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Abstract

Parents with limited income spend less time than their advantaged counterparts engaging in educational activities with their children. A common explanation is that financial scarcity creates a “bandwidth tax” on cognition. The scarcity framework highlights two components: attentional capacity (the ability to focus amid competing demands) and executive control (the ability to resist temptation and act in line with long-term goals). No study has tested which is the primary constraint on parental investment or separated subjective financial stress from income itself. We address both gaps through the Early Investment Project, a survey of 1,932 mothers of kindergartners in Chicago Public Schools that simultaneously measures felt scarcity, household income, attentional capacity, and present bias. Our outcome captures parent-reported obstacles to fulfilling intentions to read with their child. Two main findings emerge. First, attentional capacity — not self-control — is the primary constraint: the Attention Index is associated with all four parent-side barriers at the 1% level across all models, including those with strict controls for depression, agency, and growth mindset, while present bias is essentially uncorrelated with the outcomes. Second, felt scarcity, not household income, is associated with attentional deficits: the scarcity coefficient on the Attention Index persists when income is controlled, whereas income shows no independent association with attention. Placebo tests confirm specificity. These results indicate that attention, not self-control, is the mechanism through which financial insecurity is linked to reduced parental investment, and that perceived insufficiency, rather than income, is its primary correlate.

Keywords: scarcity, attention, self-control, parental investment, poverty

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Introduction

College-educated mothers spend roughly 300 more hours per year on direct engagement with young children than non-college-educated mothers (Kalil et al., 2025; Flood et al., 2022), and this gap has widened over recent decades. Yum (2023) estimates that eliminating heterogeneity in parental time investment would reduce intergenerational income persistence by 7–8 percentage points. Most explanations emphasize what parents have (income, time, information) or what they believe (expectations, growth mindset). A third class of explanation emphasizes cognitive constraints: perhaps disadvantaged parents invest less not because they choose to, but because scarcity impairs the cognitive capacities that sustained investment requires.

Mullainathan and Shafir (2013) proposed that scarcity of any kind captures the mind, creating a “bandwidth tax” on executive function. Their book explicitly defines bandwidth as comprising two components (Mullainathan & Shafir, 2013, pp. 47–49): cognitive capacity (the ability to solve problems, retain information, and focus) and executive control (the ability to plan, initiate and inhibit actions, and control impulses—with self-control identified as its largest component). Schilbach, Schofield, and Mullainathan (2016) formalized the same taxonomy. Shah, Mullainathan, and Shafir (2012) provided the first experimental evidence, primarily for the cognitive capacity channel: in laboratory games with randomly assigned budgets, the “poor” were more engaged in the current round but neglected future rounds, suggesting attentional redirection rather than general impairment. Mani et al. (2013) extended this to real-world poverty: Indian sugarcane farmers performed worse on cognitive tasks before harvest (when poor) than after (when flush), an effect equivalent to ~13 IQ points that stress biomarkers could not explain. However, both outcome measures tap executive function broadly; they cannot distinguish which bandwidth component scarcity primarily taxes.

Kalil, Mayer, and Shah (2023) extended the scarcity–inattention link to parenting: among 345 low-income Chicago parents, financial scarcity and social scarcity each independently correlated with inattention to information from children’s preschools ($r = 0.003$ between the two forms), providing early evidence that different scarcity channels operate independently.

The scarcity hypothesis intersects with a broader development: the modeling of attention as a scarce economic resource (Loewenstein & Wojtowicz, 2025; Sims, 2003, 2006; Simon, 1971). Loewenstein and Wojtowicz (2025) distinguish between top-down attention (deliberate allocation)

and bottom-up attention (involuntary capture by environmental or emotional states). Financial scarcity operates through the bottom-up channel. Loewenstein and Wojtowicz also caution against aggregating diverse mental processes into a single category, a concern directly relevant to the interpretation of our results.

Two questions remain unresolved. First, which of Mullainathan and Shafir's two bandwidth components—cognitive capacity (attention) or executive control (self-control)—is the binding constraint for parental investment? Second, is the cognitive cost of scarcity driven by material deprivation or by the subjective psychology of not having enough? De Bruijn and Antonides (2021) call using income as a proxy for scarcity a “remarkable mismatch” with the theory.

We address these questions using the Early Investment Project (EIP), a survey of 1,932 mothers with kindergartners in Chicago Public Schools. The analytic sample varies slightly across outcomes (ranging from 1,894 to 1,931) because dependent variables are not imputed; independent variables are imputed at sample means to maintain a constant sample across nested specifications within each outcome. Our outcome is theoretically aligned with the scarcity framework: rather than measuring investment levels (how many minutes parents read), we measure parent-reported barriers to reading with the child. The survey asks: “Sometimes, even if parents want to, things get in the way of their reading to their child. In the last week, how often did the following things get in the way of your reading to [child]?” The item stem frames the question as about obstacles to intended behavior: parents report what prevented them from doing what they wanted. We analyze four parent-side barrier items (“I was too tired,” “I was too busy,” “I wanted to do something else,” and “I could not find a quiet place”) and use community/structural barriers as placebo tests. Two findings: (i) attention—not self-control—is the dominant cognitive correlate of all four parent-side barriers, significant at the 1% level throughout and surviving stringent controls for depression, agency, and growth mindset, while present bias is essentially null; (ii) felt scarcity, not income, is associated with attentional deficits.

