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Hidden patterns of inequality: The heterogeneity in parenting within educational groups

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ABSTRACT

When sociology deals with differences within groups of similar socioeconomic status, research and theorizing tend to focus on the heterogeneity among the socioeconomically advantaged thus representing the socioeconomically disadvantaged as homogeneous. This study is a case of the opposite. For at set of high-stake cultural practices, parental strategies for social reproduction, I find most heterogeneity among socioeconomically disadvantaged mothers. Using data from the NLSY-CYA, I provide novel descriptive statistics of the variance in parenting by maternal education and analyze the determinants of these differences employing a variance function regression. I find an educational gradient in the heterogeneity of cognitively stimulating parenting: the variance is highest among mothers with no high school diploma and shrinks among mothers with more education. That is, mothers with the least amount of education show the most diversity in parenting. This educational gradient is associated with inequality in mothers' family of origin, cognitive skills, and current economic situation. This result suggests that the systematic differences in heterogeneity stem from (1) selection into education based on family-of-origin characteristics and cognitive skills, where the non-deterministic sorting makes the least educated the most heterogeneous, and (2) the effect of education on mothers' economic situation, where education decreases uncertainty and thereby makes the most educated the most homogeneous group. Moreover, the study calls for bringing attention to the potential larger heterogeneity in cultural practices among the socioeconomically disadvantaged and provides a theoretical framework for understanding this heterogeneity. This approach challenges stereotypes and deepens sociological understanding of inequality.

1. Introduction

Sociology has a long tradition for studying differences by socioeconomic status. When sociology deals with differences within groups of similar socioeconomic status, research and theorizing tend to focus on the heterogeneity among the socioeconomically advantaged thus representing the socioeconomically disadvantaged as homogeneous. This is evident in social class schemes differentiating horizontally at the top but not at the bottom (see e.g., Hansen, Flemmen & Andersen, 2009), or cultural consumption studies portraying the working class as disengaged 'univores' with homogenous cultural practices (Sivertsen, 2023; e.g., Peterson, 1992; de Vries & Reeves, 2022). This study showcases the opposite. For a set of high-stakes cultural practices, parental strategies for social reproduction, I deflate the narrative of homogeneity among the socioeconomically disadvantaged. I show that there is most heterogeneity in cognitively stimulating parenting among the less advantaged and the most homogeneity among the most advantaged.

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Moreover, I show that this pattern is related to selection into education and effects of education.

Parenting practices during early childhood such as shared book reading and play increase children's cognitive skills (Attanasio et al., 2014; Cano, Perales & Baxter, 2019; Fiorini & Keane, 2014; Hsin & Felfe, 2014) and these early cognitive skills lay the foundation for later socioeconomic attainment (Cunha et al., 2006). Across social science disciplines, consensus is forming that parents with more education engage more in cognitively stimulating parenting (sociology: e.g., Attewell & Lavin, 2006; Domina & Roksa, 2012; Dumais, 2019; Schaub, 2010; psychology: e.g., Feinstein, Duckworth & Sabates, 2008; Hoff, Laursen & Tardif, 2002; Kalil, Ryan & Corey, 2012; Magnuson et al., 2009; economics: e.g., Carneiro, Meghir & Parey, 2013), hence placing cognitively stimulating parenting practices as a key mechanism of social reproduction. Common to this literature is a focus on differences in parenting *between* groups of parents with high and low educational attainment. While studies typically assume differences in parenting *within* groups, only few studies address this heterogeneity analytically.

Qualitative studies show that heterogeneity in parenting among parents with similar educational attainment stem from within-group differences in parents' social origin, current disadvantage, and interpretations of personal experiences (Chin & Phillips, 2004; Irwin & Elley, 2011; Mayo & Siraj, 2015; Streib, 2013). These studies analyze within-group variation among either parents with low or high educational attainment and do not compare the variation in one educational group to another. Comparing within-group variation across groups and understanding the mechanisms leading to homogeneity among one group and heterogeneity among another group may lead to new understandings of inequality. In this study, I draw on the literatures on *selection into education* based on family of origin Brand and Xie (2010); Domina, Penner and Penner (2017) and cognitive skills (Boudon, 1974; Brand & Xie, 2010; Breen & Goldthorpe, 1997; Farkas, 2003; Jackson, 2013; Jackson et al., 2007; Karlson, 2019) and *the effect of education* on economic uncertainty (Card, 1999; Hout, 2012; Kalleberg, 2011), to understand why cognitively stimulating parenting is more heterogeneous among the less advantaged and the most homogeneous among the most advantaged.

Using data from the National Longitudinal Survey of Youth 1979 and the Children and Young Adults Supplement (NLSY79-CYA), I examine parenting from the perspective of a U.S. cohort of women (NLSY79-men were not interviewed about their parenting, which limits my analysis to reports from mothers). Today, the NLSY79-CYA covers nearly all the children born to this cohort of women (National Longitudinal Surveys, Bureau of Labor Statistics, 2021). Among these children, I focus on age 3–4 ($N = 6040$), as this is a peak period for the influence of mothers' educational attainment on children's cognitive development (Mollborn et al., 2014). The information collected by NLYSY79-CYA allows me to consider how the heterogeneity in cognitively stimulating parenting is influenced by mothers' family of origin, cognitive skills, and current economic situation. I measure heterogeneity as variance, and I use a variance function regression to analyze educational differences in the variance of cognitively stimulating parenting. This method simultaneously treats the mean and the variance of the dependent variable as functions of the independent variables (Western & Bloome, 2009). The method thus allows me to assess whether the variance in cognitive stimulation is substantially different among parents with different levels of educational attainment and which factors explain differences in variance.

I find that the variation in parenting is highest among mothers without a high school diploma and gradually shrinks among mothers with more education, with the lowest variation among college-educated mothers. Moreover, I find that the larger variation in parenting among mothers without high school diplomas is due to selection into education based on mothers' family of origin and cognitive skills and the effects of education on mothers' current economic situation. The practical implication of my findings is that educators and social workers should be prepared to meet a lot of diversity in parenting among mothers without high school diploma, with some mothers engaging just as much in cognitively stimulating parenting of their children as their highly educated peers. The sociological implication of my findings is that the inequality, that selection into education and the effects of education reflect, does not just give the privileged more, but also makes them more alike. This paper offers a theoretical framework for understanding why there may be more heterogeneity in cultural practices among the least advantaged. While this framework focuses on the high-stakes cultural practices of social reproduction in the form of cognitively stimulating parenting, the framework may prove transferable to other cultural practices too. Hence, this particular case of greater heterogeneity among the least advantaged is empirically relevant, because it opens up for the question of whether the variance of other cultural practices may too be socially stratified, and whether we should reconsider the image of less privileged groups as a homogenous mass of disengaged 'univores'. Therefore, the broader call of this study is to pay attention to the potential greater heterogeneity in cultural practices among the least advantaged groups.

2. Theoretical framework

During early childhood, cognitive development may be stimulated by activities like shared book reading, playing together, taking the child on outings, teaching the child letters, numbers, songs, and rhythms (Feinstein et al., 2008). The theoretical argument is that these activities increase children's skills directly, as well as their general interest in learning (Feinstein et al., 2008; Melhuish et al., 2008). Both observational studies and interventions show that these parenting practices during early childhood increase children's cognitive skills and later socioeconomic attainment (e.g., Attanasio et al., 2014; Bodovski & Farkas, 2008; Bradley et al., 2001; Cano et al., 2019; Cheadle, 2008; Crane, 1996; Fiorini & Keane, 2014; Gertler et al., 2014; Heckman & Mosso, 2014; Hsin & Felfe, 2014;

Melhuish et al., 2008; Yeung & Conley, 2008; although persistent parental investment across childhood is important for such effects to last, see Andrew et al., 2018; Doyle et al., 2017). Here, I refer to these activities and the possession of the related objects (books, toys, and musical instruments) as cognitively stimulating parenting.[a]

The positive association between parents' education and parenting practices is partly due to selection into education and partly due to a causal effect of education on parents' provision of cognitively stimulating parenting (Breinholt & Holm, 2020; Carneiro et al., 2013; Domina & Roksa, 2012; Magnuson, 2007). In the following section, I theorize that both *selection into education* and *the effect of education* lead to more heterogeneity in cognitively stimulating parenting among mothers with less education and less heterogeneity among mothers with more education. Therefore, I expect to find an educational gradient in the heterogeneity in cognitively stimulating parenting:

Hypothesis 1: Educational attainment is associated with less heterogeneity in cognitively stimulating parenting.

2.1. Selection into education: family-of-origin inequality

Schools create categories like grades, classrooms, academic tracks, "high school dropouts," "college graduates" etc., but schools also reinforce categories like social class and race-ethnicity (Domina et al., 2017). Schools' reinforcement of social inequality happens via formal and informal sorting processes such as neighborhood-based enrollment, ability tracking, curricular content, and role modeling (Domina et al., 2017). This sorting leads to increasing homogeneity in family-of-origin characteristics among the group that progresses at each educational transition point. Due to the association between family-of-origin characteristics and parenting, the sorting also leads to increasing homogeneity in parenting among the group that progresses at each educational transition point. I unfold this argument below.

The sorting process along family-of-origin characteristics is not deterministic. At each educational transition point, some individuals with a privilege family background will not make the transition despite this background. The reasons may vary from negative life shocks like losing a family member to positive factors like opportunities to pursue a career outside of formal education. This process makes people without a high school degree a heterogeneous group consisting of individuals who had the odds against them because they came from a disadvantaged family background and individuals with the odds in their favor who nevertheless did not graduate high school. The most homogeneous groups in terms of family-of-origin characteristics will be people with college degrees since sorting along family-of-origin characteristics occurred at many transition points leading up to achieving this degree.

The parent's family of origin may be an important site for the socialization of parenting practices: the parenting practices that the parent was subject to as a child may influence their own parenting practices (Domina & Roksa, 2012). Family-of-origin characteristics may be associated with individuals' exposure to cognitively stimulating parenting during their childhood and whether they continue these practices as parents. A couple of studies support this point. Highly educated mothers, whose own mothers were also highly educated, are more committed to concerted cultivation of school-age children than highly educated mothers, whose own mothers were not highly educated (Roksa & Potter, 2011; Streib, 2013, although see Dumais, 2019). In addition, the association between mothers' education and cognitively stimulating parenting is reduced substantially once information on the mothers' childhood environment is taken into account, suggesting mothers' childhood environments as an important influence on their own parenting behaviors (Feinstein & Duckworth, 2006). The association between family-of-origin characteristics and parenting leads to more heterogeneity in parenting among parents without high school diplomas than parents with more education. This argument leads me to expect that:

Hypothesis 2: The negative association between educational attainment and heterogeneity in cognitively stimulating parenting decreases once family-of-origin characteristics are taken into account.

2.2. Selection into education: cognitive skills

Selection into education is also driven by cognitive skills (Brand & Xie, 2010; Farkas, 2003; Karlson, 2019). These skills are the result of many processes – e.g., the family environment, ability, school quality – leading up to each educational transition point (see review in Farkas, 2003). This selection mechanism is relevant as cognitive skills may enable parents to provide cognitively stimulating parenting (Harding, Morris & Hughes, 2015).

