their will, leave more autonomy to their child and communicate with the child more positively. The last style is like an *authoritarian* style, but the parents are much more inconsistent in their parenting. We call this style *authoritarian-inconsistent*. Our results show that parenting styles are strongly associated with household income, education and whether the child is an only child. Although our model does not directly allow for the identification of potential channels, the results suggest that constraints

in both time and (non-)cognitive skills of the parents play an important role in choosing a parenting style. We find that children's (non-)cognitive skills are strongly associated with the parenting style. In line with Fiorini & Keane (2014), this link is more pronounced for non-cognitive than for cognitive skills. An *authoritative* and a *democratic-loving* style are associated with the highest skills, whereas children who are raised with an *authoritarian-inconsistent* style have the lowest skills. Our results show how differences in parenting styles contribute to the skill gap between children from different socioeconomic environments. We find that in particular styles associated with low household income are linked with lower skills. Parents with high household income are more likely to choose a style which is associated with higher skills. Further, parents with more than one child are more likely to choose a style that is related to lower skills. In contrast, having an only child is associated with a style that is associated with higher skills. Interestingly, parents' education is not systematically connected to parenting styles which are related to more favorable outcomes.

The remaining paper is structured as follows. Section 2 briefly describes the data. In section 3, we describe the method applied in the empirical analysis. Section 4 describes the parenting styles which are identified by our model. In section 5, we show how these parenting styles are linked with parental socioeconomic environment. Section 6 presents and discusses how the parenting styles are linked to (non-)cognitive skills. Section 7 concludes.

2 Data

This paper uses the first Starting Cohort (NEPS-SC1) of the German National Educational Panel Study (NEPS 2021*b*). The panel study follows children born between February and July 2012 since they were six months old. One parent of every child is interviewed as part of the study. The data is perfectly suited to answer our research questions. It contains extensive information on each child, the child's development, the household in which the child lives in as well as on parents and how they rear their child. Our analysis mainly relies on questions about the parent-child interaction and measures on (non-)cognitive skills.

2.1 Parent-Child Interaction

To identify parenting styles, we rely on $J = 23$ questions about the parent-child interaction when the child was 5 and 6 years old. Broadly, the parent-child interaction can be classified into six categories: (1) How parents monitor their child, (2) how parents enforce their will, (3) how inconsistent parents are in their parenting, (4) how emotionally warm parents are with their child, (5) how parents communicate with their child and (6) how much autonomy parents leave to their child. Table 1 summarizes the questions and shows the response behavior of parents from 1530 children. For most of the questions, there is a rather large amount of response heterogeneity. The distribution is mostly concentrated around one option, i.e. multiple mass points at extremes of the response distribution do not exist. Our goal is to link parenting styles with household income, parental education and household composition. To this end, we compute the monthly household equivalence income (Hagenaars et al. 1994) and split it into three categories using the 33%- and 66%-quantile of its distribution.

We use an indicator showing whether at least one parent has a university degree to measure parental education and an indicator that shows whether the child is an only child to measure the household composition. In the right panel of table 1 we depict p-values of a Chi-Square Test that tests the null hypothesis of independence between parent-child interaction x_{ij} and the parental characteristics. Results show that there are substantial differences in parenting between parents with different characteristics. In section 5, we analyze whether there are any patterns behind these differences.

	never	seldom	some-times	often	very often	χ^{inc}	χ^{educ}	χ^{sib}
Monitoring of Parents (M)								
If your child has new friends, you talk to him/her about them.	0.00	0.03	0.17	0.56	0.24	0.01	0.01	0.26
If your child went out, you ask him/her what he/she did and experienced.	0.00	0.00	0.01	0.28	0.71	0.05	0.79	0.75
If your child's out, you know exactly where he/she is.	0.00	0.00	0.01	0.11	0.88	0.18	0.46	0.92
If your child has new friends, you will meet them soon.	0.00	0.01	0.09	0.37	0.53	0.04	0.17	0.25
Enforcement of Will (E)								
When your child starts to negotiate with you, you exercise your authority.	0.01	0.11	0.52	0.33	0.03	0.59	0.00	0.11
You set clear limits for your child so that it does not exploit your goodwill.	0.00	0.04	0.24	0.59	0.12	0.01	0.00	0.68
If you want your child to do something, you give a clear command and don't tolerate any great detours.	0.01	0.11	0.35	0.47	0.06	0.39	0.00	0.48
If your child wants you to make an exception, you insist on your rules so that it is clear who is in charge in the family.	0.05	0.23	0.50	0.20	0.02	0.06	0.01	0.67
Inconsistency of parenting (I)								
You soften a punishment or terminate it prematurely.	0.04	0.33	0.49	0.12	0.02	0.05	0.34	0.11
On some days you are stricter with your child than on the others.	0.01	0.18	0.69	0.11	0.01	0.20	0.04	0.51
You threaten to punish your child, but you don't punish him/her.	0.18	0.48	0.28	0.06	0.00	0.00	0.02	0.02
It's hard for you to be resolute in your parenting.	0.09	0.47	0.37	0.06	0.01	0.03	0.00	0.05
Emotional Warmth (W)								
You show your child with words and gestures that you love him/her.	0.00	0.00	0.02	0.27	0.71	0.05	0.01	0.30
You comfort your child, when it is sad.	0.00	0.00	0.02	0.30	0.68	0.77	0.46	0.74
You praise your child.	0.00	0.00	0.03	0.56	0.41	0.39	0.00	0.14
Communication of parents (C)								
You criticize you child.	0.04	0.30	0.56	0.09	0.00	0.00	0.00	0.28
You shout at your child, if he/she has done something wrong.	0.15	0.55	0.27	0.03	0.00	0.17	0.19	0.04
You insult your child when you are angry at him/her.	0.46	0.34	0.18	0.02	0.00	0.10	0.06	0.04
Autonomy of child (A)	does not apply at all	does rather not apply	does rather apply	does completely apply		χ^{inc}	χ^{educ}	χ^{sib}
I think it's good if my child says what it thinks.	0.00	0.01	0.36	0.64		0.49	0.03	0.93
If my child wants something and doesn't get it, I'll explain why.	0.00	0.01	0.28	0.72		0.24	0.17	0.34
I often ask my child for opinion.	0.00	0.10	0.61	0.28		0.69	0.00	0.01
I let my child make its own plans for the things it wants to do.	0.01	0.17	0.66	0.15		0.88	0.00	0.34
If I want my child to do something, I'll explain why.	0.00	0.06	0.55	0.39		0.67	0.10	0.24

Table 1 – Measures on Parent-child interaction

The table summarizes the measures on parent-child interaction. The panel in the middle depicts the survey responses. The right panel shows the p-values of a Chi-Square Test testing the null of independence between each parent-child interaction and monthly equivalence household income in three categories (χ^{inc}), whether at least parent has a university degree (χ^{educ}) or whether the child is an only child (χ^{sib}).

2.2 Non-cognitive and Cognitive Skills

The final part of this paper analyzes how parenting styles affect (non-)cognitive skills of the child. NEPS-SC1 collects an extensive set of different skill measures. In our main analysis, we focus on outcomes that were surveyed when the child was 4 and 7 years old, i.e. before and after the parenting style is observed. Cognitive skills are assessed via standardized tests (Berendes et al. 2013, NEPS 2020, 2021*a*). The measurement of basic cognitive skills is based on tests that are as education-independent and domain-unspecific as possible. To measure mental performance, we rely on the child's ability to reason. Linguistic skills are undisputedly very import determinants for explaining social disparities in school careers. These are captured via listening comprehension. To test the mathematical literacy, the child is required to recognize and flexibly apply mathematics in realistic, mainly extra-mathematical situations.