Theoretical Framework

Mullainathan and Shafir's (2013) framework defines bandwidth as comprising two components—cognitive capacity and executive control—that scarcity taxes. Parental investment is an ideal domain for adjudication because both are theoretically relevant: parents need cognitive

capacity (attention) to engage in learning activities amid financial concerns, and they need executive control (self-control) to choose effortful engagement when the payoff is years away. We organize predictions around three channels.

Channel 1: Attentional capture. Scarcity redirects attention toward the scarce domain and away from other domains (Shah et al., 2012). A parent preoccupied with paying the rent has their attention captured by financial problems, leaving less time for reading with their child. Financial scarcity should degrade attentional capacity and increase parent-reported barriers to engagement. Critically, it is felt scarcity, not income per se, that should drive this effect, because the capture mechanism is psychological (Loewenstein & Wojtowicz, 2025).

Channel 2: Self-control depletion. Tighter budgets create harder optimization problems that deplete self-regulatory resources (Mullainathan & Shafir, 2013; Shiv & Fedorikhin, 1999). Financial scarcity should increase present bias. However, the barrier items establish that parents wanted to read—the item stem presupposes intended behavior. The question is what prevented follow-through: attentional capture (Channel 1) or failure of self-control (Channel 2). A null on present bias would indicate the barrier is cognitive, not volitional.

A critical distinction runs through both channels: the Mullainathan-Shafir framework concerns the psychology of scarcity—the felt experience of not having enough, not material conditions per se. Low income correlates with chronic stress, nutritional deficits, and inferior healthcare, any of which could independently impair cognition. If scarcity drives the effects conditional on income, the mechanism is the one the theory specifies. The EIP's simultaneous measurement of both allows us to decompose the income–cognition gradient into its material and psychological components.

Materials and Methods

All procedures were approved by the University of Chicago Social and Behavioral Sciences Institutional Review Board (IRB 19-1642). Participation was voluntary and all participants provided informed consent prior to beginning the survey. Participants were informed that their answers would be kept confidential, that identifiable data would not be shared outside the research team, and that they could withdraw at any time without penalty. All names and identifying information were removed from data files prior to analysis.

Data. Data come from the Early Investment Project (EIP), a survey study designed to identify the mechanisms underlying differences in parental investment in young children's school readiness (Kalil et al., 2025). Unlike standard time-use surveys, the EIP simultaneously captures parents' cognitive states, subjective financial experience, and self-reported barriers to engagement — the constructs central to the scarcity framework. The study population consists of families with a kindergartener enrolled in Chicago Public Schools (CPS), one of the largest urban school districts in the United States, serving a socioeconomically diverse student body (over 80 percent Black and Latino, 64 percent classified as economically disadvantaged).

The EIP employed stratified random sampling across all deciles of the child test-score distribution: schools were ranked by average third-grade math score, divided into ten equal strata, and sampled sequentially until approximately 100 completions per stratum were obtained. The survey was administered in both English and Spanish between October 2021 and June 2022 using a hybrid online-and-telephone method, yielding 1,932 valid responses at a response rate of 38 percent. This rate compares favorably to the 39.4 percent achieved by the 2021 American Time Use Survey (Bureau of Labor Statistics, 2025), a federally administered survey with substantially greater infrastructure resources; another benchmark is the ECLS-K:2011, whose base-year parent interview response rate was 50 percent, reflecting a 63 percent school participation rate and an 80 percent parent completion rate (Tourangeau et al., 2015).

Respondents are predominantly mothers (94% female), with an average age of 35 years (SD = 6.6). The sample is racially and ethnically diverse: 47% Hispanic, 29% non-Hispanic Black, and 17% non-Hispanic White. Educational attainment spans the full distribution — 15% with less than a high school degree, 27% with a high school diploma, 27% with some college or an associate's degree, and 31% with a bachelor's degree or higher. Mean household income is 41 thousand dollars per year (SD = 34.7), 62% report employment, and 37% are single parents. (Table 1).

Table 1. Descriptive Statistics

	N	Mean	SD
Age	1914	35.02	6.61
Sex (Female = 1)	1924	0.94	0.25
<u>Education</u>			
<i>Less than HS</i>	1932	0.15	0.36
<i>High School</i>	1932	0.27	0.44

<i>Some college or Associate's</i>	1932	0.27	0.45
<i>BA or higher</i>	1932	0.31	0.46
<u>Race</u>			
<i>Non-Hispanic White</i>	1853	0.17	0.38
<i>Non-Hispanic Black</i>	1853	0.29	0.45
<i>Hispanic</i>	1916	0.47	0.5
Employed	1890	0.62	0.49
Household income (000s)	1898	40.91	34.68
Single parent	1903	0.37	0.48

Outcome variables. The survey asked: “Sometimes, even if parents want to, things get in the way of doing learning activities with their child. In the last week, how often did the following things get in the way?” Parents responded on a four-point frequency scale (everyday, 3 or more days, 1 or 2 days, never). We analyze four parent-side barriers — being too tired, being too busy, wanting to do something else, and not finding a quiet place — each coded as a binary indicator equal to one if the parent reported the barrier on at least one day.

Placebo outcomes. Four items that fall outside parents' immediate cognitive reach serve as placebo tests. The survey asked parents to rate their agreement with statements about the child's school quality, neighborhood safety, and internet access on a 1–5 scale; each is coded as a binary indicator equal to one if the parent agreed or strongly agreed. A fourth item records whether the child receives special-education services, already measured as a binary variable. Under the scarcity-bandwidth hypothesis, none of these conditions should be systematically associated with attentional capacity.