Cognitive skills alone do not guarantee post-secondary education. Some individuals from socioeconomically disadvantaged backgrounds may not proceed despite having the skills required by the educational system, while individuals from advantaged backgrounds with these cognitive skills will be highly likely to proceed (Boudon, 1974; Breen & Goldthorpe, 1997; Jackson, 2013; Jackson et al., 2007). This imperfect selection suggests more heterogeneity in cognitive skills among parents with less education compared to parents with more education. The greater heterogeneity in parents' cognitive skill among the less educated leads to

[a] Cognitive skills are typically assessed using language and math test scores, which closely mirror the skills valued in schools. From a Bourdieusian perspective the skills produced by cognitively stimulating parenting practices are arbitrary but valued by the middle and upper class and therefore valued in schools (Bourdieu and Passeron 1977). As Lareau described in her ethnographic study of child rearing, other parenting practices produce different skill sets, but these skills are not recognized in the educational system (Lareau 2011). The concept of cognitively stimulating parenting may in particular capture middle- and upper-class parenting.

greater heterogeneity in cognitively stimulating parenting. Therefore, my third hypothesis is:

Hypothesis 3: The negative association between educational attainment and heterogeneity in cognitively stimulating parenting decreases once mothers' cognitive skills are taken into account.

2.3. Effects of education: less economic uncertainty

Education – especially college education – leads to jobs with higher wages, more job security, more autonomy on the job including control of one's schedule, and in the case of the U.S. benefits like employer-paid health insurance (Card, 1999; Hout, 2012; Kalleberg, 2011). These factors provide financial, psychological, and social resources that facilitate cognitively stimulating parenting. In addition to invest in a child's development by buying, for example, books and toys, higher wages also provide economic security, which leads to less economic stress and less parental conflict, and hence the capacity to do cognitively stimulating parenting (Conger, Conger & Martin, 2010; Masarik & Conger, 2017). Field experiments suggests that poverty makes individuals more focused on solving issues related to day-to-day expenses, diverting attention from other activities (Shah, Mullainathan & Shafir, 2012) potentially including cognitively stimulating parenting. Finally, flexible working hours enable parents to take their children to organized leisure activities and events in relation to these activities (Lareau, 2011). In sum, the better labor market outcomes associated with college education may increase the mean of cognitively stimulating parenting.

The effect of education on parenting via better labor market outcomes may also lead to a homogenization of parenting. College-educated parents may be similar in the financial, psychological, and social resources that arise from jobs that provide high wages, flexibility, and security[b]. Parents without a college degree may be able to secure good jobs, but this outcome is more uncertain, especially, given the polarization of the U.S. labor market into high-wage and low-wage jobs (Autor, Katz & Kearney, 2006). Therefore, the job characteristics of non-college educated parents may be less similar. While getting a good job is a more uncertain outcome in the first place, having to rely on a less secure, low-income job makes it harder to insulate one's family from the instability and uncertainty of daily life let alone health or unemployment shocks. Hence, the variance in financial, psychological, and social resources may be greater among parents with fewer years of education, which may result in a more heterogeneous provision of cognitively stimulating parenting. My final hypothesis is therefore:

Hypothesis 4: the negative association between educational attainment and heterogeneity in cognitively stimulating parenting decreases once economic uncertainty is taken into account.

2.4. Other factors leading to an educational gradient in the heterogeneity in parenting

The sections above have focused on explanations that are testable using the NLSY-CYA data. However, other factors are worth mentioning. First, education is theorized to provide parents with human capital, cultural knowledge, and social networks, which may lead them to provide more cognitively stimulating parenting (Attewell & Lavin, 2006; Harding et al., 2015). This socialization effect may homogenize parenting practices among the most educated: Through similar exposure to human capital enhancing activities, cultural knowledge, and social networks, pre-college enrollment differences are muted. Once becoming a parent, this socialization may translate into a more similar provision of cognitively stimulating parenting among college-educated parents compared to parents without a college degree. Second, cognitively stimulating parenting practices may diffuse from college-educated mothers to mothers with less education. As this diffusion takes time, uptake is uneven among mothers with less education, and therefore cognitively stimulating parenting is more heterogenous. This explanation is supported by the narrowing gaps in cognitively stimulating parenting between educational groups (Bassok et al., 2016; Schaub, 2010). Finally, peer effects due to economic sorting into neighborhoods and schools may also create more homogeneous parenting among the most educated.

3. Data

I use data from the National Longitudinal Survey of Youth 1979 (NLSY79) and the National Longitudinal Survey of Youth 1979 Children and Young Adults (NLSY-CYA). In 1979, the NLSY79 surveyed a national representative sample of 14–22-year-old women and men in the U.S. From 1986, female participants with children were surveyed biannually about their own and family members' parenting practices and other topics. Today, NLSY-CYA contains information on 11,545 children born to 4934 mothers (National Longitudinal Surveys, |Bureau of Labor Statistics, 2021). NLSY-CYA offers a unique opportunity to follow the parenting of a cohort of women as they transition into parenthood. In this study, I focus on parenting of young children aged 3–4 years old. While the analysis relies on data from several waves depending on when the focal child was 3–4 years old, I use the data in a cross-sectional fashion. By 2020, 3699 women have been surveyed about their 3–4-year-old children ($n = 7002$). Excluding cases with missing data on key variables brings the analytic sample to 5816 children of 3219 mothers. Table 1 shows the weighted and non-weighted means and standard deviations for the analytic sample (the weights adjust for the oversampling of Black and Hispanic individuals, and it is drawn from the first survey wave in 1979).

[b] While more years of education is associated with more wage variability (Mouw and Kalleberg 2010), this variation occurs at the top of the income distribution at a point where the financial and psychological benefits for parenting have already kicked in.

Table 1
Means and standard deviations.

	Unweighted Mean	Std. Dev.	Weighted Mean	Std. Dev.
HOME cognitive stimulation score	7.98	2.03	8.47	1.74
Alternative cognitive stimulation score	6.44	1.88	6.91	1.69
Maternal Education				
No high school diploma	0.21	0.41	0.15	0.36
High school diploma	0.38	0.49	0.39	0.49
Some college	0.22	0.42	0.22	0.42
College degree	0.18	0.38	0.24	0.43
Grandparental Education				
No high school diploma	0.36	0.48	0.23	0.42
High school	0.39	0.49	0.43	0.5
Some college	0.11	0.32	0.14	0.34
College degree	0.14	0.35	0.20	0.4
Race-ethnicity of mother				
Black	0.20	0.40	0.07	0.25
Hispanic	0.26	0.44	0.13	0.34
Other	0.54	0.50	0.80	0.4
Magazines 1979	0.56	0.50	0.69	0.46
Newspapers 1979	0.74	0.44	0.83	0.37
Library card 1979	0.72	0.45	0.78	0.41
AFQT	41.68	28.47	51.34	28.16
Household income, 1000 2024-USD	95.84	143.2	118.09	168.61
Wealth, 1000 2024-USD	157.37	454.36	227.82	557.09
Maternal employment status				
Working class	0.14	0.35	0.13	0.34
Intermediate	0.22	0.41	0.23	0.42
Service	0.17	0.38	0.20	0.4
Out of the labor force	0.40	0.49	0.38	0.49
Unemployed	0.03	0.17	0.02	0.15
Working - no EGP classification	0.03	0.18	0.03	0.18
Child's year of birth	1988.3	5.15	1988.96	5.11
Maternal age at birth				
17–20 years	0.08	0.27	0.05	0.22
21–24 years	0.24	0.43	0.20	0.4
25–30 years	0.41	0.49	0.42	0.49
31+ years	0.27	0.45	0.32	0.47
Present father	0.72	0.45	0.80	0.40
Number of children	2.39	1.11	2.34	1.04
Female child	0.50	0.50	0.50	0.50
Child is four years old	0.49	0.50	0.49	0.50
Children	5816		5816	

3.1. Cognitively stimulating parenting

I measure cognitively stimulating parenting using the cognitive stimulation score from the Home Observation Measurement of the Environment-Short Form (HOME-SF) Inventory. Table 2 shows the items and how they are scored into binary variables. Only one item asks specifically to the mother's parenting activities (shared book reading), while the rest of the items includes family members. NLSY-CYA provides scores that include four items of the physical appearance of the home assessed by the interviewer (amount of clutter, cleanliness, darkness and perceptual monotonicity, and potential health hazards). I have excluded these items to focus on items that are considered cognitively stimulating parenting as described in the Theoretical Framework. As the procedure of HOME-SF prescribes, I have summed the remaining ten items. The resulting sum score ranges from 0 to 10. The HOME cognitive stimulation may not capture variation in the top of the distribution, which may lead to inflated differences in the variance between the educational groups if college-educated mothers cluster at the top values of the score. To address this issue, I have made an alternative cognitive stimulation score, where items are coded so 1 (when possible) represents higher values than the HOME-SF procedure prescribes (see Table 2).

3.2. Mothers' education

I measure mothers' level of education in the survey year that the items on the cognitive stimulation score were collected. If maternal education is missing for that survey year, I replace it with information from earlier waves. I define the educational groups in the following way: 0–11 years of education is coded as no high school diploma, 12 years of education is coded as a high school diploma, 13–15 years of education is coded as some college (which includes a two-year college degree but not a four-year college degree), and 16–20 years of education is coded as a college degree or beyond. I use this categorization of educational groups as it resonates well both with sociological research but also with a more everyday life understanding of educational groups (Hout, 2012).

Table 2
Items in the scores for cognitively stimulating parenting practices age 3–4.

Question Text	HOME recoding		Alternative recoding	
	1	0	1	0
How often do you read stories to child?	5,6 (three times per week to everyday)	1–4	6 (everyday)	1–5
About how many children's books does child have?	4 (ten or more)	1–3	4 (ten or more)	1–3
About how many magazines does your family get regularly?	2–5 (one or more)	1	4–5 (three or more)	1–3
Does child have the use of a CD player, tape deck, or tape recorder, or record player at home and at least 5 children's records or tapes?	1 (yes)	0	1 (yes)	0
Do you (or someone else) help child with numbers?	1 (yes)	0	1 (yes)	0
Do you (or someone else) help child with the alphabet?	1 (yes)	0	1 (yes)	0
Do you (or someone else) help child with colors?	1 (yes)	0	1 (yes)	0
Do you (or someone else) help child with shapes and sizes?	1 (yes)	0	1 (yes)	0
How often does a family member get a chance to take child on any kind of outing?	3–5 (two-three times per month or more)	1,2	4–5 (several times a week or everyday)	1–3
How often has a family member taken child to any type of museum the past year?	2–5 (once-twice or more)	1	4–5 (monthly or more frequently)	1–3

3.3. Family-of-origin inequality

To capture a privileged family background that may affect selection into education and mothers' provision of cognitively stimulating parenting (via their own upbringing), I include highest educational level of the mothers' parents, race-ethnicity, and cultural consumption. *Highest educational attainment* is coded like maternal education (no high school diploma, high school diploma, some college, and college degree) and takes the value of the highest educated parent of the mother. *Race-ethnicity* is reported by the mother (0=non-Black, non-Hispanic, 1=Black, 2= Hispanic). *Cultural consumption* is three dummy variables indicating whether the family-of-origin household received a daily newspaper, received magazines, and had a library card when the mother was 14 years old.

3.4. Mothers' cognitive skills

I use the Armed Forces Qualification Test (AFQT) to capture mothers' skills. AFQT is a written test on paragraph comprehension, word knowledge, arithmetic reasoning, and mathematics knowledge. The test was administered in 1980 when the mothers were 16–23 years old. Quasi-experimental evidence shows that the AFQT and similar tests are positively affected by time spent in high school (Carlsson et al., 2015; Cascio & Lewis, 2006), which raises the question of whether the test captures skills that are influenced by post-secondary education. To capture mothers' cognitive skills prior to educational attainment I use the 2006-revised AFQT percentile score, which is calculated within three-months cohorts. That means that any effect of education on the AFQT resulting from mothers' age at test-taking is removed from the score. Moreover, I find no interaction effects between AFQT and cohort on the variance of cognitively stimulating parenting (see Table A11 in Appendix A), and the explanatory role of AFQT is the same for younger and older cohorts of mothers (see the overlapping confidence intervals in Fig. A3 in Appendix A).