To analyze the effect of parenting styles on non-cognitive skills, we use the Goodman's (1997) *Strengths and Difficulties Questionnaire* (SDQ) to measure social behavior (see Wohlkinger et al. 2019). We also observe the patience of the child. It is measured by a classical experiment on the delay of gratification, where the child could choose between one gift now or two gifts tomorrow (NEPS 2021*a*).

In addition, we conduct supplementary analyses for outcomes that are only surveyed once. We analyze the effect of parenting styles on the child's personality traits measured by Big Five and how children cope with their every-day school life. This includes the child's autonomy, enjoyment of learning, willingness to make an effort, and social integration into the class.

3 Latent Dirichlet Analysis for Survey Data

Motivated by the differences shown in table 1, our goal is to explain the heterogeneity in parent-child interaction given the parental education, household income and whether the child is an only child. We apply an adapted version of Latent Dirichlet Analysis (see Blei et al. 2003) for Survey Data (LDA-S) proposed by Munro & Ng (2022). LDA-S connects unobserved heterogeneity with observed characteristics and survey responses, explicitly acknowledges that survey responses are categorical and provides an economic interpretation of the unobserved heterogeneity. Throughout the paper, italic symbols denote scalars and bold symbols denote vectors that collect the respective scalars along their indices.

Assume we observe N parents indexed by i. Each parent belongs to one of $d_i \in \mathbb{G} = \{1, ..., G\}$ observable groups. In our case, individuals are grouped by all possible combinations of three categories of household equivalence income, an indicator that shows whether one parent has a university degree and whether the child has siblings living in the same household, i.e. $G = 12$. We observe J dimensions of the interaction between the target child of the survey and the parents x_{ij}. Each dimension j has L^j possible responses, where parents choose a single response v from $x_{ij} \in \mathbb{L}^j = \{1, ..., L^j\}$. We model the heterogeneous parent-child interaction as coming from K possible strategies to raise a child $z_i \in \mathbb{K} = \{1, ..., K\}$ (i.e. parenting styles). Parents choose z_i such that their utility is maximized. The model incorporates a group-affinity, which allows parents with similar income, education and number of children to choose the same parenting style. An individual effect allows parents to deviate from their group affinity though.

$$z_i = \underset{k \in 1,...,K}{\arg\max}\, U(k) = \underset{k \in 1,...,K}{\arg\max} \sum_{j}^{K} \mathbb{1}\left(k = j\right)\left(u_{d_i,j} + e_{ij}\right), \tag{1}$$

where $u_{d_i,j}$ denotes the group affinity of $d_i = g$ for style $j = k$ and e_{ij} is an individual effect that captures everything else. The observed heterogeneity of an individual's group membership d_i and unobserved heterogeneity of an individual's chosen parenting style is linked by a random variable that gives the probability to choose parenting style $z_i = k$ given group membership $d_i = g$

$$\pi_{gk} = \mathbb{P}\left(z_i = k | d_i = g\right) = \mathbb{P}\left(u_{gk} + e_{ik} = \max_{j \in \mathbb{K}} \left(u_{gj} + e_{ij}\right)\right). \tag{2}$$

The chosen parenting style influences the observed parent-child interaction x_{ij}. Parents optimally interact

with their child by maximizing their individual score function for each survey question.

$$x_{ij} = \underset{v \in \{1,\dots,L^j\}}{\arg\max} \sum_{u=1}^{L_j} \mathbb{1}\left(v = u\right) \left(q^j_{z_i,u} + s^j_{iu}\right), \tag{3}$$

where $q^j_{z_i,u}$ denotes a parenting style-specific effect and s^j_{iu} an individual-specific effect, which allows parents to deviate from the usual parent-child interaction with parenting style $z_i = k$. The expected parent-child interaction is described by a random variable $\beta^j_{k,v}$ that captures the probability that an individual with parenting style $z_i = k$ chooses v as the response to survey question j.

$$\beta^j_{kv} = \mathbb{P}\left(x_{ij} = v | z_i = k\right) = \mathbb{P}\left(q^j_{z_i,v} + s^j_{iv} = \max_{u \in \mathbb{L}^j} \left(q^j_{z_i,u} + s^j_{iu}\right)\right) \tag{4}$$

Since we neither observe $\boldsymbol{u}_{g,:}, \boldsymbol{e}_{i,:}, \boldsymbol{q}^j_{k,:}$ and $\boldsymbol{s}^j_{i,:}$ nor their distribution, $\boldsymbol{\pi}_{g,:}$ and $\boldsymbol{\beta}^j_{k,:}$ are treated as random. Each $\boldsymbol{\pi}_{g,:}$ and each $\boldsymbol{\beta}^j_{k,:}$ is multinomial distributed. Therefore, Munro & Ng (2022) specify priors that follow a Dirichlet distribution with hyperparameters $\boldsymbol{\alpha}_{g,:} \in \mathbb{R}^K$ and $\boldsymbol{\eta}^j_{k,:} \in \mathbb{R}^{L^j}$ respectively. In summary, LDA-S is identified by a hierarchical model

$$x_{ij} | \boldsymbol{\beta}, z_i \sim \text{Multinomial}\left(\boldsymbol{\beta}^j_{z_i,:}\right) \tag{5a}$$

$$z_i | \boldsymbol{\pi}_{d_i,:} \sim \text{Multinomial}\left(\boldsymbol{\pi}_{d_i,:}\right) \tag{5b}$$

$$\boldsymbol{\pi}_{d_i,:} \sim \text{Dirichlet}\left(\boldsymbol{\alpha}_{d_i,:}\right) \tag{5c}$$

$$\boldsymbol{\beta}^j_{z_i,:} \sim \text{Dirichlet}\left(\boldsymbol{\eta}^j_{z_i,:}\right). \tag{5d}$$

Using this, we can write down the joint distribution and estimate the model using MCMC methods (see Munro & Ng 2022). The Gibbs Sampler iteratively samples each variable from its conditional distribution conditional on all other variables. Each iteration comprises three steps. First, z_i conditional on $\boldsymbol{x}_{i,:}$, $\boldsymbol{\beta}$, and $\boldsymbol{\pi}_{d_i,:}$ is sampled from a multinomial distribution. Second, $\boldsymbol{\beta}$ conditional on $\boldsymbol{\eta}$, $\boldsymbol{x}$, and $\boldsymbol{z}$ is sampled form a Dirichlet distribution. Third, $\boldsymbol{\pi}_{g,:}$ conditional on $\boldsymbol{\alpha}$, $\boldsymbol{x}$, and $\boldsymbol{z}$ is sampled form a Dirichlet distribution. Throughout the process, new values of the variables are used as soon as they are obtained. Draws of z_i depend on the values of $\boldsymbol{\beta}$ and $\boldsymbol{\pi}_{d_i,:}$ from the previous iteration, whereas draws of $\boldsymbol{\beta}$ and $\boldsymbol{\pi}_{g,:}$ depend on z_i from the current one. In our analysis, we conduct 20000 iterations. The results shown in sections 4, 5 and 6 are based on the the sample averages over the whole process, as it is usually done. To account for the bias caused by starting the system with randomly chosen initial values (initial transient), we burn the first 10000 iterations.