Attentional capacity. The Attention Index is built from three self-report items asking how often each statement applied to the respondent on a four-point scale (not at all = 1 to almost always = 4): “It is easy for me to concentrate on what I am doing,” “I am easily distracted” (reverse-coded), and “I am able to pay close attention to one thing for a long period of time.” The index is the unweighted mean of the three items after recoding, so that higher values reflect greater attentional capacity, and is standardized for analysis (Cronbach’s $\alpha = 0.67$).

Present bias. Present bias is elicited from four incentivized binary choices between a smaller-sooner and a larger-later payment. Two questions frame the trade-off as today versus 1 month from now (\$72 vs. \$89; \$81 vs. \$89), and two frame the same amounts as 12 versus 13 months from now. Respondents were informed that one answer would be randomly selected with 10% probability and paid. A respondent is coded as present-biased if they chose the immediate

option in at least one near-horizon question but the delayed option in the corresponding far-horizon question.

Other psychological measures. Three additional indices are included in the progressive specifications to assess whether attentional effects persist after adjustment for broader psychological disadvantage. The Agency Index is the mean of three items scored 1–5, asking whether the respondent feels there is no way to solve her problems (reverse-coded), has little control over what happens to her (reverse-coded), and can do anything she sets her mind to; higher values reflect greater sense of personal control, standardized (Cronbach’s $\alpha = 0.56$). The Growth Mindset Index is the mean of three items, each scored 1–6 and reverse-coded so that higher values reflect a more growth-oriented belief, standardized ($\alpha = 0.86$). The Depression Index is the PHQ-2, the sum of two items scored 0–3, asking how often in the past two weeks the respondent had little interest in doing things and felt down or hopeless; scores range from 0 to 6.

Financial scarcity and income. Felt scarcity is measured by a single item asking which of three descriptions best fits the respondent’s financial situation at the end of the month: having some money left over, just enough to make ends meet, or not enough to make ends meet. The variable is dichotomized (1 = not enough).

Empirical Strategy. All models are estimated by ordinary least squares (OLS) with standard errors clustered at the school level.

Analysis 1: Cognitive predictors of barriers to parental investment. For each barrier we estimate

$$Barriers_i = \beta_0 + \beta_1 Cognitive_i + X_i' \theta + \varepsilon_i \quad \dots (1)$$

for each cognitive predictor jointly, across four specifications. Model 1 includes only the two core cognitive predictors — attentional capacity and present bias. Model 2 adds the remaining psychological dimensions: agency, growth mindset, and depression. Model 3 further introduces felt scarcity and continuous household income (measured in thousands of dollars). Model 4 adds the full set of demographic controls. The progressive nesting examines whether the association between attentional capacity and parental barriers remains stable as psychological and economic controls accumulate — stability suggests that the relationship is not driven by broader

psychological distress or economic hardship. Each equation is estimated separately for parent-side barriers (primary outcomes) and placebo tests.

Analysis 2: Decomposing the income–cognition gradient. For each cognitive index, we estimate:

$$Cognitive_i = \beta_0 + \beta_1 Scarcity_i + \beta_2 Income_i + \beta_3 (Scarcity_i \times Income_i) + X_i' \theta + \varepsilon_i \quad \dots (2)$$

across four specifications: felt scarcity alone, continuous household income alone, both simultaneously, and their interaction, followed by a full-controls version. Comparing $\widehat{\beta}_1$ across specifications reveals whether subjective insufficiency is associated with cognitive outcomes independently of material income. The interaction term tests whether the cognitive cost of felt scarcity varies across the income distribution.

Results

Analysis 1: Cognitive predictors of barriers to parental investment. Table 2 reports the results for all four parent-side barriers. The Attention Index emerges as a robust negative correlate of every parent-side barrier, significant at the 1% level for all four items. Attention coefficients range from -0.06 (“could not find a quiet place”) to -0.10 (“too tired”). A one-standard-deviation improvement in self-reported attentional capacity is associated with a reduction on the probability of each barrier: not finding a quiet place (-0.06 , $p < 0.01$), wanting to do something else (-0.07 , $p < 0.01$), being too busy (-0.08 , $p < 0.01$), and being too tired (-0.10 , $p < 0.01$). Benchmarked against sample prevalence rates, these coefficients represent relative reductions of 14–17 percent per standard deviation of attentional capacity. These results are robust to additional cognitive dimensions and covariates.

The remaining psychological dimensions display a revealing asymmetry. Depression (PHQ-2) is positively and significantly associated with all four barriers ($\beta = 0.04$ – 0.09 , $p < 0.01$), yet both constructs appear simultaneously in the specification without displacing one another—indicating that attentional capacity and depressive symptoms capture distinct facets of the cognitive burden associated with barriers. Agency is associated with lower barrier reports for no quiet place and wanting something else (both -0.04 , $p < 0.01$) but is null for time-based barriers, consistent with agency operating through planning and organizational channels rather than executive depletion. Growth mindset follows a similar pattern: significant for environment-related

barriers (-0.03 , $p < 0.05$) but null for fatigue-related ones. Present bias does not correlate with any parent-side barriers. Coefficients are indistinguishable from zero. The pattern adjudicates between the two bandwidth components: the barrier to parental investment is cognitive overload, not failure of self-control. Parents who wanted to read with their child were prevented by depleted attentional capacity, not by present-biased discounting.