3.5. Economic uncertainty

I capture economic uncertainty with measures of mother's employment status, household income and, net family wealth. *Employment status* is a variable that combines information on occupation and labor market attachment. If mothers are working, I have categorized their job using the Erikson-Goldthorp-Portocarero classes (EGP class) (Goldthorpe, 2000). The key principle in the construction of this class scheme is the regulation of employment: the working class has labor contracts whereas the middle class is employed in service relationships (Goldthorpe, 2000). Hence, this class scheme serves as broad proxy for job security, flexibility, and benefits mentioned in the Theoretical Framework. To avoid too small cells, I am using three levels: the service class, the intermediate classes, and the working classes.[c] Hence, employment status is coded as working class, intermediate class, service class, out of the labor force, unemployed, and working but no EGP-classification. *Family income* is measured as the natural logarithm of the average household income in three waves prior to the year the items of the cognitive stimulation score was collected (*t, t-2,* and *t-4*). I allow for years with missing information on income. *Wealth* is measured as the natural logarithm of wealth prior to the year the items of the cognitive stimulation score was collected. If wealth is missing, I use information from prior waves.

3.6. Control variables

To capture any cohort effect on access to education I include indicator variables for *mothers' year of birth*. To adjust for *time trends*, I

[c] NLSY provides 1970 occupation census codes for the years 1979-2000 and the 2000 occupation census codes for the years 2002 and onwards. Using a cross-classification constructed by Florian Hertel (Hertel 2017), I converted these 1970 and 2000 codes to 1990 occupation codes and assigned EGP classes to the 1990 codes using coding by Morgan and McKerrow (2004).

include child's year of birth as a continuous variable. Post-secondary education delayed fertility among the NLSY-79 women (Carneiro et al., 2013), meanwhile cognitively stimulating parenting was on the rise so children in more recent cohorts on average received more cognitively stimulating parenting than older cohorts of children (Bassok et al., 2016; Kalil et al., 2016). This coincidental overlap may lead to a spurious similarity in cognitively stimulating parenting among more educated parents compared to less educated parents. I control for *maternal age at birth* using indicators for 17–20 years, 21–24 years, 25–30 years, and 31 years and older. I control for *family structure* with an indicator for present father in the household (0=no present father, 1=present father) and the number of children living in the household the year the items for the cognitive stimulation scores was collected, counting all biological, adopted, and stepchildren under 18. The indicator for present father captures a broad range of fatherhood from fathers devoting many hours to their children to fathers devoting very little time.

4. Analytical strategy

The goal of the analysis is to examine (1) whether there is an educational gradient in the variance of parenting, and (2) whether this educational gradient variance may be explained by selection into education based on family-of-origin characteristics and cognitive skills and effects of education on economic uncertainty.

To assess whether there is an educational gradient in the variance of cognitively stimulating parenting, I present distributions and variances of the HOME cognitive stimulation score and the alternative cognitive stimulation score by educational groups. As NLSY79 oversampled Black and Hispanic individuals, I weight the distributions and variances with the 1979-survey weight.

To analyze whether the educational gradient in variance can be explained by selection into education and effects of education, I apply a variance function regression (Western & Bloome, 2009). Variance function regression provides estimates of differences in means and variances between groups: I write both the mean of mothers' provision of cognitively stimulating parenting, $\widehat{y}_i$, and the variance, σ_i^2, as functions of maternal education and control variables, $\boldsymbol{x}_i$, for the i^{th} child of the j^{th} mother:

$$\widehat{y}_{ij} = \boldsymbol{x}_{ij}\boldsymbol{\beta} \tag{1}$$

$$log\sigma_{ij}^2 = \boldsymbol{x}_{ij}\boldsymbol{\lambda} \tag{2}$$

The coefficients of maternal education in $\boldsymbol{\lambda}$ shows how maternal education is associated with variability in cognitively stimulating parenting practices.

I use the maximum likelihood estimation method described by Western and Bloome (2009), which consists of four steps. In the first step, the cognitive stimulation score, y_{ij}, is regressed on maternal education and control variables, $\boldsymbol{x}_{ij}$, to predict differences in group means, $\boldsymbol{\beta}$. In the second step, the squared residuals, $\widehat{e}_{ij}^2$, from the first stage regression are regressed on maternal education and the control variables, $\boldsymbol{x}_{ij}$, using a gamma regression with the natural log as link function. The Gamma regression is a generalized linear model used for positive right-skewed dependent variables like the squared residuals . The second step provides estimates of differences in group variance, $\widehat{\lambda}$. In the third step, a weighted linear regression of y_{ij} is fitted, where the weights are one over the fitted values from the gamma regression in the second step, $1/\widehat{\sigma}_{ij}^2$. The fourth step iterates step two and three to convergence using updated estimates of $\widehat{\boldsymbol{\beta}}$, $\widehat{e}_{ij}^2$, $\widehat{\lambda}$, and $\widehat{\sigma}_{ij}^2$. The third and the fourth step ensure that the standard errors for the estimates of the group variance, $\widehat{\lambda}$, take into account the uncertainty of the estimates of the group mean, $\widehat{\boldsymbol{\beta}}$, from the first stage. These steps also address that y_{ij} is heteroscedastic (i.e., the residuals are a function of covariates) (Western & Bloome, 2009). I do not weight the variance function regression with survey weights since this estimation procedure already includes weighting with $1/\widehat{\sigma}_{ij}^2$. Since up to several children are observed per mother, I estimate cluster robust standard errors.

The variance regression function cannot be combined with modern strategies for handling missing data like multiple imputation, full information maximum likelihood (FIML), and propensity weighting. Multiple imputation does not work because predicted values from multiple imputation should not be used in calculations (Stata, 2021:298), and the variance function regression relies on residuals from the mean regression to estimate differences in the variance. In e.g., Stata, it is only possible to obtain residuals for complete cases post estimation on imputed data. FIML only works on linear regression, which is not compatible with the gamma regression using a log link function employed on the residuals in the variance function regression. Finally, propensity weighting is not possible because the variance function regression already applies weights to the mean regression to account for heteroskedasticity (Western & Bloome, 2009). Hence, I only use complete cases for the analysis. The differences in the variance of cognitive stimulation by mothers' education are not statistically different between children with no missing information and children, who are excluded because they are missing other covariates (see Table A1 in Appendix A). The distributions of cognitive stimulation by maternal education does not change once children with missing covariates are included (see Fig. A1 in Appendix A). While this analysis does not speak to the relationship between the variance in cognitively stimulating parenting and maternal education among the excluded cases with either missing maternal education or missing cognitive stimulation, it is reassuring to see that the pattern of the analysis holds up for those cases who have missing information in other variables.

To test hypotheses 2, 3, and 4, I gradually add variables to the variance function regression in the causal order they would affect the relationship between mothers' education and variance in cognitively stimulating parenting. If z-tests show that the differences in the associations between mother's education and the variance of cognitively stimulating parenting before and after adding the variables is statistically significantly different from zero, I conclude that the variables explain the educational gradient in the variance of

cognitively stimulating parenting. As I cannot guarantee exogenous variation in any of the independent variables, these relationships may be confounded by unobserved variables.

For both outcomes I start with a baseline model, Model 1, only containing the indicators of mothers' education. This step provides a statistical test of hypothesis 1 stating that educational attainment is negatively associated with the variance in cognitively stimulating parenting. Second, to test hypothesis 2 stating that the negative association between educational attainment and variance in cognitively stimulating parenting decreases once family-of-origin characteristics are taken into account, I add highest educational attainment of the mother's parents, race-ethnicity, and household cultural consumption when the mother was 14 in Model 2. At this step, I also include mothers' year of birth as a control variable. Third, to test hypothesis 3 stating that the negative association between educational attainment and variance in cognitively stimulating parenting decreases once mothers' cognitive skills are taken into account, I add mothers' AFQT. Fourth, to test hypothesis 4 stating that the negative association between educational attainment and variance in cognitively stimulating parenting decreases once economic uncertainty is taken into account, I add household income, wealth, mother's EGP class, and employment status. At this step, I control for child's birth year, maternal age, present father indicator, and number of children living in the household.

5. Results

5.1. Test of hypothesis 1: the educational gradient of heterogeneity in cognitively stimulating parenting

To test hypothesis 1 stating that higher educational attainment is associated with less heterogeneity in cognitively stimulating parenting, I examine the variance of the two measures of cognitively stimulating parenting and provide a statistical test using variance function regression. Fig. 1 shows the weighted distribution, mean, and variance of the HOME cognitive stimulation score for each level of education. The figure shows that the distribution of the cognitive stimulation score is quite dispersed for mothers without high school diplomas and becomes less dispersed for mothers with higher levels of educational attainment. The different degrees of dispersion translate into differences in the variance. The variance of the HOME cognitive stimulation scores is 4.63 for mothers with no high school diploma, 2.97 for mothers with a high school diploma, 2.17 for mothers with some college, and 1.00 for mothers with a college degree. The variance of the HOME cognitive stimulation score is 78 % smaller among mothers with college degrees compared to mothers with no high school diploma. These results indeed suggest a negative association between educational attainment and the variance of cognitively stimulating parenting. Moreover, Table A2 in Appendix A shows that educational differences in the variance of cognitive stimulation are larger than differences related to other family characteristic.

Fig. 2 shows the results from variance function regressions of the HOME cognitive stimulation score (the full regressions results are displayed in Table A3 and A4). The bars represent the estimated percentage difference in the variance of cognitive stimulation score between mothers with no high school diploma and mothers with respectively high school, some college and four-year college degrees. The baseline variance function regression (Model 1) also shows a negative educational gradient in the variance of cognitively stimulating parenting: the dummies for mothers with a high school diploma, some college, and college degrees are all statistically significant and negative. Since λ is estimated using the natural log as a link function, $100 \cdot (e^{\hat{\lambda}} - 1)$ is the estimated percentage change in the variance. Compared to mothers with no high school diploma, the variance of the HOME cognitive stimulation score is 27 % lower among mothers with a high school diploma, 46 % lower among mothers with some college, and 74 % lower among mothers with a college degree (these numbers differ slightly from the hand calculation of differences in variance above, since I do not use survey weights in the variance function regression as discussed in the Analytical Strategy section).

Fig. 1 shows that the distributions of the HOME cognitive stimulation score pile up at the top values – especially among mothers with some college and college degrees. 56.5 % of the mothers with college degrees falls in the top value ten. To address whether the lower variance among college-educated mothers appears because the HOME cognitive stimulation score does not capture the variation at the top of the distribution (i.e., due to right censoring), I have replicated the analysis using an alternative coding of the items in the HOME cognitive stimulation score in Appendix A (Table 2 shows the alternative coding, Fig. A2 shows the distribution by educational groups, and Table A5 and A6 shows the variance regression function). None of the distributions of the alternatively coded score are piled up at the top value. Only 5.4 % of the mothers with college degrees falls in the top value. The variance of the alternative cognitive stimulation score is higher than for the HOME cognitive stimulation score. However, there is still an educational gradient in the variance: the variance is highest among mothers with no high school diploma and lowest among college-educated mothers. The variance is 56 % lower among mothers with college degrees than mothers with no high school diploma.

To summarize, descriptively, I find an educational gradient in the variance of cognitively stimulating parenting whether measured as the original cognitive stimulation score, or an alternatively coded score not prone to right censoring. The variance in parenting is highest among mothers without a high school diploma and gradually shrinks among mothers with more education, with the lowest variance among college-educated mothers. These results support hypothesis 1 and show that there is more diversity in parenting among mothers with the least amount of education.