To estimate the model, hyperparameters of the Dirichlet distributions, $\boldsymbol{\alpha}_{g,:}$ and $\boldsymbol{\eta}^j_{k,:}$, and the number of parenting styles, K, have to be specified. Hyperparameters of the Dirichlet prior specify the researcher's beliefs about the importance of the group-specific terms ($\boldsymbol{u}_{g,:}$ and $\boldsymbol{q}^j_{k,:}$) relative to the individual-specific ones ($\boldsymbol{e}_{i,:}$ and $\boldsymbol{s}^j_{i,:}$). For example, we would specify $\alpha_{g,k} < 1$ if we believe that members of the same observable group g are likely to choose the same parenting style k. Similarly, $\eta^j_{kv} < 1$ reflects the belief that all individuals who choose the same parenting style, are likely to respond in the same way. The opposite is true for $\alpha_{g,k} > 1$ and $\eta^j_{kv} > 1$. We impose uninformative priors to the relationship between observed group affinity and parenting style or parenting style and response behavior, i.e. $\alpha_{g,k} = 1 \, \forall g, k$ and $\eta^j_{kv} = 1 \, \forall j, k, v$. Regarding the number of parenting styles, we follow Munro & Ng (2022) and choose the optimal K according to the minimum of an approximated Bayesian information criterion (BIC). In our case $K = 4$.

In summary, LDA-S imposes structure on observable group indicators and parents' responses in the questionnaires by assuming that parents optimally choose parenting styles given their group membership and optimally select responses given their chosen parenting styles. The optimal choices are affected by individual terms and group commonalities in the first or parenting style commonalities in the second case. The individual effects allow parents to deviate from the choices usually made by other parents with the same group or parenting style.

4 Identification of Parenting Styles

In this section, we present the parenting styles defined by LDA-S. Our results show that Parenting Style 1 is chosen slightly more often (31%) than Parenting Style 2 (28%). Parenting Style 3 and 4 are chosen less often (20%). We want to give each parenting style a meaningful interpretation. Figure 1 and 2 depict the probability for an individual with parenting style $z_i = k$ to choose v as response to survey question j, i.e. $\boldsymbol{\beta}^j_{k,:}$.

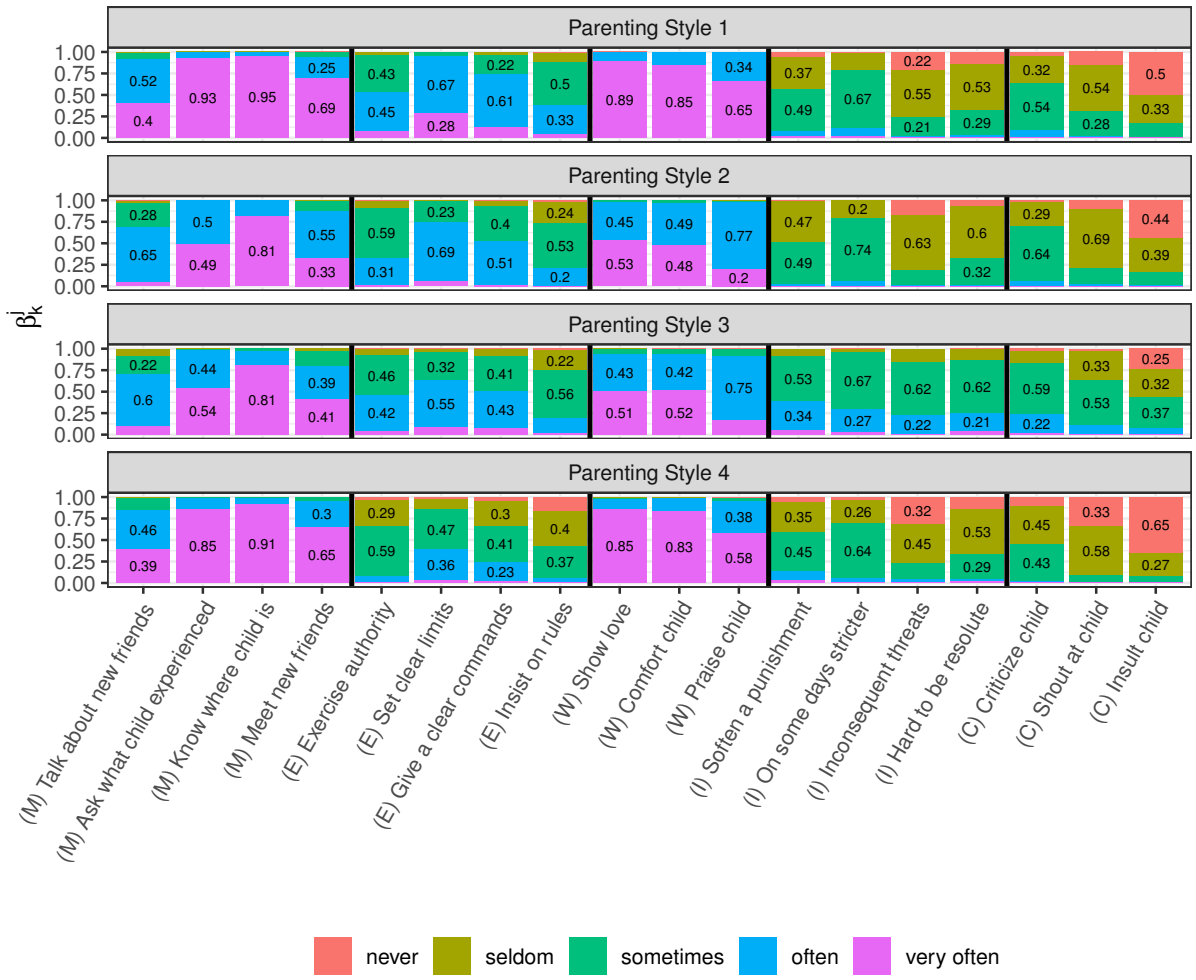

Figure 1 – Probability to respond given choice of parenting style I

The figure depicts $\boldsymbol{\beta}^j_{k,:}$, i.e. the probability for an individual with parenting style $z_i = k$ to choose v as response to survey question j.

The far left area of figure 1 shows how the typical **monitoring** behavior of parents, given their parenting style, looks like. Parents who choose Style 1 state (1) with a probability of 0.40 that they talk about the child's new friends *very often*, (2) with a probability of 0.93 that they ask about the child's experiences *very often*, (3) with a probability of 0.95 that they know where the child is *very often* and (4) with a probability of 0.69 that they meet their child's new friends *very often*. Typical parents with Style 4 behave similarly. In contrast, the respective probabilities of parents who choose Style 2 or Style 3 are much smaller. The left area of figure 1 shows that the styles also differ in the way how parents **enforce their will**. Parents with Style 1, Style 2, or Style 3 *often* enforce their will with a rather high probability. In contrast, the respective probabilities are much smaller for parents with Style 4. The parent-child interaction along **emotional warmth** shows that parents who choose Style 1 or Style 4 are likely to be very warm in their parenting. In contrast, parents with Style 2 or Style 3 are emotionally warm with a much smaller probability. With regard to **inconsistent** parenting, parents who choose Style 3 stand out. They state (1) with a probability of 0.34 that they *often* soften a punishment, (2) with a probability of 0.27 that they *often* are stricter on some days, (3) with a probability of 0.22 that they *often* inconsistently threaten their child and (4) with a probability of 0.21 that it is *often* hard for them to be resolute in their parenting. The respective probabilities for Style 1, Style 2, or Style 4 are very close to zero. The parent-child interaction along the dimension of **communication** shows that typical parents who choose Style 4 communicate with the child in a negative way with a very low probability. They state (1) with a probability of 0.45 that they *seldom* criticize the child, (2) with a probability of 0.33 that they *never* shout at the child and (3) with a probability of 0.65 that they *never* insult the child. In contrast, parents with Style 3 state (1) with a probability of 0.22 that they *often* criticize the child, (2) with a probability of 0.53 that they *sometimes* shout at the child and (3) with a probability of 0.37 that they *sometimes* insult the child. The respective probabilities of Style 1 and Style 2 are somewhere between those of Style 3 and Style 4.