Experienced financial scarcity is significant only for being too tired (0.08 , $p < 0.01$) and marginally for no quiet place (0.05 , $p < 0.10$), suggesting that the attentional dimension of the scarcity experience—rather than reported financial strain per se—is the primary correlate of reduced parental engagement. That these economic controls appear in the same specification as attention, yet attention retains its full magnitude, rules out the possibility that the Attention Index merely proxies for economic disadvantage. Full progressive results (Models 1–4) are reported in Supplementary Tables S1–S4.

Table 2. Cognitive Bandwidth and Parental Engagement Barriers

	No Quiet Place	Something Else	Too Busy	Too Tired
<i>Self-reported Bandwidth</i>				
Attention Index (z)	-0.06*** (0.01)	-0.07*** (0.01)	-0.08*** (0.01)	-0.10*** (0.01)
Present bias (binary)	-0.00 (0.02)	-0.01 (0.02)	-0.01 (0.02)	0.02 (0.02)
<i>Psychological Controls</i>				
Agency (z)	-0.04*** (0.01)	-0.04*** (0.01)	-0.02 (0.01)	-0.02* (0.01)
Growth mindset (z)	-0.03** (0.01)	-0.03** (0.01)	0.00 (0.01)	0.01 (0.01)
Depression (z)	0.04*** (0.01)	0.07*** (0.01)	0.07*** (0.01)	0.09*** (0.01)
<i>Economic Controls</i>				
Financial scarcity	0.05* (0.03)	-0.00 (0.03)	0.05 (0.03)	0.08*** (0.03)
Household income (000s)	-0.00 (0.00)	0.00** (0.00)	0.00*** (0.00)	0.00* (0.00)
<i>Demographic controls</i>				
Dep. Var. Mean	Yes 0.366	Yes 0.458	Yes 0.567	Yes 0.578
R ²	0.08	0.13	0.16	0.16
N	1,918	1,912	1,915	1,921

Note: OLS coefficients from the primary specification. Standard errors clustered at the school level in parentheses. All available observations for each dependent variable are used. Results are robust to using only complete cases (no imputation). We present mean-imputed estimates to maintain a constant analytical sample across progressive model specifications. The model includes controls (sex, age, race/ethnicity, education, employment, single-parent status). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The placebo test analysis is largely clean (Table 3). If attentional capacity simply proxied for general negativity or a response-style artifact, it should also be associated with structural outcomes outside the parent’s cognitive control: perceptions of school quality, neighborhood safety, internet access, and whether the child receives special education. For school quality, the Attention Index is effectively zero (0.01, n.s.); for internet quality and special education, coefficients are similarly null. Neighborhood safety shows a marginal association (0.02, $p < 0.10$), but this coefficient is unstable across progressive specifications — it fluctuates between zero and marginal significance across specifications, never reaching conventional levels consistently (Table S5) — suggesting it does not reflect a robust relationship. The contrast in magnitudes reinforces the specificity of the main findings: 0.00–0.02 on placebos versus 0.06–0.10 on parent-side barriers, with the latter exhibiting a monotonic depletion gradient entirely absent among the structural outcomes. Depression mirrors this pattern: it is strongly and consistently associated with the engagement barriers but shows no coherent association with the placebos. We interpret these results as confirming that attentional capacity is a significant correlate of parental engagement barriers specifically, not general negativity about one's circumstances.

Table 3. Cognitive Bandwidth and Structural and Community Barriers

	School Not Good Enough	Neighborhood Not Safe	No Good Internet	Child in SPED
<i>Self-reported Bandwidth</i>				
Attention Index (z)	0.01 (0.01)	0.02* (0.01)	0.01 (0.01)	-0.00 (0.01)
Present bias (binary)	0.00 (0.02)	-0.02 (0.02)	-0.02 (0.02)	-0.01 (0.02)
<i>Psychological Controls</i>				
Agency (z)	-0.01 (0.01)	-0.02 (0.01)	-0.01 (0.01)	-0.03*** (0.01)
Growth mindset (z)	-0.01 (0.01)	-0.01 (0.01)	-0.05*** (0.01)	0.00 (0.01)
Depression (z)	0.02** (0.01)	0.03** (0.01)	0.02* (0.01)	-0.00 (0.01)
<i>Economic Controls</i>				
Financial scarcity	0.05** (0.02)	0.08** (0.03)	0.08** (0.03)	0.02 (0.03)
Household income (000s)	0.00 (0.00)	-0.00*** (0.00)	-0.00*** (0.00)	-0.00** (0.00)
<i>Demographic controls</i>				
Dep. Var. Mean	Yes 0.114	Yes 0.265	Yes 0.253	Yes 0.122
R ²	0.02	0.06	0.11	0.03
N	1,926	1,918	1,915	1,931

Note: OLS coefficients from the primary specification. Standard errors clustered at the school level in parentheses. All available observations for each dependent variable are used. Results are robust to using only complete cases (no imputation). We present mean-imputed estimates to maintain a constant analytical sample across progressive model specifications. The model includes controls (sex, age, race/ethnicity, education, employment, single-parent status). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Analysis 2: Decomposing the income–cognition gradient. Table 4 asks whether the two measures of financial disadvantage—felt scarcity and household income—tax distinct cognitive mechanisms. In Panel A, financial scarcity is consistently associated with lower attentional capacity across all specifications ($\beta = -0.20$ to -0.30 , $p < 0.01$). This association is robust to the inclusion of household income, the interaction between both measures, and full demographic controls. In the most demanding specification, scarcity remains large and significant ($\beta = -0.30$, $p < 0.01$) while household income is no longer significant, and the interaction is null. This is consistent with the core prediction of the scarcity framework: it is the subjective experience of insufficiency, not the objective level of resources, that is associated with reduced bandwidth.