5.2. Test of hypothesis 2: family-of-origin inequality

The second hypothesis states that the negative association between educational attainment and variance in cognitively stimulating parenting decreases once family-of-origin characteristics are taken into account. I test this hypothesis by including variables for the highest educational attainment of the mother's parents, the mother's race-ethnicity, household cultural consumption when the mother

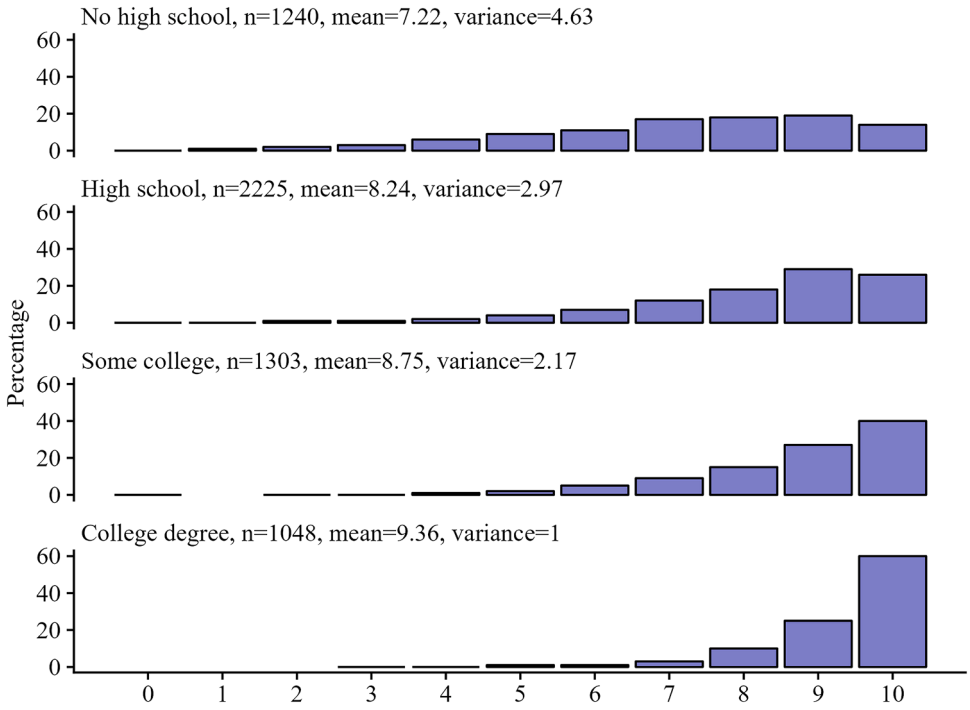

Fig. 1. Weighted distributions of the HOME cognitive stimulation score at age 3–4 by mothers' education.
Note: Weighted distributions, means, and variances. The count (n) is not weighted. $N = 5816$.

was 14, and mother's year of birth in Model 2 (Fig. 2 and Table A3 in Appendix A). Across outcomes, most markers of socioeconomic advantage are associated with less variance, and markers of socioeconomic disadvantage are associated with more variance. For instance, Hispanic or Black minority status is associated with more variance net of own socioeconomic status and parental socioeconomic status. This association between minority status and variance in cognitively stimulating parenting underlines the importance of not treating ethnoracial minorities as monolithic groups (Williams, 2019) and may also suggest larger everyday uncertainty among minority groups in the USA.

When the variables capturing family-of-origin inequality are added in Model 2, the differences in variance between the educational groups are reduced statistically significantly from the coefficients in Model 1 (Fig. 2). The difference in the variance between mothers without high school diplomas and mothers with high school diplomas is reduced 12 percentage points, meaning a 16 % decrease. The difference in the variance between mothers without high school diplomas and mothers with some college is reduced 9 percentage points, meaning an 12 % decrease. The difference in the variance between mothers without high school diplomas and mothers with college degrees is reduced 16 percentage points, meaning an 21 % decrease. These reductions are similar for the alternative cognitive stimulation score (see Table A5 in Appendix A). All three family-of-origin variables contribute to reducing the differences in the variance of cognitively stimulating parenting, especially when considered jointly (see Table 3). These results fail to reject hypothesis 2 and thereby support the notion that selection into education associated with family-of-origin inequality may lead to a homogenization of parenting among more educated parents.[d]

5.3. *Test of hypothesis 3: mothers' cognitive skills*

The third hypothesis states that the negative association between educational attainment and variance in cognitively stimulating parenting decreases once mothers' cognitive skills are taken into account. To test this hypothesis, I include mother's cohort-adjusted AFQT percentile rank in Model 3. Fig. 2 shows the results (full regressions are displayed inTable A3 and A4 in Appendix A). A one percentile-increase leads to a one percent reduction in the variance of cognitively stimulating parenting. While this direct association may not sound of much, as shown in Fig. 2 and Table 3 the mediating role of AFQT is substantial. The difference in variance between mothers without high school diplomas and mothers with high school diplomas is reduced 6 percentage points (a 11 % decrease) and is no longer statistically significant. The difference in variance between mothers without high school diplomas and mothers with some college is reduced 12 percentage points (a 20 % decrease). The difference in variance between mothers without high school diplomas

[d] I have analyzed whether high school quality as operationalized by Phillips et al. (1998) may explain the educational gradient in cognitively stimulating parenting. This does not appear to be the case (results are available upon request). However, the indicators of high school quality are only available for a small subset of the sample (3,265 children and 3,278 children depending on the item).

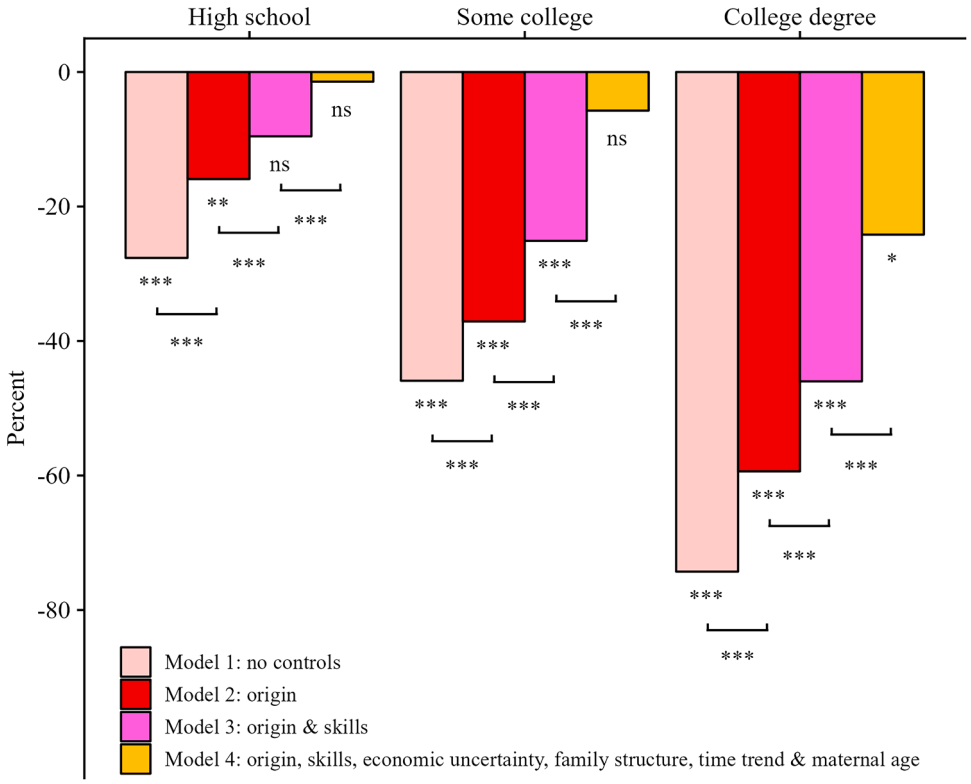

Fig. 2. Variance function regression of the HOME cognitive stimulation score (reference category: no high school diploma).
Note: the bars represent the estimated percentage difference in the variance of cognitive stimulation score between mothers with no high school diploma and mothers with respectively high school, some college and four-year college degrees (see Table A2). The estimated percentage difference in the variance is $100 \cdot (e^{\hat{\lambda}} - 1)$ since λ is estimated using the natural log as a link function. The brackets show the results of z-tests comparing coefficients across models. $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.5$ (two-tailed tests). $N = 5816$ children.

and mothers with college degrees is reduced 14 percentage points (a 23 % decrease). Z-tests show that all these reductions are statistically significant (Table 3). For the alternatively coded cognitive stimulation score, these reductions imply that there is no longer any statistical difference in the variance between the educational groups (see Table A5 in Appendix A). These results fail to reject hypothesis 3, and therefore support the notion that due to imperfect selection into education, the greater heterogeneity in cognitive skills among parents with less education compared to parents with more education leads to greater heterogeneity in cognitively stimulating parenting.

5.4. Test of hypothesis 4: economic uncertainty

To test the fourth hypothesis stating that the association between educational attainment and variance in cognitively stimulating parenting decreases once economic uncertainty is taken into account, I add household income, mother's employment status, and wealth to Model 4. I also control for time trends, maternal age, present father, and number of children in the household. Model 4 in Fig. 2 shows the results (full regression tables are displayed in Table A3 and A4 in Appendix A).

Of the three indicators of economic uncertainty family income and wealth are associated with less variance in cognitively stimulating parenting, while employment status is not statistically significantly associated with any of the outcomes (Table A3 and A5 in Appendix A). A one percent increase in family income is associated with a 12 % reduction in the variance of cognitively stimulating parenting. A one percent increase in wealth is associated with a 3 % reduction in the variance of cognitively stimulating parenting depending on the outcome.

Adding the three indicators of economic uncertainty reduces the difference in variance in the HOME cognitive stimulation score between mothers without high school diploma and mothers with some college with 6.2 percentage points (see Table 3). The difference in variance between mothers without high school diplomas and mothers with college degrees is reduced 8.7 percentage points (see Table 3). These results fail to reject hypothesis 4 and suggest that education's negative effect on economic uncertainty leads to greater homogeneity in cognitively stimulating parenting among mothers with more education.

Fig. 3 summarizes how much each category of variables explain of the difference in the variance of the HOME cognitive stimulation score between mothers with no high school diploma and mothers with more education (to achieve a legible graph, statistical uncertainty is not represented). The greater variation in parenting among mothers without a high school diploma compared to mothers

Table 3
Reductions in education lambda coefficients when introducing explanatory variables.

	HOME λ1-λ2[a]	s.e.[b]	%points[c]
Model 2			
Grandparental Education (ref.=no high school)			
High school	0.017	(0.012)	1.5
Some college	−0.045*	(0.018)	−2.8
College+	−0.113**	(0.038)	−4.4
Race-ethnicity of mother (ref.=other)			
High school	0	(0.018)	0
Some college	0.04	(0.024)	2.6
College+	−0.069**	(0.026)	−2.8
Magazines, newspapers & library card			
High school	−0.071***	(0.015)	−5.8
Some college	−0.045**	(0.016)	−2.8
College+	−0.076***	(0.019)	−3
Mother's year of birth (ref.=1957)			
High school	0.004	(0.01)	0.3
Some college	−0.007	(0.013)	−0.4
College+	0.006	(0.015)	0.3
Model 3			
AFQT			
High school	−0.071***	(0.02)	−6.3
Some college	−0.173***	(0.041)	−11.9
College+	−0.284***	(0.065)	−13.6
Model 4			
Child's birth year			
High school	0.002	(0.002)	0.2
Some college	0.001	(0.005)	0.1
College+	−0.001	(0.005)	−0.1
Present father			
High school	−0.002	(0.003)	−0.2
Some college	−0.003	(0.004)	−0.3
College+	−0.001	(0.005)	−0.1
No. of children			
High school	−0.03*	(0.012)	−2.9
Some college	−0.057***	(0.015)	−5.1
College+	−0.046**	(0.017)	−3.4
Log income			
High school	−0.011	(0.007)	−1.1
Some college	−0.017	(0.011)	−1.6
College+	−0.052**	(0.016)	−3.9
Maternal employment status			
High school	0.01	(0.01)	1
Some college	0.006	(0.011)	0.5
College+	−0.001	(0.03)	−0.1
Wealth			
High school	−0.014	(0.011)	−1.4
Some college	−0.03**	(0.01)	−2.7
College+	−0.011	(0.016)	−0.9
Maternal age			
High school	0.007	(0.005)	0.7
Some college	0.005	(0.009)	0.4
College+	0.005	(0.009)	0.4
Income and wealth			
High school	−0.033	(0.017)	−3.2
Some college	−0.06**	(0.019)	−5.3
College+	−0.097***	(0.027)	−7
Economic uncertainty variables			
High school	−0.03	(0.021)	−2.9
Some college	−0.069**	(0.025)	−6.2
College+	−0.121**	(0.041)	−8.7
Number of children	5816		

Note: Cluster robust standard errors. ***$p < 0.001$, **$p < 0.01$, *$p < 0.5$ (two-tailed tests).