In figure 2, we show how much **autonomy** parents leave to their child. The behavior of parents with Style 4 stands out. They typically leave their child much autonomy. Children who are raised with Style 2 and 3 are likely to be less autonomous. The probabilities for parents with Style 1 lie in between. Their child is likely to be more autonomous than those of Style 2 or Style 3 but less than those of Style 4.

Figure 1 and 2 show major differences between the four parenting styles. To summarize these differences, we compute the Rao distance between $\boldsymbol{\beta}^j_{k,:}$ and $\boldsymbol{\beta}^j_{m,:}$ for all $k \neq m$ (Munro & Ng 2022). Table 2 depicts the five dimensions of parent-child interaction where the parenting styles differ most from each other for each parenting style.

The results show that talking about new friends and asking what the child experienced are the two biggest differences between Style 1 and Style 2. In addition, four out of the five biggest differences between Style 1 and Style 4 can be followed back to the way parents enforce their will. We conclude that typical parents who choose Style 1 monitor their child, are consistent, powerfully enforce their will yet leave the child autonomy and are emotionally warm. This style closely mirrors Baumrind's (1991) *authoritative* style.

Besides the major difference between Style 1 and Style 4 in that parents with Style 4 do not powerfully enforce their will, one of the key difference between Style 4 and Style 1 in table 2 is shouting at the child. This is also one of the main differences between Style 4 and Style 3. Thinking that it is good if the child

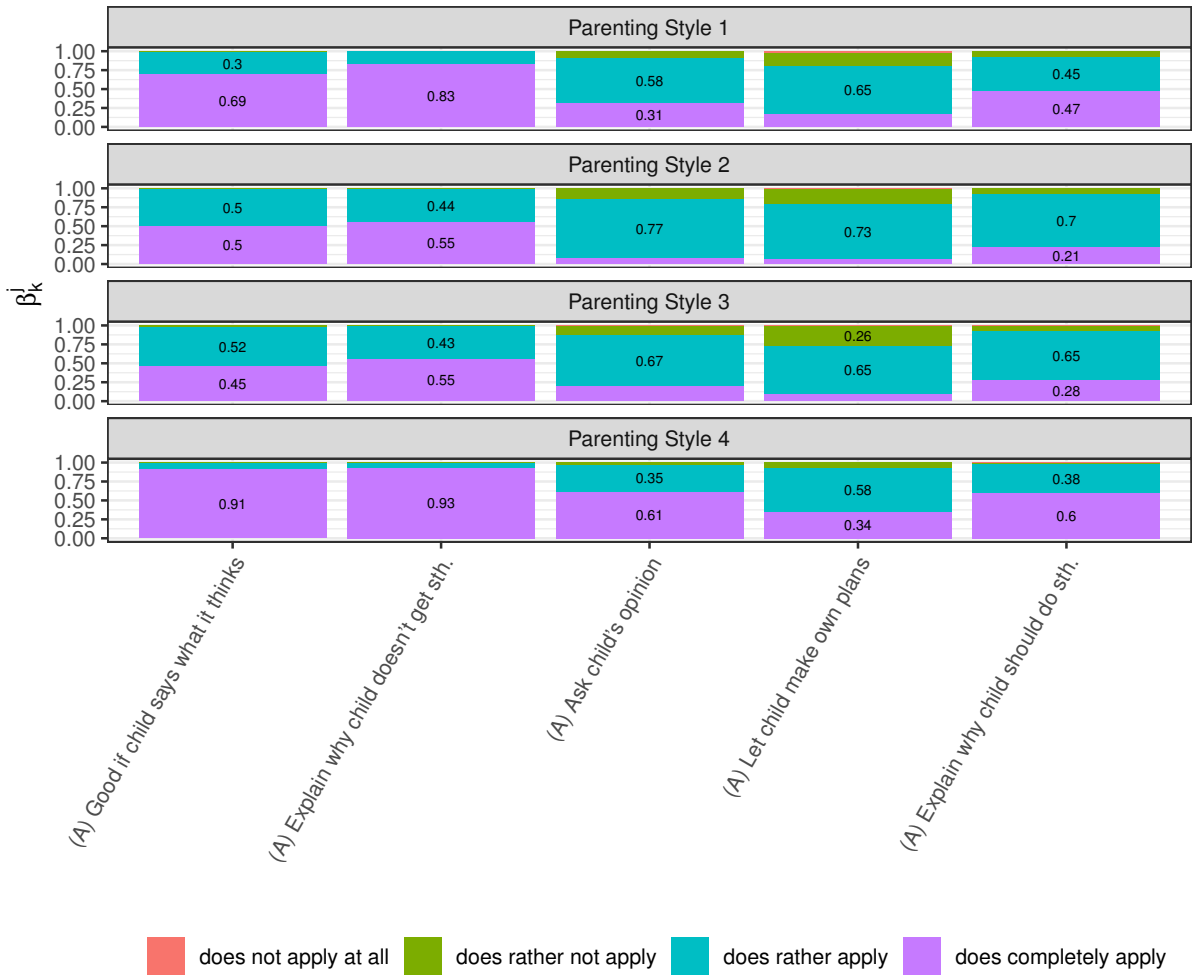

Figure 2 – Probability to respond given choice of parenting style II

The figure depicts $\beta^j_{k,:}$, i.e. the probability for an individual with parenting style $z_i = k$ to choose v as response to survey question j.

says what she thinks, explaining why the child does not get something and asking the child for her opinion are among the five biggest differences between Style 4 and Style 2. The latter also belongs to the biggest differences between Style 4 and Style 3. In summary, Style 4 is similar to Style 1 in many aspects. They differ, as parents with Style 4 typically do not enforce their will but leave their child more autonomy, and do not communicate negatively. This style is not only closely related to Baumrind's (1991) *authoritative* style, but also to Baumrind's (1991) *permissive* style. However, *permissive* parents do not extensively monitor their child. As positive and participative communication distinguish this style, we define Style 4 as *democratic-loving*.