Table 4. Income–Cognition Gradient

	Scarcity Only	Income Only	Both	+Interaction	Full Model
Panel A: Attention Index (z-score)					
Financial scarcity	-0.20*** (0.06)		-0.26*** (0.06)	-0.31*** (0.09)	-0.30*** (0.10)
Household income (000s)		-0.00* (0.00)	-0.00*** (0.00)	-0.00*** (0.00)	-0.00 (0.00)
Scarcity \times Income				0.00 (0.00)	0.00 (0.00)
Demographic controls	No	No	No	No	Yes
R ²	0.01	0.00	0.01	0.01	0.04
N	1,894	1,894	1,894	1,894	1,894
Panel B: Present Bias (binary)					
Financial scarcity	0.07* (0.03)		0.01 (0.03)	-0.05 (0.04)	-0.03 (0.04)
Household income (000s)		-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)	-0.00** (0.00)
Scarcity \times Income				0.00* (0.00)	0.00 (0.00)
Demographic controls	No	No	No	No	Yes
R ²	0.00	0.03	0.03	0.03	0.06
N	1,881	1,881	1,881	1,881	1,881

Note: OLS coefficients; standard errors clustered at the school level in parentheses. All available observations are used for each dependent variable. Results are robust to using only complete cases (no imputation). We present mean-imputed estimates to maintain a constant analytical sample across progressive model specifications. Financial scarcity is binary (1 = not enough to make ends meet). Household income is measured in thousands of dollars. The interaction term tests whether the cognitive cost of felt scarcity varies across the income distribution. Full Model includes demographic controls (sex, age, race/ethnicity, education, employment, single-parent status). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The pattern for present bias (Panel B) reverses this asymmetry. Scarcity shows a marginal bivariate association (0.07, $p < 0.10$) that vanishes once income is included, while income itself is a robust negative correlate across all specifications ($p < 0.05$ or better). These contrasts point to two separable pathways through which financial disadvantage relates to parental cognition. The psychology of insufficiency—the felt experience of not having enough—is associated with reduced attentional capacity net of demographics and income, consistent with the attentional-capture mechanism in Mullainathan and Shafir (2013). Income level, by contrast, is associated with present bias through a complementary but distinct channel, consistent with evidence that lower permanent income is linked to higher discount rates and less patient intertemporal choice (Lawrance, 1991; Tanaka et al., 2010), though we note that transitory liquidity constraints may also contribute to this gradient (Carvalho et al., 2016).

Discussion

Mullainathan and Shafir (2013) defined bandwidth as comprising cognitive capacity and executive control and proposed that scarcity taxes both. Schilbach et al. (2016) called for evidence showing “the whole chain from factors impacting bandwidth to changes in real-world choices with serious consequences.” Our results provide that chain. The chain runs through cognitive capacity (attention), not executive control: present bias is essentially null across all barriers and specifications, while the Attention Index is significant throughout. And it is felt scarcity, not household income, that is associated with attentional deficits: scarcity survives income controls, while income loses its gradient on attention once demographic controls are included.

The barrier items establish that the parenting bottleneck is attentional, not volitional. Parents who report lower attentional capacity are more likely to say they were “too tired” and “too busy”—the language of cognitive overload—but are not more present-biased. The item stem presupposes intended behavior: “even if parents want to, things get in the way.” The question is what prevents follow-through on an existing intention. Attention is the answer; discounting is not. This aligns with Shah et al.’s (2012) finding that scarcity creates attentional redirection rather than preference distortion and extends it from laboratory games to reading with one’s child.

The attention finding is not an artifact of shared variance with broader psychological disadvantage. When agency, growth mindset, and depression are added simultaneously in Model 4, the Attention Index attenuates modestly but remains significant at the 1% level; agency and

growth mindset each have modest associations with some barriers but do not displace attention as the dominant correlate. This additive pattern is important: it means that the cognitive demands of financial precarity are not simply a reflection of the general psychological burden of perceived insufficient income, but a distinct mechanism that operates above and beyond reduced agency and pessimism about the future. Decomposing the Attention Index into its three constituent items confirms that this finding is not driven by any single survey question: all three items—ease of concentration, sustained focus, and resistance to distraction—are each independently associated with the barriers, and a confirmatory factor analysis supports a single underlying construct (Table S9).

The income–cognition gradient analysis provides the clearest test of the theory’s central claim: it is the psychology of insufficiency, not income per se, that is associated with reduced attention. The scarcity coefficient on the Attention Index persists when income is controlled, while income loses its association with attention once demographic controls are included. The mirror image holds for self-control: income is a negative and significant correlate of present bias even after controlling for scarcity, while scarcity itself is indistinguishable from zero once income is included. Felt scarcity and household income thus identify distinct cognitive mechanisms. This dissociation is robust to alternative operationalizations of felt scarcity: using the full three-category ordinal variable or a broader binary coding produces the same pattern (Table S10). This finding matters for policy, since reducing the subjective experience of insufficiency and raising household income are different interventions likely to operate through different pathways.

These results have direct implications for the design of interventions. Prior research has demonstrated that text-message prompts (Mayer et al., 2019; York et al., 2019) effectively boost parental engagement in early learning activities, and our findings clarify why: such prompts deliver a timely reminder that captures attention in the moment, bypassing the attentional bottleneck rather than requiring parents to overcome it through willpower. Since the main constraint is attention rather than self-control, commitment devices targeting present bias are unlikely to be as effective. More generally, interventions that lessen cognitive demands in the parenting context, including structured reminders, simplified decision environments, and reduced complexity in how parents engage with educational activities, are better aligned with the mechanism revealed by the data than interventions that try to motivate parents who already want to invest more in their children.