[a] The difference in the coefficient between a model including and a model excluding the explaining variable.

[b] The standard error around the difference calculated as sqrt(var(λ_1) + var(λ_2) +2cov(λ_1,λ_2)).

[c] the difference in percentage points between λ_1 and λ_2, calculated as 100*(eλ_1^−1)−100*(eλ_2–1).

with high school diplomas or some college is fully explained by family-of-origin characteristics, mother's cognitive skills, economic uncertainty, and demographic variables. These factors, however, do not fully explain the greater variation in parenting among mothers without high school diplomas compared to mothers with college degrees. This persisting difference could be caused by a socializing effect of college, a diffusion process of parenting practices from college-educated to less educated mothers, or peer effects due to economic sorting into neighborhoods and schools, but these speculations remain untestable due to limitations of the data.[e]

5.5. What aspects of parenting contribute to the variance?

The large variance in cognitive stimulation among mothers without high school diplomas stands out compared to the other educational groups. In this group, reading stories, having children's books, and owning a music device contribute to the variance: these practices are the least common among mothers with low scores and grow increasingly common among mothers with higher scores (Table A7 in Appendix A).

The differences in variance between the three groups with more education may also be meaningful. For instance, the typical difference between scoring 8 and 10 on the HOME cognitive stimulation score is whether the mother reads to the child three times per week or more, and whether the mother or another family member has taken the child to a museum once-twice in the past year or more (see Table A8). Given the importance of shared book reading for the development of language skills (Bus, van Ijzendoorn & Pellegrini, 1995; Mol & Bus, 2011; O'Farrelly et al., 2018; Sloat et al., 2015), the variation may be consequential for children's cognitive skills. Indeed, higher cognitive stimulation scores are associated with higher math and reading test scores once children start school (Table A9 in Appendix A). This is even true in the top of the distribution of the cognitive stimulation score: there are substantial differences in test scores between children whose mothers had a cognitive stimulation score of 8 and 10 (Table A9 in Appendix A).

A high HOME cognitive stimulation score covers slightly different practices across the educational groups (Table A10 in Appendix A). There is virtually no difference in the commonality of owning a musical device and teaching numbers, the alphabet, colors, shapes and sizes. However, reading stories is more common among the high-scoring college-educated mothers than among high-scoring mothers in the three other educational groups. This pattern is reversed for outings and museum visits. For instance, 63 % of the high-scoring mothers with no high school diploma visits museums and 85 % goes on outings, while among the high-scoring mothers with college degrees this is only 41 % and 66 % respectively (Table A10 in Appendix A).

6. Discussion

Ample research shows that mothers with more years of education engage more in cognitively stimulating parenting than mothers with fewer years of education (e.g., Attewell & Lavin, 2006; Carneiro et al., 2013; Domina & Roksa, 2012; Feinstein et al., 2008; Hoff et al., 2002). However, qualitative studies show that there is considerable heterogeneity in cognitively stimulating parenting within groups of parents with similar levels of education (Chin & Phillips, 2004; Irwin & Elley, 2011; Mayo & Siraj, 2015; Streib, 2013). In this study, I have analyzed whether this heterogeneity is socially stratified. Specifically, I have analyzed whether there is an educational gradient in the heterogeneity in cognitively stimulating parenting, and whether selection into education and effects of education may explain this gradient. I have addressed these questions by analyzing the variance in cognitive stimulation provided by mothers and their family members to children aged 3–4 in NLSY79-CYA using variance function regressions.

My results show an educational gradient in the heterogeneity in cognitively stimulating parenting: there is most heterogeneity among mothers with no high school diploma, the heterogeneity gradually shrinks for mothers with higher levels of educational attainment, and the heterogeneity is smallest among mothers with college degrees. This is true for a classic measure of cognitively stimulating parenting (the HOME cognitive stimulation score) and an alternative measure of cognitively stimulating parenting capturing variation at the top of the parenting distribution. From a child's perspective, one may think of this educational gradient as more uncertain access to opportunities for cognitive development among children of mothers with less education compared to children of mothers with more education. Meanwhile the greater heterogeneity in parenting among mothers with no high school diploma also shows that some children of these mothers are receiving substantial amounts of cognitively stimulation.

Further, my findings show that the educational gradient in the heterogeneity in cognitively stimulating parenting is related to selection into education based on mothers' family of origin and cognitive skills and the effects of education on economic uncertainty. First, family-of-origin characteristics such as the educational attainment of the mother's parents, the mother's race-ethnicity, and household cultural consumption during adolescence explain a substantial part of the differences in the variance of cognitively stimulating parenting between educational groups. This finding supports the notion that the inequality-reinforcing sorting of individuals by schools (Domina et al., 2017) makes the group that transitions at each educational level more homogeneous. This homogeneity may entail homogeneity in the mothers' exposure to cognitively stimulating parenting as children, and if mothers parent like they themselves were parented (Domina & Roksa, 2012), the homogeneity in exposure translates to a homogeneity in their own parenting.

Second, mothers' cognitive skills explain a substantial part of the educational gradient in the heterogeneity in cognitively stimulating parenting. The reason may be that selection into education is also driven by cognitive skills (Brand & Xie, 2010; Farkas, 2003; Karlson, 2019), however, imperfectly, as individuals from socioeconomically disadvantaged backgrounds are less likely to proceed

[e] For a subsample of 947 children, I was able to test whether The Center for Epidemiologic Studies Depression Scale (CES-D) is associated with variance in cognitively stimulating parenting and whether this factor explains the difference in variance between educational groups. This was neither the case for a continuous measure nor the cut-off measure (results available upon request).

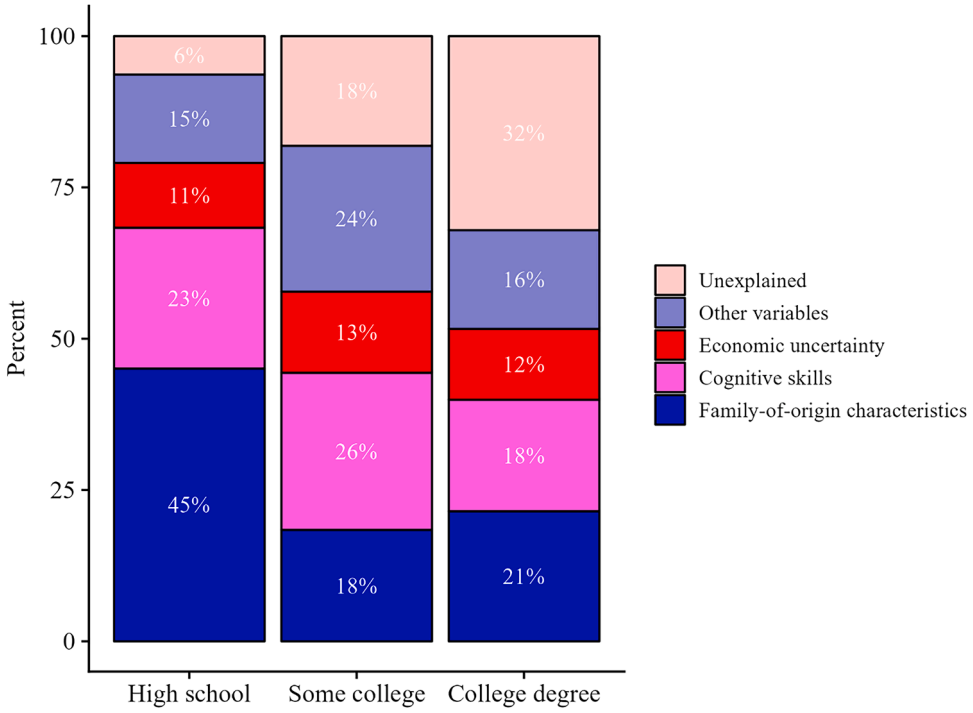

Fig. 3. Percentage explained of the difference in the variance of the HOME cognitive stimulation score between educational groups (reference category: no high school diploma).
Note: Estimates from variance function regression of the HOME cognitive stimulation score, Table A2 in Appendix A. Family-of-origin characteristics are captured by highest educational level of mothers' parents, race-ethnicity, and cultural consumption. Cognitive skills are captured by the 2006-revised AFQT percentile score. Economic uncertainty is captured by mothers' employment status, family income, and wealth. Other variables include mothers' birth year, child's birth year, maternal age, present father, and number of children. $N = 5816$.

than individuals from advantaged backgrounds with the same skill level (Boudon, 1974; Breen & Goldthorpe, 1997; Jackson, 2013; Jackson et al., 2007). This imperfect selection into education leads to greater heterogeneity in cognitive skills among parents with less education compared to parents with more education. Since parents' cognitive skills increase the certainty of cognitively stimulating parenting, the greater heterogeneity in parents' cognitive skills among the less educated, leads to greater heterogeneity in cognitively stimulating parenting.

Third, household income, wealth, and occupational class explain part of the educational gradient in the heterogeneity in cognitively stimulating parenting. The reason may be that lack of a college degree leads to higher uncertainty in securing employment with high job security, flexible hours, and a sustainable income. This higher uncertainty leads to greater variation in financial, psychological, and social resources which in turn leads to greater heterogeneity in cognitively stimulating parenting.

Some limitations should be kept in mind when interpreting these results. First, I may underestimate the heterogeneity in cognitively stimulating parenting among the most educated parents if I do not observe the upper part of the distribution of cognitively stimulating parenting. I have addressed this concern by constructing a cognitive stimulation score, where items are coded to their top value. This measure captures 'the upper bar' of cognitively stimulating parenting such as shared book reading every day, outings several times a week, and museum visits each month. Only 5.4 % of the college-educated mothers and their family members receive the highest values on this measure. Hence, this score should be less prone to underestimating the heterogeneity among the most educated parents. There may of course be aspects of cognitively stimulating parenting that are not captured in the NLSY-CYA survey questionnaire and that may be hard to measure in the context of this type of study. One of these aspects may be time use and tailoring of activities to the developmental stage of the child (Kalil & Ryan, 2020). Another aspect may be conversations among parents and children like the ones documented by Lareau (2011) in her ethnographic study of social class difference in parenting. This issue underlines the importance of a continued effort to uncover socioeconomic differences in how parents promote the cognitive development of their children and to find innovative ways of capturing these parenting practices in large-scale, quantitative studies.

Second, while I show that the educational gradient in the heterogeneity of cognitively stimulating parenting decreases when taking into account family-of-origin inequality, mothers' cognitive skills, and economic uncertainty, I do not have exogeneous variation in these factors to plausibly argue that their influences are causal. Women pursuing post-mandatory education and especially women completing college may be more alike in ways that I cannot observe in the NLSY79 data. Unpacking the causal relationships leading to the educational gradient in the heterogeneity of cognitively stimulating parenting is a task for future research.