Style 2 strongly differs from Style 4 in talking about new friends. Further, table 2 underlines that parents with Style 2 are emotionally much colder than parents with Style 1 or Style 4. Showing love with words or gestures belongs to the biggest differences between Style 1 and Style 2. Praising the child is one of the biggest differences between Style 4 and Style 2. We conclude that parents who choose Style 2 powerfully enforce their will, are not as emotionally warm as *authoritative* or *democratic-loving* parents and typically do not take the child's will into account as much as *authoritative* or *democratic-loving* parents. In line with Baumrind (1991),

	Parenting Style 2	Parenting Style 3	Parenting Style 4
Parenting Style 1	(M) Talk about new friends	(I) Threaten child	(E) Set clear limits
	(M) Ask what child experienced	(I) Hard to be resolute	(E) Exercise authority
	(W) Praise child	(W) Praise child	(E) Give a clear commands
	(E) Set clear limits	(I) Soften a punishment	(E) Insist on rules
	(W) Gestures	(E) Set clear limits	(C) Shout at child
Parenting Style 2		(I) Threaten child	(A) Ask child's opinion
		(I) Hard to be resolute	(A) Good if child says what it thinks
		(I) Soften a punishment	(M) Talk about new friends
		(C) Shout at child	(A) Explain why child doesn't get sth.
		(I) On some days stricter	(W) Praise child
Parenting Style 3			(I) Threaten child
			(C) Shout at child
			(I) Hard to be resolute
			(A) Good if child says what it thinks
			(E) Exercise authority

Table 2 – Largest Differences Between Parenting Styles

The table summarizes the five biggest differences between each parenting style. Differences are computed using the Rao distance.

we call such parents *authoritarian*.

Table 2 also shows that differences between Style 3 and the other styles are mainly due to inconsistent behavior. Other than that, Style 3 closely mirrors an *authoritarian* style. Therefore, we refer to this style as *authoritarian-inconsistent*.

5 Parenting Styles and Socio-Economic Environment

By modeling group affinities for parenting styles, our model directly incorporates differences in parenting styles along parents' education, household equivalence income and whether the child is an only child. In this section, we interpret $\boldsymbol{\pi}_{g,:}$, i.e. the probability to choose style k given membership of observable group g. Table 3 shows the average probabilities of $\boldsymbol{\pi}_{g,:}$ for each parental characteristic separately.

	Authoritative	Authoritarian	Authoritarian-inconsistent	Democratic-loving	Number of Observations
Education					
No University	0.34	0.26	0.22	0.18	643
University	0.27	0.31	0.19	0.23	887
Household equivalence income					
Low	0.26	0.28	0.25	0.21	431
Middle	0.29	0.30	0.21	0.20	504
High	0.34	0.28	0.17	0.21	595
Siblings					
Only child	0.32	0.23	0.21	0.25	323
Siblings	0.30	0.30	0.20	0.20	1207

Table 3 – Average probabilities

The table depicts the average probabilities to choose each style for each parental characteristic separately. Probabilities are computed by averaging $\boldsymbol{\pi}_{g,:}$ along observable groups weighted by the number of observations in each observable group.

The results show that parental education is an important determinant in choosing a parenting style. On average, parents with a university degree are more likely to raise their child with an *authoritarian* or *democratic-loving* style than parents without a university degree. In contrast, they are less likely to choose an *authoritative* or *authoritarian-inconsistent* style. The average probability to choose an *authoritative* style becomes higher with rising household income. In contrast, it is less likely to raise the child with an *authoritarian-inconsistent* style for parents with higher household income. The average probability to choose an *authoritarian* or *democratic-loving* style is not associated with household income. The household composition is strongly associated with the average probability to choose an *authoritarian* and *democratic-loving* style. Whereas the probability to raise the child with an *authoritarian* style is smaller for parents with an only child than for parents with more than one child. The probability to choose a *democratic-loving* style is higher for parents with an only child.

Figure 3 shows the link between parenting style and parents' socioeconomic status as well es as household composition in more detail. It depicts the probability to choose a parenting style given the membership of observable group g. An *authoritative* style is most likely chosen by parents with more than one child,

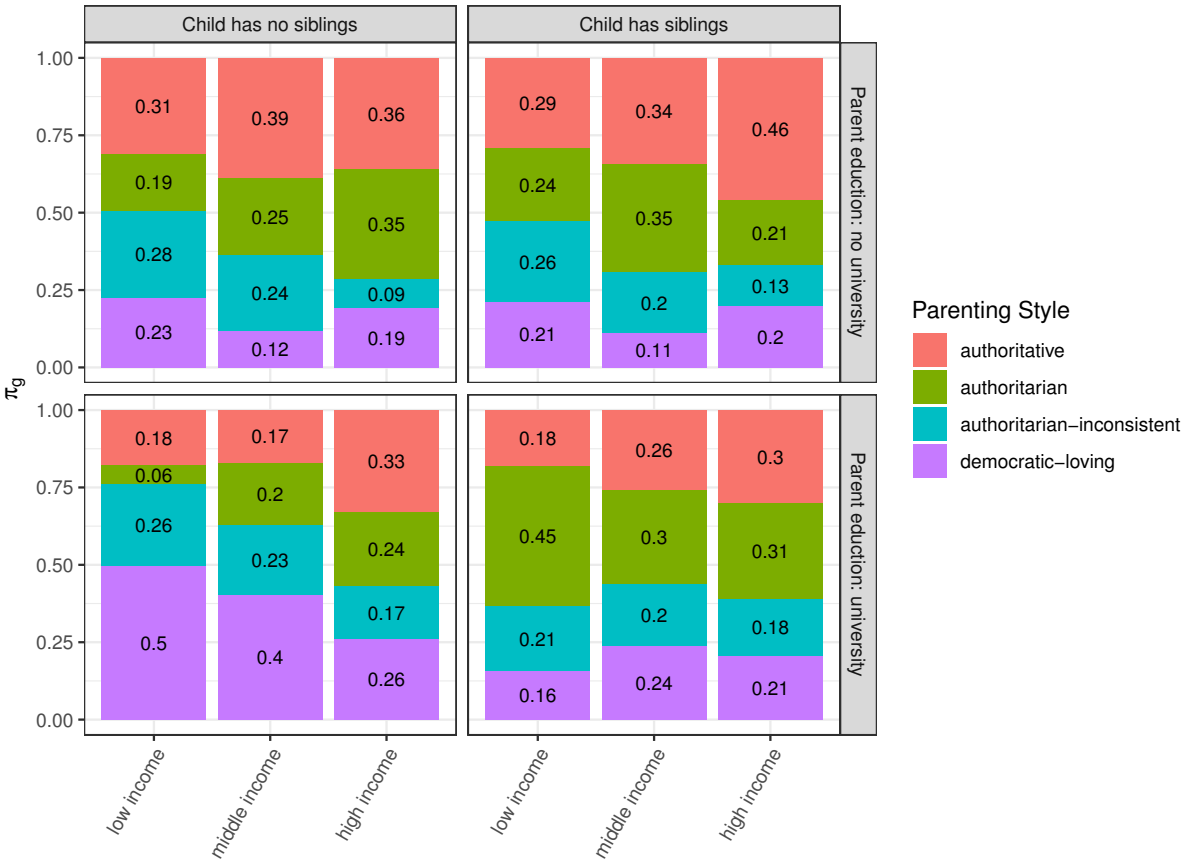

Figure 3 – Probability to choose parenting style k given membership of observable group

The figure shows $\boldsymbol{\pi}_{g,:}$, i.e. the probability to choose style k given membership of observable group g.

without a university degree and with high household income (0.46). The probability becomes smaller for lower income, however stays on a high level (0.29 and 0.34). For parents with lower education and an only child the probabilities to choose an *authoritative* style are also high (upper left panel). Those with low income

have the lowest probability, although differences between income levels are less pronounced. The lower panels reveal that parents with low income and university degree are less likely to raise their child *authoritatively*. The probability becomes larger for higher income.