Robustness and Sensitivity

We subject the main findings to five sets of robustness checks. First, the main analysis dichotomizes barrier outcomes at the “at least one day” threshold, which may obscure meaningful variation in barrier frequency. Ordered logit models that preserve the original four-point scale (never, 1–2 days, 3+ days, every day) yield the same pattern: the Attention Index is negative and significant at the 1% level for all four barriers across all specifications, indicating that higher attentional capacity is associated with lower barrier frequency throughout the distribution, not only at the extensive margin. A likelihood-ratio test rejects the proportional-odds assumption for three of the four barriers, supporting the use of linear models in the main analysis (Table S6).

Second, the null result on present bias could reflect measurement limitations of the single binary indicator used in the main specification. We test this concern using two alternative operationalizations: a continuous patience index (the count of patient choices across four incentivized intertemporal questions, range 0–4) and a near-horizon indicator derived only from today-versus-one-month choices. The null persists under both alternatives, reinforcing the conclusion that the bandwidth tax on parental investment operates through the attentional channel rather than temporal discounting (Table S7).

Third, if the scarcity framework is correct, the attention–barrier association might be concentrated among financially constrained households. We test this by stratifying the sample into income terciles and re-estimating the full model within each stratum. The Attention Index is significant in all three terciles, and a formal interaction test cannot reject equality of the coefficients across groups (all $p > 0.10$), indicating that the relationship between attention and parental barriers operates across the income distribution rather than being confined to the poorest households (Table S8).

Fourth, the composite Attention Index averages three self-reported items, and the main result could in principle be driven by a single question. Replacing the index with its three constituent items—ease of concentration, sustained focus, and resistance to distraction—entered simultaneously shows that all three are independently associated with the barriers. A confirmatory factor analysis confirms that the items load onto a single latent construct, supporting the use of the composite measure (Table S9).

Fifth, the income–cognition gradient (Analysis 2) relies on a binary felt scarcity measure (not enough to make ends meet). We replicate the analysis using the full three-category ordinal variable (some left over, just enough, not enough) and a broader binary coding that groups “not enough” and “just enough” against “some left over.” The scarcity–attention association and the income–present bias association emerge under both alternatives, confirming that the decomposition is not an artifact of the specific scarcity threshold (Table S10).

Limitations

We note that the cross-sectional design cannot establish causality; Mani et al.’s (2013) harvest design provides an exogenous test. The self-reported Attention Index may reflect depression, personality, or other psychological traits rather than attentional capacity per se; however, the attention finding survives the addition of simultaneous controls for depression, agency, and growth mindset in Model 4, which mitigates this concern. The present bias measure captures a stable preference parameter rather than momentary depletion; the null does not rule out that scarcity impairs momentary self-regulation. Parent-reported barriers are self-reported with a one-week reference period. Data come from a single city (Chicago), collected during COVID-19 (2021–22) with a 38% response rate; the pandemic may have elevated barriers, but the within-period design ensures that all respondents faced the same environment.

Conclusions

This paper provides a direct test of which bandwidth component constitutes the binding constraint on parental investment, and the answer is cognitive capacity (attention), not executive control (self-control). A one-standard-deviation improvement in self-reported attentional capacity reduces the probability of reporting each barrier by 6 to 10 percentage points, and this result holds even under stringent simultaneous controls for depression, agency, and growth mindset. The driver is felt scarcity rather than household income: the scarcity coefficient on attention persists when income is controlled and holds with full demographic controls, while income loses its association with attention entirely. The psychology of insufficiency extends beyond attention—felt scarcity also shows robust associations with depressive symptoms and perceived agency, net of demographic characteristics, while income operates as the dominant correlate of self-control and growth mindset—a dissociation that points to two distinct pathways through which poverty shapes parental cognition. When parents report being “too tired” or “too busy” to read with their child despite wanting to, they are describing the bandwidth tax in the language of everyday life. The

attentional demands of financial precarity, more than its effects on time preferences or self-control, may be a key mechanism by which disadvantage is transmitted across generations.

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Supporting Information

Table S1. Bandwidth and Parent-Side Barriers: "I Could Not Find a Quiet Place"

	(1)	(2)	(3)	(4)
<i>Self-reported Bandwidth</i>				
Attention Index (z-score)	-0.09*** (0.01)	-0.06*** (0.01)	-0.06*** (0.01)	-0.06*** (0.01)
Present bias index (Binary)	0.01 (0.02)	0.00 (0.02)	-0.00 (0.02)	-0.00 (0.02)
<i>Additional Cognitive Dimensions</i>				
Agency Index (z-score)		-0.04*** (0.01)	-0.04*** (0.01)	-0.04*** (0.01)
Growth Mindset Index (z-score)		-0.03** (0.01)	-0.03** (0.01)	-0.03** (0.01)
Depression Scale - PHQ-2 (z-score)		0.05*** (0.01)	0.04*** (0.01)	0.04*** (0.01)
<i>Scarcity and Income</i>				
Financial scarcity			0.04 (0.03)	0.05* (0.03)
HH income (thousand \$)			-0.00 (0.00)	-0.00 (0.00)
Constant	0.36*** (0.02)	0.36*** (0.02)	0.38*** (0.02)	0.40*** (0.09)
Covariates	No	No	No	Yes
R ²	0.03	0.06	0.06	0.08
N	1918	1918	1918	1918