Third, this study relies on parenting practices reported by the mother, thereby potentially overlooking educational patterns of the heterogeneity among fathers. Just as studies have shown for mothers, fathers with higher educational levels spent more time in

cognitively stimulating activities than their lower educated counterparts (Altintas, 2016), and father-child time spent in cognitively stimulating activities positively affect children's cognitive skills (Cano et al., 2019). While mothers report the items, as described in the data section, all items on activities (except shared book reading) ask how frequent the mother or someone else/a family member engaged in the activity with the child. Hence, to the extend mothers are reporting correctly on fathers' activities, these items indirectly capture fathers' parenting practices. In support of this indirect measure, one may argue that mothers may play a crucial organizing role in their children's lives, where they affect the type of activities children engage in, even when mothers are not present themselves (Cano et al., 2019). Moreover, a recent time-use study shows an educational gradient in the heterogeneity in overall time with children for both mothers and fathers: heterogeneity in time use is lowest among parents with the most education (Balbo et al., 2023). It is up to future research to analyze whether educational patterns in heterogeneity in cognitively stimulating parenting look differently for fathers than mothers.

Fourth, this study relies on a discretized measure of mothers' educational level based on years of schooling. Information on obtained on diplomas and degrees could have given a more accurate grouping of mothers into educational levels. This data limitation potentially introduces classical measurement error, which may attenuate the estimates of difference in the variance of cognitively stimulating parenting by mothers' educational level.

Finally, the reports of parenting practices may be subject to social desirability bias. Contrasting responses on survey questionnaires to time use diaries, research shows that all parents over-report shared book reading in survey questionnaires, and that college-educated mothers over-report more than mothers with lower educational attainment (Hofferth, 2006). Hence, when it comes to parenting practices, social desirability bias may be stronger among mothers with more education. This bias will make college-educated mothers' responses more alike and hence partly explain the social gradient in heterogeneity in cognitively stimulating parenting.

Despite these limitations, the educational gradient in the heterogeneity of cognitively stimulating parenting has practical implications for educators and social workers engaging with less educated parents. Descriptively, mothers with no high school diploma parent in much more diverse ways than the impression one might get from the previous literature. Group-means reported by previous research may unintentionally translate into the stigmatizing understanding that mothers with little or no secondary and postsecondary education per se do not stimulate the cognitive development of their children. Educators and social workers, however, should be prepared to meet a much more diverse group of mothers, with some mothers engaging just as much in cognitive stimulating parenting of their children as their highly educated peers.

The broader call of this study is to pay more attention to the potential greater variation in cultural practices among less privileged groups compared to more privileged groups than sociological research and theorizing has previously done. This attention may require new types of data (see e.g., Sivertsen, 2023) or new usages of existing data like in the current study. This endeavor helps de-stereotyping less privileged groups. A fundamental type of stereotyping is to view a group as homogeneous and not see the individuating differences. Therefore, analyzing heterogeneity within groups challenges stereotypes. Moreover, to show how this heterogeneity is connected to social inequality is sociological relevant. This paper contributes a theoretical framework for understanding heterogeneity in cultural practices among the less advantaged in terms of education. While this framework focuses on parenting practices, it may prove transferrable to other cultural practices.

CRediT authorship contribution statement

Asta Breinholt: Writing – review & editing, Writing – original draft, Visualization, Methodology, Investigation, Data curation, Conceptualization.

Declaration of competing interest

I have no conflicting interests to declare.

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Appendix A

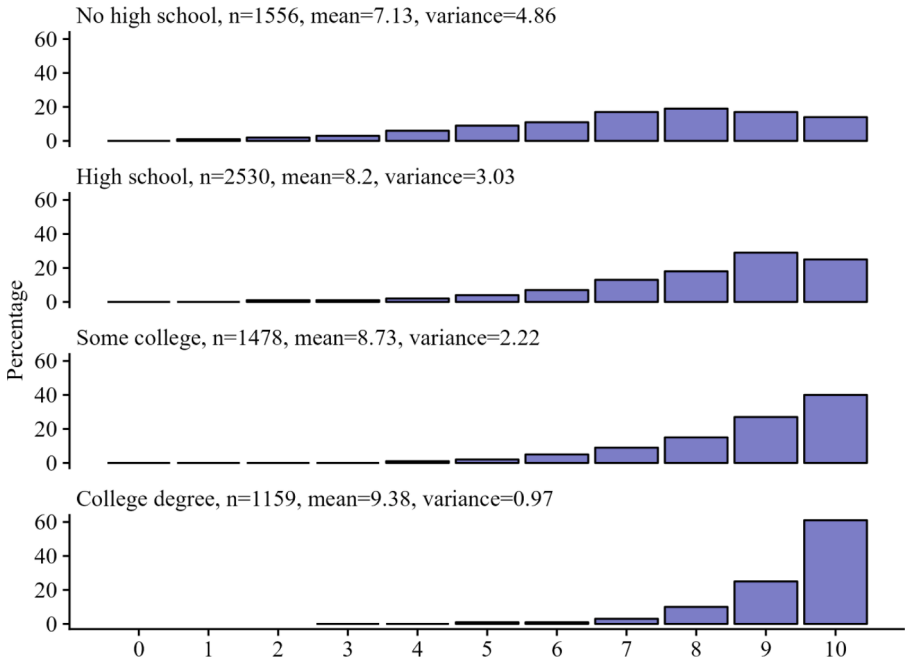

Fig. A1. Weighted distribution of the HOME cognitive stimulation score at age 3–4 by mothers' education (for all cases with valid information on the cognitive stimulation and mothers' education). Note: weighted distributions, means, and variances. The count (n) is not weighted. $N = 6723$.

Table A1
Variance function regression for complete cases and excluded cases with valid information on cognitively stimulating parenting and maternal education.

	Complete cases		Excluded cases		Complete and excluded cases	
	λ	s.e.	λ	s.e.	λ	s.e.
Maternal Education (ref.=no high school)						
High school	−0.31***	(0.06)	−0.43***	(0.11)	−0.31***	(0.06)
Some college	−0.61***	(0.07)	−0.41ǂ	(0.21)	−0.61***	(0.07)
College+	−1.35***	(0.11)	−1.62***	(0.28)	−1.35***	(0.11)
Excluded cases x maternal education (ref.=no high school)						
High school					−0.12	(0.13)
Some college					0.21	(0.22)
College+					−0.27	(0.30)
Excluded cases					0.09	(0.09)
Constant	1.64***	(0.04)	1.73***	(0.08)	1.64***	(0.04)
Number of children	5816		907		6723	

Note: Cluster robust standard errors. ***$p < 0.001$, **$p < 0.01$, *$p < 0.5$, ǂ$p < 0.1$. (two-tailed tests).

Table A2
Mean and variance of cognitively stimulating parenting by sociodemographic characteristics (Weighted).

	Original Mean	Variance	Alternative Mean	Variance
Mother no high school diploma	7.22	4.63	5.73	3.54
Mother has high school diploma	8.24	2.97	6.61	2.44
Mother has some college	8.75	2.17	7.15	2.32
Mother has a college degree	9.36	1.00	7.92	1.54
AFQT 1st quartile	6.92	5.28	5.50	3.97
AFQT 2nd quartile	7.98	3.17	6.33	2.67
AFQT 3rd quartile	8.63	2.13	7.03	2.21
AFQT 4th quartile	9.15	1.39	7.62	1.68
No present father	7.64	4.19	6.03	3.25
Present father	8.68	2.51	7.14	2.51
One child	8.58	2.44	7.00	2.47
Two children	8.61	2.74	7.05	2.75
Three children	8.35	3.27	6.78	2.99
Four or more	7.99	4.20	6.49	3.31
Income 1st quartile	7.27	4.60	5.81	3.62

(*continued on next page*)

Table A2 (*continued*)

	Original		Alternative	
	Mean	Variance	Mean	Variance
Income 2nd quartile	8.34	2.64	6.69	2.32
Income 3rd quartile	8.87	1.69	7.24	1.87
Income 4th quartile	9.31	1.09	7.82	1.60
Wealth 1st quartile	7.35	4.55	5.86	3.56
Wealth 2nd quartile	8.33	2.63	6.75	2.34
Wealth 3rd quartile	8.94	1.70	7.26	1.94
Wealth 4th quartile	9.26	1.08	7.80	1.55
Mother in the working class	8.01	3.24	6.44	2.86
Mother in the intermediate class	8.62	2.45	6.92	2.30
Mother in the service class	9.05	1.54	7.48	1.95
Mother out of the labor force	8.26	3.70	6.80	3.38
Mother unemployed	7.81	3.97	6.13	2.94
Mother is working, but not EGP-classified	8.64	2.82	7.13	2.64
Hispanic	7.24	5.34	5.76	3.92
Black NH	7.28	4.55	5.72	3.67
NHNB	8.77	2.13	7.20	2.21
Girl	8.53	2.80	6.97	2.71
Boy	8.42	3.23	6.86	2.99
Age 3	8.40	3.22	6.89	3.11
Age 4	8.54	2.81	6.93	2.60
N children	5816		5816	

Table A3
Variance function regression of the HOME cognitive stimulation score.

	Model 1		Model 2		Model 3		Model 4	
	λ	s.e.	λ	s.e.	λ	s.e.	λ	s.e.
Maternal Education (ref.=no high school)								
High school	−0.31***	(0.06)	−0.16**	(0.06)	−0.09	(0.07)	−0.02	(0.07)
Some college	−0.61***	(0.07)	−0.46***	(0.07)	−0.29***	(0.08)	−0.09	(0.08)
College+	−1.35***	(0.11)	−0.88***	(0.10)	−0.60***	(0.11)	−0.27*	(0.11)
Grandparental Education (ref.=no high school)								
High school			0.01	(0.06)	0.08	(0.06)	0.05	(0.06)
Some college			−0.32***	(0.09)	−0.21*	(0.09)	−0.05	(0.10)
College+			−0.31**	(0.12)	−0.18	(0.12)	−0.07	(0.11)
Race-ethnicity of mother (ref.=other)								
Black			0.51***	(0.06)	0.34***	(0.08)	0.16*	(0.07)
Hispanic			0.42***	(0.06)	0.30***	(0.07)	0.32***	(0.07)
Mother's year of birth (ref.=1957)								
1958			0.11	(0.11)	0.04	(0.11)	0.03	(0.11)
1959			0.27**	(0.11)	0.25*	(0.10)	0.29**	(0.11)
1960			0.32*	(0.14)	0.29	(0.15)	0.25	(0.13)
1961			0.25	(0.13)	0.14	(0.11)	0.09	(0.12)
1962			0.26**	(0.10)	0.25**	(0.10)	0.30*	(0.13)
1963			0.33***	(0.10)	0.30**	(0.10)	0.29*	(0.13)
1964			0.27**	(0.11)	0.29**	(0.11)	0.36*	(0.15)
1979 magazines			−0.12*	(0.06)	−0.09	(0.06)	−0.07	(0.06)
1979 newspapers			−0.09	(0.06)	−0.07	(0.06)	−0.00	(0.06)
1979 library card			−0.17**	(0.06)	−0.14**	(0.05)	−0.13*	(0.05)
AFQT					−0.01***	(0.00)	−0.01***	(0.00)
Child's birth year							−0.02	(0.02)
Present father							−0.03	(0.06)
No. of children							0.10**	(0.03)
Log income							−0.11***	(0.03)
Maternal EGP class (ref.=working class)								
Intermediate							−0.09	(0.08)
Service							−0.05	(0.10)
Out of the labor force							−0.12	(0.08)
Unemployed							−0.15	(0.11)
Working-no EGP							0.01	(0.16)
Log wealth							−0.03***	(0.00)
Maternal age at birth (ref.=25–30 years)								
17–20 years							0.08	(0.14)
21–24 years							0.16	(0.09)
31+ years							0.01	(0.11)
Constant	1.64***	(0.04)	1.14***	(0.11)	1.33***	(0.11)	37.59	(32.49)
N	5816		5816		5816		5816	

Note: Cluster robust standard errors. ***$p < 0.001$, **$p < 0.01$, *$p < 0.5$ (two-tailed tests). This table shows the results of the variance regressions. The results from the mean regressions are displayed in Table A4, Appendix A.