Parents with a university degree and more than one child are very likely to choose an *authoritarian* style (lower right panel). The probability is the highest if the income of the household is low (0.45). For parents with a middle and a high income the probability is much smaller, but stays on a high level (0.3). In comparison, parents with a university degree and an only child are less likely to choose an *authoritarian* style, especially if the income of the household is small (0.06) or in the middle (0.2). Opposed to highly educated parents with more than one child, the probability becomes higher with increasing income. For parents with lower education and an only child, the probability also systematically increases with higher income. The level of the probability is consistently higher compared to parents with a university degree and an only child, but smaller compared to parents without university education, more than one child and a low or middle household income. Thus, figure 3 shows that the number of children is strongly associated with the decision to choose an *authoritarian* style. Parents with an only child are less likely to choose such a style. The role of education and income in choosing an *authoritarian* style clearly differs with the number of children.

The probability to choose an *authoritarian-inconsistent* style does not vary by observable groups as much as the probability to choose one of the other styles. Mostly, the probability lies between 0.2 and 0.28. However, we find a clear pattern, where parents with lower income are systematically more inclined to choose this style.

Among all parents, those with one child and a university degree have the highest probability to choose a *democratic-loving* style (lower left panel). The probability is especially high for a low household income (0.5) and decreases for parents in households with middle or high income (0.4 and 0.26, respectively). Highly educated parents with more than one child or parents with low education are less inclined to raise their child with a *democratic-loving* style.

In summary, average probabilities depicted in table 3 show a strong association between parenting styles and parental characteristics. However, figure 3 indicates, that the link between parenting styles, parental socioeconomic status and household composition is complex. The probabilities strongly differ along observable groups, i.e. the combination of all three variables. The results show that there is no style which is clearly preferred by one group. This indicates that other characteristics not captured by the observable groups are very important determinants.

The results point to the importance of parents' time resources and (non-)cognitive skills when choosing a parenting style. Parents who choose a *democratic-loving* style strongly focus on the needs of the child and do not impose their will by directly restricting the child's actions. Such parents rather enforce their will by persuading the child. In contrast, an *authoritative* or *authoritarian* style directly restrict the child's actions. At the same time, holding a university degree is a good predictor for choosing a *democratic-loving* style. An *authoritative* style is generally more likely chosen by parents without a university degree. For parents with an only child, an *authoritarian* style is more likely chosen by parents with lower education. Therefore, we conclude that a *democratic-loving* style demands high (non-)cognitive skills of the parents. In contrast, an

authoritative or an *authoritarian* style are not as (non-)cognitively demanding as a *democratic-loving* style. Therefore, (non-)cognitive skills may play an important role in the choice of a parenting style. Further, a *democratic-loving* style requires to discuss issues in case of disagreement between child and parent or to let the child make own plans. In contrast, an *authoritarian* style leaves less autonomy to the child. The number of children indicates whether parents are able to give their full attention to only one child or whether they have to allocate their time to multiple children. The results of the model show that parents with more than one child are less likely to choose a *democratic-loving* style, but more likely choose an *authoritarian* style. Therefore, we conclude that a *democratic-loving* style requires more time resources compared to an *authoritarian* style. This underlines the importance of time resources in choosing a parenting style.

6 Parenting Styles and Children's Skill Development

6.1 Estimation Strategy

To analyze how parenting styles are related to the skill development of children, we estimate a simple static model, where we look at one specific period in childhood. Our data contains M skills S_i^{7m} when the child was 7 years old indexed by m. Our model uses predictions $z_{i1}, ..., z_{i4}$ for the parenting style of parents i derived from the estimation in section 4 and 5 (z_{ik} equals one for the most likely parenting style for parents i and zero otherwise). We assume that S_i^{7m} is linearly affected by the parenting style z_{ik}, the initial endowment of that skill S_i^{4m} at age 4, and a vector of child's and parent's individual characteristics captured by $\boldsymbol{X}_i^m$.

$$S_i^{7m} = \beta_{0g}^m + \sum_{k \in 2,3,4} \gamma_{1k}^m z_{ik} + \delta_1^m S_i^{4m} + \boldsymbol{\delta}_2^{m'} \boldsymbol{X}_i^m + \eta_i^m, \tag{6}$$

where the base category is z_{i1}, i.e. whether i chooses an *authoritative* style or not, and β_{0g}^m is an intercept that varies with the observed group membership. The coefficient γ_{1k}^m can be interpreted as the effect of the parenting style on the change in skills between age 4 and 7. This effect is biased if, given $\boldsymbol{X}_i^m$, unobserved factors affect both the choice of the parenting style and the change in skills of the child. For example, the speed at which children learn may be related to factors that are also associated with the parents' choice of parenting style (genetics, neighborhood, etc.). Unfortunately, we cannot use an instrumental variable approach to solve this issue, because it is difficult to find any exogenous source of variation that affects the choice of the parenting style. Therefore, we use an extensive set of control variables to mitigate the bias induced by potential confounding factors. First, other skills at age 4 may affect both, the change in skills of the child and the choice of parenting style. Hence, $\boldsymbol{X}_i^m$ contains the initial endowment of all other considered skills and additional measures on (non-)cognitive skills at age 4 (e.g. measures on the child's temperament). Second, the choice of the parenting style may depend on parental skills and preferences, which may also have a strong effect on the change in the child's skills. To account for this, we control for the respondents personality traits, patience and risk aversion. Third, peers may be important confounding factors. Therefore, we control for the share of parents' friends who hold a university degree, the share of parents' friends with migration background and the share of the child's friends with migration background. Fourth, the quality time parents spend with their child may be correlated with both, the change in skills of the child and the choice of the parenting style.

To address this source of bias, we control how much quality time parents spent with their child when the child was 6 years old, i.e. in our considered period of childhood between age 4 and 7. The indicator is constructed by taking the average over how often parents (1) read a story to their child, (2) show single letters or the alphabet to the child, (3) practice numbers with the child, (4) teach short poems, rhymes or songs to the child, (5) paint, draw or craft with the child, (6) go to the library with the child, and (7) tell a story to the child. Finally, we control for demographic characteristics of the child and the parents. All controls are summarized in table A1 in the appendix.

Using equation (6), we estimate how parenting styles are related to cognitive skills (mathematical literacy, listening comprehension, reasoning) and non-cognitive skills (problem behavior, prosocial behavior and patience). We also report supplementary results on how parenting styles are associated with the child's personality traits measured by the Big Five. However, the child's initial endowments of personality traits at age 4 are not available in the data due to the children's young age. Since parents pass on their skills and preferences to their child through genetic, social or other channels, we use the personality traits of the interviewed parent to measure the child's initial endowment (comparable to Falk et al. 2021). Further, we analyze how the children cope with their school day. No initial endowments can be observed since children were recently enrolled.

6.2 Results

We estimate equation (6) using ordinary least squares. All regression models contain the same control variables. The outcomes are normalized to have mean 0 and standard deviation 1. Table 4 shows the main results of our analysis.