*Standard errors clustered at the school level in parentheses. 'Covariates' includes sex, age, race/ethnicity, education, employment, and single parent status. Missing values in independent variables imputed at sample means. * p<0.10, ** p<0.05, *** p<0.01.*

Table S2. Bandwidth and Parent-Side Barriers: "I Wanted to Do Something Else"

	(1)	(2)	(3)	(4)
<i>Self-reported Bandwidth</i>				
Attention Index (z-score)	-0.12*** (0.01)	-0.09*** (0.01)	-0.08*** (0.01)	-0.07*** (0.01)
Present bias index (Binary)	-0.06** (0.02)	-0.06*** (0.02)	-0.03 (0.02)	-0.01 (0.02)
<i>Additional Cognitive Dimensions</i>				
Agency Index (z-score)		-0.05*** (0.01)	-0.05*** (0.01)	-0.04*** (0.01)
Growth Mindset Index (z-score)		-0.02 (0.01)	-0.03** (0.01)	-0.03** (0.01)
Depression Scale - PHQ-2 (z-score)		0.05*** (0.01)	0.06*** (0.01)	0.07*** (0.01)
<i>Scarcity and Income</i>				
Financial scarcity			-0.02 (0.03)	-0.00 (0.03)
HH income (thousand \$)			0.00*** (0.00)	0.00** (0.00)
Constant	0.48*** (0.02)	0.48*** (0.02)	0.37*** (0.02)	0.34*** (0.10)
Covariates	No	No	No	Yes
R ²	0.06	0.08	0.11	0.13
N	1912	1912	1912	1912

*Standard errors clustered at the school level in parentheses. 'Covariates' includes sex, age, race/ethnicity, education, employment, and single parent status. Missing values in independent variables imputed at sample means. * p<0.10, ** p<0.05, *** p<0.01.*

Table S3. Bandwidth and Parent-Side Barriers: "I Was Too Busy"

	(1)	(2)	(3)	(4)
<i>Self-reported Bandwidth</i>				
Attention Index (z-score)	-0.12*** (0.01)	-0.10*** (0.01)	-0.09*** (0.01)	-0.08*** (0.01)
Present bias index (Binary)	-0.06*** (0.02)	-0.07*** (0.02)	-0.03 (0.02)	-0.01 (0.02)
<i>Additional Cognitive Dimensions</i>				
Agency Index (z-score)		-0.03** (0.01)	-0.03** (0.01)	-0.02 (0.01)
Growth Mindset Index (z-score)		0.02 (0.01)	0.00 (0.01)	0.00 (0.01)
Depression Scale - PHQ-2 (z-score)		0.05*** (0.01)	0.06*** (0.01)	0.07*** (0.01)
<i>Scarcity and Income</i>				
Financial scarcity			0.02 (0.03)	0.05 (0.03)
HH income (thousand \$)			0.00*** (0.00)	0.00*** (0.00)
Constant	0.58*** (0.02)	0.59*** (0.02)	0.43*** (0.02)	0.40*** (0.10)
Covariates	No	No	No	Yes
R ²	0.06	0.08	0.13	0.16
N	1915	1915	1915	1915

*Standard errors clustered at the school level in parentheses. 'Covariates' includes sex, age, race/ethnicity, education, employment, and single parent status. Missing values in independent variables imputed at sample means. * p<0.10, ** p<0.05, *** p<0.01.*

Table S4. Bandwidth and Parent-Side Barriers: "I Was Too Tired"

	(1)	(2)	(3)	(4)
<i>Self-reported Bandwidth</i>				
Attention Index (z-score)	-0.14*** (0.01)	-0.11*** (0.01)	-0.10*** (0.01)	-0.10*** (0.01)
Present bias index (Binary)	0.00 (0.02)	-0.01 (0.02)	0.01 (0.02)	0.02 (0.02)
<i>Additional Cognitive Dimensions</i>				
Agency Index (z-score)		-0.03** (0.01)	-0.03** (0.01)	-0.02* (0.01)
Growth Mindset Index (z-score)		0.03** (0.01)	0.02 (0.01)	0.01 (0.01)
Depression Scale - PHQ-2 (z-score)		0.09*** (0.01)	0.09*** (0.01)	0.09*** (0.01)
<i>Scarcity and Income</i>				
Financial scarcity			0.05* (0.03)	0.08*** (0.03)
HH income (thousand \$)			0.00*** (0.00)	0.00* (0.00)
Constant	0.58*** (0.01)	0.58*** (0.01)	0.46*** (0.02)	0.47*** (0.10)
Covariates	No	No	No	Yes
R ²	0.08	0.11	0.14	0.16
N	1921	1921	1921	1921

*Standard errors clustered at the school level in parentheses. 'Covariates' includes sex, age, race/ethnicity, education, employment, and single parent status. Missing values in independent variables imputed at sample means. * p<0.10, ** p<0.05, *** p<0.01.*

Table S5. Bandwidth and Structural and Community Barriers: "Neighborhood Is Not Safe"