Table A4
Mean regression of the HOME cognitive stimulation score.

	Model 1		Model 2		Model 3		Model 4	
	β	s.e.	β	s.e.	β	s.e.	β	s.e.
Maternal Education (ref.=no high school)								
High school	1.19***	(0.10)	0.76***	(0.09)	0.67***	(0.09)	0.39***	(0.08)
Some college	1.76***	(0.10)	1.22***	(0.09)	1.02***	(0.09)	0.57***	(0.09)
College+	2.57***	(0.09)	1.55***	(0.09)	1.24***	(0.10)	0.58***	(0.10)
Grandparental Education (ref.=no high school)								
High school			0.35***	(0.07)	0.27***	(0.07)	0.23***	(0.06)
Some college			0.51***	(0.08)	0.39***	(0.08)	0.27***	(0.08)
College+			0.54***	(0.09)	0.38***	(0.09)	0.26**	(0.08)
Race-ethnicity of mother (ref.=other)								
Black			−0.83***	(0.07)	−0.62***	(0.08)	−0.31***	(0.07)
Hispanic			−0.51***	(0.08)	−0.37***	(0.08)	−0.35***	(0.07)
Mother's birth year (ref.=1957)								
1958			0.01	(0.09)	0.07	(0.09)	0.02	(0.08)
1959			−0.20*	(0.09)	−0.18	(0.09)	−0.24**	(0.09)
1960			−0.16	(0.10)	−0.13	(0.10)	−0.18	(0.09)
1961			−0.03	(0.09)	0.03	(0.09)	−0.04	(0.09)
1962			−0.18*	(0.09)	−0.17	(0.09)	−0.31***	(0.09)
1963			−0.10	(0.09)	−0.08	(0.10)	−0.18	(0.10)
1964			−0.04	(0.10)	−0.05	(0.10)	−0.19	(0.11)
Magazines			0.25***	(0.06)	0.21***	(0.06)	0.17**	(0.05)
Newspapers			0.27***	(0.08)	0.25**	(0.08)	0.14*	(0.07)
Library card			0.40***	(0.07)	0.37***	(0.06)	0.32***	(0.06)
Mothers' AFQT					0.01***	(0.00)	0.01***	(0.00)
Child's birth year							0.03***	(0.01)
Present father							0.09	(0.06)
No. of children							−0.17***	(0.03)
Log income							0.16***	(0.03)
Maternal EGP class (ref.=working class)								
Intermediate							0.22**	(0.07)
Service							0.17*	(0.08)
Out of the labor force							0.15*	(0.07)
Unemployed							0.17	(0.14)
Working-no EGP							0.12	(0.12)
Intermediate								
Log wealth							0.05***	(0.01)
Maternal age at birth (ref.=25–30 years)								
17–20 years							−0.26*	(0.12)
21–24 years							−0.17*	(0.07)
31+ years							−0.10	(0.07)
Constant	6.67***	(0.08)	6.67***	(0.12)	6.46***	(0.13)	−62.50***	(18.30)
R^2	0.20		0.29		0.30		0.33	
N	5816		5816		5816		5816	

Note: Cluster robust standard errors. ***$p < 0.001$, **$p < 0.01$, *$p < 0.5$ (two-tailed tests). The results from the variance regressions are displayed in Table A3, Appendix A.

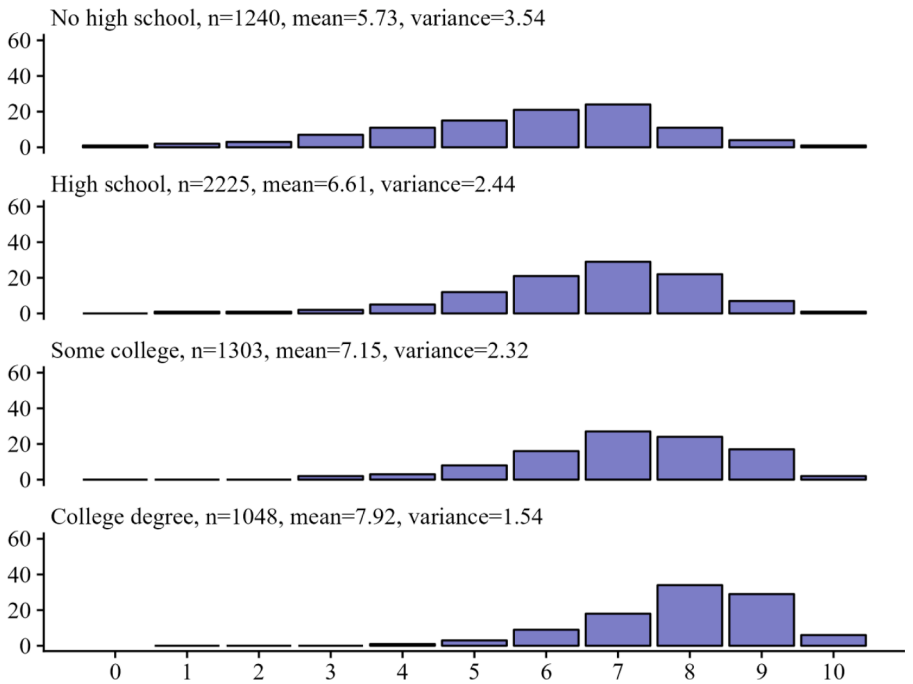

Fig. A2. Weighted Distribution of the Alternative Cognitive Stimulation Score at Age 3–4 by Mothers' Education
Note: Weighted distributions, means, and variances. The count (n) is not weighted. $N = 5816$.

Table A5
Variance function regression of the alternative cognitive stimulation score.

	Model 1		Model 2		Model 3		Model 4	
	λ	s.e.	λ	s.e.	λ	s.e.	λ	s.e.
Maternal Education (ref.=no high school)								
High school	−0.26***	(0.06)	−0.16*	(0.06)	−0.10	(0.06)	−0.10	(0.06)
Some college	−0.35***	(0.06)	−0.29***	(0.07)	−0.14	(0.07)	−0.07	(0.08)
College+	−0.74***	(0.08)	−0.41***	(0.08)	−0.17	(0.10)	−0.04	(0.11)
Grandparental Education (ref.=no high school)								
High school			−0.01	(0.05)	0.04	(0.06)	0.03	(0.06)
Some college			−0.11	(0.09)	−0.03	(0.09)	0.06	(0.10)
College+			−0.21*	(0.09)	−0.08	(0.10)	0.01	(0.10)
Race-ethnicity of mother (ref.=other)								
Black			0.39***	(0.06)	0.24***	(0.07)	0.15*	(0.07)
Hispanic			0.29***	(0.06)	0.18**	(0.07)	0.16*	(0.07)
Mother's year of birth (ref.=1957)								
1958			0.02	(0.10)	−0.02	(0.11)	−0.02	(0.11)
1959			0.10	(0.10)	0.10	(0.10)	0.13	(0.11)
1960			0.18	(0.10)	0.18	(0.10)	0.17	(0.11)
1961			0.06	(0.11)	0.00	(0.10)	−0.02	(0.11)
1962			0.08	(0.09)	0.09	(0.09)	0.15	(0.12)
1963			0.24*	(0.10)	0.23*	(0.10)	0.21	(0.12)
1964			0.06	(0.10)	0.08	(0.10)	0.17	(0.14)
1979 magazines			−0.03	(0.05)	−0.01	(0.05)	0.02	(0.05)
1979 newspapers			−0.05	(0.05)	−0.04	(0.05)	−0.01	(0.06)
1979 library card			−0.12*	(0.05)	−0.08	(0.05)	−0.05	(0.05)
AFQT					−0.01***	(0.00)	−0.01***	(0.00)
Child's birth year							−0.01	(0.01)
Present father							0.05	(0.06)
No. of children							0.02	(0.03)
Log income							−0.08***	(0.02)
Maternal EGP class (ref.=working class)								
Intermediate							−0.07	(0.07)
Service							0.01	(0.08)
Out of the labor force							−0.09	(0.07)
Unemployed							−0.21	(0.11)
Working-no EGP							0.07	(0.14)
Log wealth							−0.02***	(0.00)

(*continued on next page*)

Table A5 (*continued*)

	Model 1		Model 2		Model 3		Model 4	
	λ	s.e.	λ	s.e.	λ	s.e.	λ	s.e.
Maternal age at birth (ref.=25–30 years)								
17–20 years							−0.07	(0.13)
21–24 years							0.08	(0.08)
31+ years							0.02	(0.10)
Constant	1.35***	(0.04)	0.99***	(0.10)	1.13***	(0.11)	20.70	(27.03)
N	5816		5816		5816		5816	

Note: Cluster robust standard errors. ***$p < 0.001$, **$p < 0.01$, *$p < 0.5$ (two-tailed tests). This table shows the results of the variance regressions. The results from the mean regressions are displayed in Table A6 Appendix A.

Table A6
Mean regression of the alternative cognitive stimulation score.

	Model 1		Model 2		Model 3		Model 4	
	β	s.e.	B	s.e.	β	s.e.	β	s.e.
Maternal Education (ref.=no high school)								
High school	0.95***	(0.08)	0.59***	(0.08)	0.50***	(0.08)	0.26***	(0.08)
Some college	1.48***	(0.09)	1.02***	(0.08)	0.82***	(0.09)	0.42***	(0.08)
College+	2.47***	(0.09)	1.50***	(0.09)	1.19***	(0.10)	0.56***	(0.10)
Grandparental Education (ref.=no high school)								
High school			0.28***	(0.06)	0.21**	(0.06)	0.16**	(0.06)
Some college			0.51***	(0.09)	0.40***	(0.09)	0.28***	(0.08)
College+			0.64***	(0.09)	0.49***	(0.09)	0.35***	(0.08)
Race-ethnicity of mother (ref.=other)								
Black			−0.87***	(0.07)	−0.67***	(0.07)	−0.37***	(0.07)
Hispanic			−0.55***	(0.08)	−0.42***	(0.07)	−0.38***	(0.07)
Mother's birth year (ref.=1957)								
1958			−0.01	(0.10)	0.04	(0.10)	0.02	(0.09)
1959			−0.23*	(0.10)	−0.23*	(0.10)	−0.27**	(0.10)
1960			−0.18	(0.10)	−0.16	(0.10)	−0.22*	(0.10)
1961			−0.07	(0.10)	−0.03	(0.09)	−0.12	(0.10)
1962			−0.18	(0.09)	−0.20*	(0.09)	−0.39***	(0.10)
1963			−0.15	(0.10)	−0.13	(0.10)	−0.27*	(0.11)
1964			−0.04	(0.10)	−0.06	(0.10)	−0.24*	(0.12)
Magazines			0.31***	(0.06)	0.26***	(0.06)	0.21***	(0.05)
Newspapers			0.15*	(0.07)	0.14*	(0.07)	0.08	(0.06)
Library card			0.41***	(0.06)	0.38***	(0.06)	0.33***	(0.06)
Mothers' AFQT					0.01***	(0.00)	0.01***	(0.00)
Child's birth year							0.05***	(0.01)
Present father							0.12*	(0.06)
No. of children							−0.18***	(0.02)
Log income							0.17***	(0.03)
Maternal EGP class (ref.=working class)								
Intermediate							0.12	(0.07)
Service							0.13	(0.08)
Out of the labor force							0.22**	(0.07)
Unemployed							0.10	(0.13)
Working-no EGP							0.10	(0.13)
Intermediate							0.04***	(0.01)
Log wealth							0.12	(0.07)
Maternal age at birth (ref.=25–30 years)								
17–20 years							−0.09	(0.12)
21–24 years							−0.12	(0.07)
31+ years							−0.08	(0.08)
Constant	5.30***	(0.07)	5.33***	(0.12)	5.14***	(0.12)	−93.53***	(19.59)
R^2	0.20		0.31		0.32		0.37	
N	5816		5816		5816		5816	

Note: Cluster robust standard errors. ***$p < 0.001$, **$p < 0.01$, *$p < 0.5$ (two-tailed tests). The results from the variance regressions are displayed in Table A5, Appendix A.