	Authoritative vs. ...			Authoritarian vs. ...		Authoritarian-inconsistent vs. ...	
	Authoritarian	Authoritarian-inconsistent	Democratic-loving	Authoritarian-inconsistent	Democratic-loving	Democratic-loving	N
Cognitive skills							
Reasoning	-0.01	0.07	0.00	0.08	0.02	-0.07	1373
Mathematical literacy	0.05	0.09	-0.08	0.03	-0.13**	-0.17**	1364
Listening comprehension	-0.02	0.12	-0.14*	0.14*	-0.12	-0.26***	1228
Non-cognitive skills							
Prosocial	0.10	0.30***	-0.08	0.19**	-0.18**	-0.38***	1182
Problem behaviour	-0.13*	-0.17**	-0.01	-0.04	0.12	0.16*	1184
Patience	0.13*	0.07	0.23***	-0.07	0.10	0.16*	1227

Table 4 – Parenting Styles and Skills - Main Results

The table depicts the effect of each parenting style on child's (non-)cognitive skills. All controls are summarized in table A1. Controls include the initial endowment of the skill observed at age 4. Outcomes are normalized to have mean 0 and standard deviation 1. Significance of the coefficients at conventional significance levels $1\%, 5\%, 10\%$ are indicated by stars ***, **, *, respectively. The last column N shows the number of observations.

The upper panel shows the effect of the parenting style on cognitive skills. The ability to reason is not significantly associated with the parenting style. A *democratic-loving* style is associated with a significantly higher mathematical literacy compared to an *authoritarian* or *authoritarian-inconsistent* style. Further, the listening comprehension of children raised with a *democratic-loving* style is significantly higher than the listening comprehension of children with *authoritarian-inconsistent* or *authoritative* parents. Children who are raised with an *authoritarian* style have a higher listening comprehension compared to children raised with an

authoritarian-inconsistent style.

In the lower panel, we report how parenting styles are related to non-cognitive skills. Children raised by *authoritarian-inconsistent* parents are less prosocial than children with *authoritative*, *democratic-loving* or *authoritarian* parents. Further, they exhibit problem behavior more frequently than children with parents who choose an *authoritative* or a *democratic-loving* style. An *authoritarian* style is associated with less prosocial behavior than a *democratic-loving* style and with a more frequent problem behavior than an *authoritative* style. Regarding social behavior (i.e. prosocial and problem behavior) *authoritative* and *democratic-loving* styles do not differ. However, we find that children who are raised by *authoritative* parents are more patient than those raised by *democratic-loving* parents. They are also significantly more patient than children of *authoritarian* parents. Children raised with *authoritarian-inconsistent* style are significantly more patient than children with *democratic-loving* parents.

Table 5 summarizes supplementary results on how parenting styles are related to the child's non-cognitive skills.

	Authoritative vs. ...			Authoritarian vs. ...		Authoritarian-inconsistent vs. ...	N
	Authoritarian	Authoritarian-inconsistent	Democratic-loving	Authoritarian-inconsistent	Democratic-loving	Democratic-loving	
Personality							
Extraversion	0.21***	0.18**	0.20**	-0.02	-0.01	0.01	1203
Conscientiousness	0.05	0.28***	-0.02	0.23***	-0.07	-0.30***	1202
Agreeableness	0.05	0.28***	-0.07	0.23***	-0.12	-0.35***	1191
Openness	0.19***	0.18**	0.02	-0.01	-0.17**	-0.16*	1202
Neuroticism	-0.09	-0.18**	0.02	-0.09	0.12	0.20**	1202
Coping with school day: Child's autonomy							
Doing homework independently	0.03	0.25***	0.00	0.22**	-0.03	-0.24**	1084
Needs support with homework	0.03	-0.28***	-0.01	-0.32***	-0.04	0.28***	1123
Can cope with many tasks easily	0.13*	0.20**	0.04	0.07	-0.09	-0.16*	1261
Coping with school day: Enjoyment of learning							
Likes to go to school	0.02	0.05	-0.08	0.03	-0.10	-0.13	1275
Having fun at school	0.06	0.20**	-0.04	0.14*	-0.10	-0.24**	1274
Having fun studiying	0.12*	0.19**	0.04	0.06	-0.09	-0.15*	1272
Coping with school day: Willingness to make an effort							
Treats working materials careful	0.11	0.29***	-0.04	0.19**	-0.15*	-0.33***	1273
Completes tasks with care	0.04	0.24***	-0.04	0.20**	-0.08	-0.29***	1270
Gives up fast	-0.01	-0.13	-0.00	-0.12	0.01	0.13	1271
Tries hard if task are difficult	0.13*	0.33***	0.04	0.19**	-0.09	-0.28***	1263
Coping with school day: Social integration							
Integrated well in class	0.10	0.18**	-0.07	0.08	-0.17**	-0.25***	1275
Has many friends in class	0.16**	0.12	-0.06	-0.05	-0.23***	-0.18**	1271
Has many new friends in class	0.08	0.05	0.00	-0.03	-0.08	-0.05	1275

Table 5 – Parenting Styles and Skills - Further Results

The table depicts the effect of each parenting style on child's skills. All controls are summarized in table A1. Initial endowment of personality traits are measured using the Big Five of the interviewed parent. Outcomes are normalized to have mean 0 and standard deviation 1. Significance of the coefficients at conventional significance levels $1\%, 5\%, 10\%$ are indicated by stars ***, **, *, respectively. The last column N shows the number of observations.

The results in the upper panel show how the child's personality traits are associated with the parenting style. Children who are raised with an *authoritative* or a *democratic-loving* style are more conscientious, more agreeable, more open and less neurotic than children who are raised with an *authoritarian-inconsistent* style. Children with *authoritarian* parents are less open than children of *democratic-loving* or *authoritative* parents, but more agreeable and more conscientious than children who are raised with an *authoritarian-inconsistent* style. An *authoritative* style is associated with a higher extraversion compared to all other styles.

In the remaining panels, we analyze how parenting styles are related to how children cope with their everyday school life. Children with *authoritarian-inconsistent* parents are less autonomous, have less pleasure in learning, show less willingness to make an effort and are worse integrated in the class than those with *authoritative* or *democratic-loving* parents. Further, they are also less autonomous, have less fun in school and show less willingness to make an effort than children who are raised with an *authoritarian* style. Compared to an *authoritarian* style, children with *authoritative* parents can cope with many tasks more easily, have fun studying more often, try hard if a task is difficult more often and have many friends in class more often. Children with *democratic-loving* parents treat their working material more careful, are better integrated and have more friends in class. Whether parents raise their child with an *authoritative* or *democratic-loving* style is not related to how the child copes with everyday school life.

In summary, we find that both non-cognitive and cognitive skills are sensitive to the parenting style. The results shown in table 4 indicate that differences in non-cognitive skills are more pronounced than in cognitive skills. In general, an *authoritative* and a *democratic-loving* style are associated with similar cognitive and non-cognitive skills. Children with *authoritative* parents have a lower listening comprehension but are more patient than children with *democratic-loving* parents. In comparison, both an *authoritarian* and an *authoritarian-inconsistent* style are systematically associated with lower skills. Children with *authoritarian-inconsistent* parents have lower skills compared to all three alternative parenting styles. A *democratic-loving* style is associated with less patience than any other parenting style, even an *authoritarian-inconsistent* style.