Table A7
Mean of HOME items by score of the HOME cognitive stimulation score, mothers without high school diploma ($n = 1295$).

	HOME cognitive stimulation score								
Item	0	1–3	4	5	6	7	8	9	10
Read stories	0	0.08	0.15	0.18	0.32	0.38	0.56	0.79	1
Children's books	0	0.15	0.19	0.32	0.46	0.68	0.81	0.95	1

(*continued on next page*)

Table A7 (*continued*)

	HOME cognitive stimulation score								
Item	0	1–3	4	5	6	7	8	9	10
Magazines	0	0.20	0.29	0.41	0.54	0.55	0.65	0.79	1
Music device	0	0.16	0.22	0.29	0.38	0.51	0.75	0.84	1
Teach numbers	0	0.49	0.73	0.81	0.93	0.94	0.99	1	1
Teach alphabet	0	0.30	0.59	0.72	0.78	0.93	0.95	1	1
Teach colors	0	0.37	0.79	0.8	0.91	0.95	1	1	1
Teach shapes & sizes	0	0.04	0.19	0.43	0.64	0.75	0.82	0.98	1
Outings	0	0.33	0.58	0.76	0.71	0.85	0.85	0.89	1
Museum visits	0	0.19	0.26	0.27	0.33	0.46	0.63	0.77	1
Children	7	120	112	155	176	211	208	172	134

Table A8
Mean of HOME items by score of the HOME cognitive stimulation Score ($n = 5816$).

	HOME cognitive stimulation score										
Item	0	1	2	3	4	5	6	7	8	9	10
Read stories	0	0.06	0.07	0.09	0.13	0.17	0.28	0.37	0.57	0.75	1
Children's books	0	0.03	0.1	0.15	0.21	0.35	0.49	0.71	0.83	0.95	1
Magazines	0	0.03	0.22	0.25	0.36	0.48	0.51	0.62	0.75	0.86	1
Music device	0	0.06	0.14	0.23	0.27	0.33	0.43	0.56	0.74	0.87	1
Teach numbers	0	0.29	0.36	0.63	0.75	0.8	0.9	0.94	0.98	0.99	1
Teach alphabet	0	0.03	0.22	0.5	0.57	0.73	0.81	0.89	0.95	0.98	1
Teach colors	0	0.14	0.34	0.54	0.75	0.8	0.89	0.95	0.99	1	1
Teach shapes & sizes	0	0	0.05	0.1	0.2	0.41	0.59	0.72	0.85	0.95	1
Outings	0	0.37	0.26	0.32	0.56	0.66	0.72	0.78	0.79	0.9	1
Museum visits	0	0	0.22	0.18	0.2	0.26	0.38	0.46	0.56	0.74	1
Children	12	35	58	111	199	328	489	703	915	1341	1625

Table A9
Test scores regressed on HOME cognitive stimulation score and control variables.

	age 5–6		age 7–8		age 9–10		age 11–12	
	coef.	s.e.	coef.	s.e.	coef.	s.e.	coef.	s.e.
Mathematics								
HOME cognitive stimulation score (ref. cat.=10)								
0–3	−0.55***	(0.09)	−0.43***	(0.10)	−0.51***	(0.14)	−0.45**	(0.15)
4	−0.48***	(0.08)	−0.52***	(0.09)	−0.35***	(0.10)	−0.36**	(0.13)
5	−0.56***	(0.07)	−0.36***	(0.08)	−0.34***	(0.08)	−0.17*	(0.08)
6	−0.34***	(0.07)	−0.28***	(0.07)	−0.29***	(0.07)	−0.19**	(0.07)
7	−0.39***	(0.06)	−0.33***	(0.06)	−0.30***	(0.05)	−0.20**	(0.06)
8	−0.28***	(0.05)	−0.17**	(0.05)	−0.14**	(0.05)	−0.11*	(0.05)
9	−0.17***	(0.05)	−0.11**	(0.04)	−0.08	(0.04)	−0.05	(0.04)
Constant	−54.58**	(18.98)	−51.45**	(16.83)	−68.11***	(16.71)	−54.67**	(16.89)
Children	4836		4701		4544		4267	
Reading Comprehension								
HOME cognitive stimulation score (ref. cat.=10)								
0–3	−0.56***	(0.10)	−0.39***	(0.09)	−0.37**	(0.12)	−0.52**	(0.16)
4	−0.43***	(0.09)	−0.47***	(0.09)	−0.41***	(0.10)	−0.40***	(0.11)
5	−0.35***	(0.07)	−0.31***	(0.08)	−0.36***	(0.08)	−0.41***	(0.08)
6	−0.31***	(0.07)	−0.33***	(0.08)	−0.27***	(0.07)	−0.27***	(0.07)
7	−0.24***	(0.06)	−0.24***	(0.07)	−0.29***	(0.06)	−0.25***	(0.06)
8	−0.14**	(0.05)	−0.11*	(0.06)	−0.12*	(0.05)	−0.16**	(0.05)
9	−0.13**	(0.05)	−0.06	(0.05)	−0.04	(0.04)	−0.11**	(0.04)
Constant	−79.82***	(21.22)	−36.60*	(17.51)	−8.27	(15.94)	−21.12	(16.47)
Children	4605		4565		4511		4242	
Reading Recognition								
HOME cognitive stimulation score (ref. cat.=10)								
0–3	−0.50***	(0.12)	−0.35***	(0.09)	−0.48***	(0.11)	−0.55***	(0.15)
4	−0.44***	(0.09)	−0.41***	(0.09)	−0.38***	(0.11)	−0.36**	(0.11)
5	−0.37***	(0.08)	−0.29***	(0.08)	−0.33***	(0.08)	−0.29***	(0.09)
6	−0.30***	(0.07)	−0.24***	(0.07)	−0.23***	(0.07)	−0.27***	(0.07)
7	−0.24***	(0.06)	−0.21**	(0.06)	−0.25***	(0.06)	−0.24***	(0.06)
8	−0.15**	(0.05)	−0.12*	(0.06)	−0.09	(0.05)	−0.09	(0.05)
9	−0.12**	(0.04)	−0.05	(0.05)	−0.05	(0.04)	−0.06	(0.04)
Constant	−64.77***	(19.37)	−59.93***	(17.94)	−43.92**	(16.05)	−23.72	(15.21)
Children	4757		4685		4553		4272	

Note: Cluster robust standard errors. ***$p < 0.001$, **$p < 0.01$, *$p < 0.5$ (two-tailed tests). Test scores are standardized to have a mean of zero and a standard deviation of 1. All models include controls for female child, whether the child was observed at age 3 or 4, mothers' educational attainment, grandparents' educational attainment, mothers' race-ethnicity, cultural consumption of the mothers' family of origin, mothers' year of birth,

mothers' cognitive skills, child's year of birth, present father, number of children, log average household income, mothers' employment status, mothers' EGP class, wealth, and maternal age.

Table A10
Mean of HOME items by education among mothers with a score of 8 ($n = 942$).

	No high school diploma	High school diploma	Some college	College degree
Read stories	0.56	0.59	0.52	0.74
Children's books	0.81	0.89	0.92	0.96
Magazines	0.65	0.77	0.82	0.89
Music device	0.75	0.75	0.72	0.75
Teach numbers	0.99	0.97	0.99	0.95
Teach alphabet	0.95	0.97	0.95	0.87
Teach colors	1	0.99	0.99	0.97
Teach shapes & sizes	0.82	0.86	0.84	0.82
Outings	0.85	0.78	0.76	0.66
Museum visits	0.63	0.44	0.49	0.41
Children	208	411	214	109

Table A11
Variance function regression of the HOME and alternative cognitive stimulation score with interaction between AFQT and Mother's Birth Cohort.

	HOME				Alternative			
	β	s.e.	λ	s.e.	β	s.e.	λ	s.e.
Maternal Education (ref.=no high school)								
High school	0.658***	(0.087)	−0.084	(0.065)	0.491***	(0.077)	−0.088	(0.063)
Some college	1.018***	(0.094)	−0.301***	(0.077)	0.817***	(0.086)	−0.132	(0.073)
College+	1.232***	(0.102)	−0.573***	(0.115)	1.196***	(0.100)	−0.159	(0.099)
Grandparental Education (ref.=no high school)								
High school	0.267***	(0.070)	0.070	(0.060)	0.211**	(0.065)	0.023	(0.057)
Some college	0.382***	(0.085)	−0.212*	(0.091)	0.395***	(0.088)	−0.042	(0.091)
College+	0.373***	(0.087)	−0.155	(0.140)	0.490***	(0.088)	−0.085	(0.097)
Race-ethnicity of mother (ref.=other)								
Black	−0.635***	(0.081)	0.353***	(0.077)	−0.679***	(0.075)	0.240***	(0.067)
Hispanic	−0.391***	(0.078)	0.300***	(0.068)	−0.423***	(0.075)	0.177**	(0.069)
Mother's year of birth (ref.=1957–1961)								
1962–1964	0.036	(0.110)	−0.068	(0.096)	0.020	(0.100)	0.039	(0.079)
AFQT	0.009***	(0.001)	−0.010***	(0.002)	0.009***	(0.001)	−0.007***	(0.002)
AFQT x 1962–1964	**−0.002**	**(0.002)**	**0.004**	**(0.003)**	**−0.001**	**(0.002)**	**0.001**	**(0.002)**
Constant	6.385***	(0.117)	1.573***	(0.092)	5.025***	(0.105)	1.216***	(0.085)
Number of children	5816		5816		5816		5816	
R^2	0.297				0.316			

Note: Cluster robust standard errors. ***$p < 0.001$, **$p < 0.01$, *$p < 0.5$ (two-tailed tests).

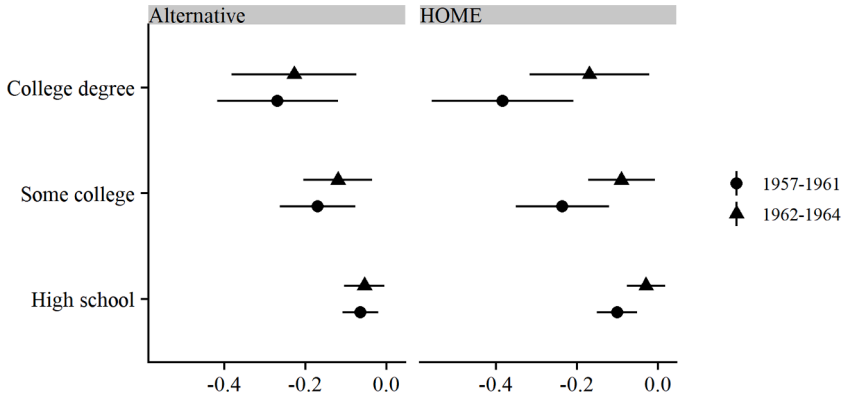

Fig. A3. The reduction in lambda coefficients for mother's education by mother's birth cohort when including AFQT
Note: The cohort born in 1957–1961 was 19–23 when they took the AFQT and could potentially have been enrolled in college. The younger cohort was 16–18 at the time of test taking and most likely were not enrolled in college. As the confidence intervals are overlapping the explanatory role of AFQT is the same for younger and older cohorts of mothers. HOME stands for the HOME cognitive stimulation score and Alternative stands for the alternative scoring of the items in the HOME cognitive stimulation score (for details see the data section).

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