7 Discussion

Recent literature established a strong link between children's skill development and parental monetary and time investments. In this paper, we focus on the role of parenting styles, a type of parental investment that has only recently become the focus of economic research. We use a novel latent class model (LDA-S, Munro & Ng 2022) to investigate which parenting styles can actually be observed in the data. The model directly incorporates a link between the latent classes, i.e. parenting styles, and parental education, household income and household composition. We identify four parenting styles. Two styles closely resemble Baumrind's (1991) authoritative and authoritarian style. The other two are variations of these styles. We find that parenting styles are strongly associated with household income, education and whether the child is an only child. The results suggest that constraints in both time and (non-)cognitive skills of the parents play an important role in choosing a parenting style. Analyzing how the observed styles are associated with the child's (non-)cognitive skill development, we find that children raised with an authoritative or a democratic-loving style have the most favorable outcomes. Our results show how differences in parenting styles contribute to the skill gap between children from different socioeconomic environment. Parenting styles that are associated with low household income and having more than one child are associated with lower skills of the child. As much of the literature, we rely on observational data to estimate the effect of parenting styles on skills. Therefore, one has to keep in mind that our results can only be interpreted as causal under the strong assumption that we control all factors that affect both, the choice of the parenting style and the change in skills of the child between age 4 and 7.

Our paper gives important implications for future research. As parenting styles are not directly observable, we emphasize the challenge to operationalize them in future research, a point also made by Doepke & Zilibotti (2021). Our results suggest three important considerations. First, most commonly, the researcher does not know in which dimensions parenting styles differ. Our model identifies an authoritative and authoritarian parenting style in the sense of Baumrind (1971, 1991). The two other styles are variations of them which would have been overlooked if we relied solely on the classical theoretical framework. Therefore, along with theoretical models, data-driven approaches are a crucial tool for identifying parenting styles. Second, it is important to rely on a large set of different dimensions. This helps to properly describe the latent variables or classes and to fully understand the differences between them. More importantly, an extensive set of dimensions is crucial to separate parenting styles that are similar to each other. Our results show that the parenting styles may only differ regarding a few dimensions (e.g. authoritative vs. democratic-loving or authoritarian vs. authoritarian-inconsistent). Missing dimensions which are important could lead to misleading results. In our case, a lack of distinction between authoritarian from authoritarian-inconsistent parents would make authoritarian parenting appear worse than it actually is. Authoritarian-inconsistent parenting is associated with much less favorable outcomes. Third, data-driven methods which can handle many different dimensions in an interpretable way, such as LDA-S, are a crucial tool to handle a large set of measures for parent-child interaction.

Our paper also gives important directions for policy-makers. The recent literature finds that non-cognitive skills foster cognitive skills but not vice versa and that non-cognitive skills mainly develop in childhood and hardly change in adulthood (Cunha & Heckman 2007, 2008, Cunha et al. 2010). Since parenting styles are strongly associated with non-cognitive skills, our results point to parenting styles as an important driver of the skill gap between children with different background. To reduce this gap, a policy measure, which may be easy to implement, could be to promote styles that are associated with the most favorable outcomes (authoritative or democratic-loving). However, the effectiveness of parents in implementing certain parenting styles may depend on their personal characteristics. Our results suggest that both (non-)cognitive skills and time resources of parents might limit the choice of parenting style. For example, some parents will find it harder to convince their child of their own opinion. Such parents may have difficulties to exercise an authoritative or democratic-loving style properly. Others might just not be able to give their full attention to only one child as they have more than one. Hence, they would not be able to apply time consuming styles, e.g. democratic-loving. Policy-makers could foster parents' (non-)cognitive skills which are important to raise a child or help parents to allocate their available time between children more efficiently.

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A Tables

	Mean	Standard Deviation	Min	Max
Skills at age 4				
Reasoning	0.3037	2.3476	-4.1	6.1
Mathmatical literacy	0.0444	0.9813	-3.6	3.2
Listening Comprehension	49.5915	24.0283	0.0	121.0
Prosocial behavior (SDQ)	7.7081	1.4843	1.0	10.0
Problem behavior (SDQ)	1.2479	1.3648	0.0	8.0
Patience	0.7787	0.3954	0.0	1.0
Short term memory	2.3747	0.9009	0.0	5.0
Frustration (temperament)	4.2296	1.3682	0.0	6.0
Is concentrated (temperament)	4.5126	1.2958	0.0	6.0
Feeling down when failing (temperament)	3.0783	1.5319	0.0	6.0
Gets lost in books (temperament)	4.6621	1.4315	0.0	6.0
Full of energy in the evening (temperament)	4.9430	1.3063	0.0	6.0
Difficult to calm down (temperament)	2.9776	1.5640	0.0	6.0
Parental skills and preferences				
Risk tolerance	4.6654	2.0122	0.0	10.0
Patience	5.6288	2.2663	0.0	10.0
Conscientiousness (Big Five)	4.0765	0.6682	1.0	5.0
Extraversion (Big Five)	3.5510	0.8313	1.0	5.0
Agreeableness (Big Five)	3.6374	0.5472	1.7	5.0
Openness (Big Five)	3.7362	0.8855	1.0	5.0
Neuroticism (Big Five)	2.8150	0.7745	1.0	5.0
Peers				
Parents' peers: University degree	4.4034	1.5460	1.0	7.0
Parents' peers: Migration background	2.9817	1.3385	1.0	7.0
Child's peers: Migration background	3.2237	1.4099	1.0	7.0
Quality time				
Quality time	9.0064	1.5770	2.5	28.3
Demographic characteristics				
Child female	0.4974	0.5002	0.0	1.0
Child migration background	0.1262	0.3321	0.0	1.0
Responded spends more time with child	0.4662	0.4990	0.0	1.0
State of Residence: SH	0.0438	0.2047	0.0	1.0
State of Residence: HH	0.0647	0.2461	0.0	1.0
State of Residence: NI	0.0752	0.2637	0.0	1.0
State of Residence: HB	0.0222	0.1475	0.0	1.0
State of Residence: NW	0.2301	0.4210	0.0	1.0
State of Residence: HE	0.0569	0.2317	0.0	1.0
State of Residence: RP	0.0281	0.1653	0.0	1.0
State of Residence: BW	0.0915	0.2884	0.0	1.0
State of Residence: BY	0.1641	0.3704	0.0	1.0
State of Residence: SL	0.0137	0.1164	0.0	1.0
State of Residence: BE	0.1078	0.3103	0.0	1.0
State of Residence: BB	0.0124	0.1108	0.0	1.0
State of Residence: MV	0.0163	0.1268	0.0	1.0
State of Residence: SN	0.0425	0.2018	0.0	1.0
State of Residence: ST	0.0235	0.1516	0.0	1.0
State of Residence: TH	0.0072	0.0845	0.0	1.0
Group: No sibling, low income, no univ.	0.0333	0.1796	0.0	1.0
Group: No sibling, low income, univ.	0.0144	0.1191	0.0	1.0
Group: No sibling, middle income., no univ.	0.0477	0.2132	0.0	1.0
Group: No sibling, middle income, univ.	0.0242	0.1537	0.0	1.0
Group: No sibling, high income, no univ.	0.0255	0.1577	0.0	1.0
Group: No sibling, high income, univ.	0.0660	0.2484	0.0	1.0
Group: Sibling, low income, no univ.	0.1614	0.3681	0.0	1.0

Table A1 continued from previous page

Group: Sibling., low income, univ.	0.0725	0.2595	0.0	1.0
Group: Sibling., middle income, no univ.	0.0915	0.2884	0.0	1.0
Group: Sibling., middle income, univ.	0.1660	0.3722	0.0	1.0
Group: Sibling., high income, no univ.	0.0608	0.2390	0.0	1.0
Group: Sibling, high income, univ.	0.2366	0.4251	0.0	1.0
N	1530			

Table A1 – Summary statistics