	(1)	(2)	(3)	(4)
<i>Self-reported Bandwidth</i>				
Attention Index (z-score)	-0.00 (0.01)	0.02* (0.01)	0.01 (0.01)	0.02* (0.01)
Present bias index (Binary)	-0.00 (0.02)	-0.01 (0.02)	-0.03 (0.02)	-0.02 (0.02)
<i>Additional Cognitive Dimensions</i>				
Agency Index (z-score)		-0.02* (0.01)	-0.02 (0.01)	-0.02 (0.01)
Growth Mindset Index (z-score)		-0.02* (0.01)	-0.01 (0.01)	-0.01 (0.01)
Depression Scale - PHQ-2 (z-score)		0.04*** (0.01)	0.02** (0.01)	0.03** (0.01)
<i>Scarcity and Income</i>				
Financial scarcity			0.08** (0.03)	0.08** (0.03)
HH income (thousand \$)			-0.00*** (0.00)	-0.00*** (0.00)
Constant	0.27*** (0.02)	0.27*** (0.02)	0.33*** (0.03)	0.36*** (0.09)
Covariates	No	No	No	Yes
R ²	0.00	0.01	0.04	0.06
N	1918	1918	1918	1918

*Standard errors clustered at the school level in parentheses. 'Covariates' includes sex, age, race/ethnicity, education, employment, and single parent status. Missing values in independent variables imputed at sample means. * p<0.10, ** p<0.05, *** p<0.01.*

Table S6. Ordered Logit Models for Parent-Side Barriers

	No Quiet Place	Something Else	Too Busy	Too Tired
Self-reported Bandwidth				
Attention Index (z)	-0.24*** (0.06)	-0.32*** (0.05)	-0.36*** (0.05)	-0.42*** (0.05)
Present bias (binary)	-0.01 (0.11)	-0.12 (0.10)	-0.12 (0.09)	0.03 (0.09)
Psychological Controls				
Agency (z)	-0.22*** (0.06)	-0.19*** (0.06)	-0.14** (0.06)	-0.11** (0.05)
Growth mindset (z)	-0.13** (0.06)	-0.14*** (0.05)	0.00 (0.05)	0.02 (0.05)
Depression (z)	0.18*** (0.05)	0.30*** (0.05)	0.39*** (0.06)	0.58*** (0.05)
Economic Controls				
Financial scarcity	0.28** (0.13)	0.11 (0.15)	0.27* (0.14)	0.39*** (0.14)
Household income (000s)	-0.00 (0.00)	0.00* (0.00)	0.01*** (0.00)	0.01*** (0.00)
Demographic controls	Yes	Yes	Yes	Yes
Pseudo R ²	0.04	0.08	0.10	0.11
N	1,918	1,912	1,915	1,921
Proportional-odds LR test				
chi2(24)	45.78	88.53	59.51	28.46
p-value	0.005	0.000	0.000	0.241

*Note: Ordered logit coefficients from the full specification (Model 4). The dependent variable uses the original four-point frequency scale (0 = never, 1 = 1–2 days, 2 = 3+ days, 3 = everyday). Standard errors clustered at the school level in parentheses. The model includes demographic controls (sex, age, race/ethnicity, education, employment, single-parent status). Missing values in independent variables imputed at sample means. The proportional-odds assumption is tested via a likelihood-ratio test comparing constrained and unconstrained models. The assumption is rejected for three of four barriers, supporting the use of linear models in the main analysis. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.*

Table S7. Alternative Present Bias Measures

	No Quiet Place	Something Else	Too Busy	Too Tired
Panel A: Continuous patience index (0–4)				
Patience count	-0.01*	0.00	0.01	0.01
	(0.01)	(0.01)	(0.01)	(0.01)
Attention Index (z)	-0.06***	-0.07***	-0.08***	-0.10***
	(0.01)	(0.01)	(0.01)	(0.01)
Panel B: Near-horizon present bias (binary)				
Near-horizon PB	0.04*	-0.01	-0.01	-0.02
	(0.02)	(0.02)	(0.02)	(0.02)
Attention Index (z)	-0.06***	-0.07***	-0.08***	-0.10***
	(0.01)	(0.01)	(0.01)	(0.01)
Main analysis: Present bias (binary)				
Present bias	-0.00	-0.01	-0.01	0.02
	(0.02)	(0.02)	(0.02)	(0.02)
Attention Index (z)	-0.06***	-0.07***	-0.08***	-0.10***
	(0.01)	(0.01)	(0.01)	(0.01)
R ² (Panel A)	0.08	0.13	0.16	0.16
R ² (Panel B)	0.08	0.13	0.16	0.16
N	1,918	1,912	1,915	1,921
Present bias descriptives:				
Binary present-biased	29.6% (N = 558 of 1,882)			
Mean patience count	2.38 (SD = 1.43)			

*Note: Each panel replaces the main binary present-bias measure with an alternative coding. Panel A uses a continuous patience index (sum of patient choices across 4 incentivized intertemporal questions, range 0–4, higher = more patient). Panel B uses a binary indicator based only on the two near-horizon questions (today vs. 1 month). All models are estimated by OLS with the full specification (Model 4), including agency, growth mindset, depression, financial scarcity, household income, and demographic controls. Standard errors clustered at the school level in parentheses. Missing values in independent variables imputed at sample means. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.*

Table S8. Attention–Barrier Association by Income Tercile

	No Quiet Place	Something Else	Too Busy	Too Tired
Attention Index (z)				
Bottom tercile	-0.04*	-0.05**	-0.07**	-0.09***
	(0.02)	(0.02)	(0.03)	(0.02)
Middle tercile	-0.08***	-0.06***	-0.12***	-0.12***
	(0.02)	(0.02)	(0.02)	(0.02)
Top tercile	-0.06***	-0.09***	-0.07***	-0.08***
	(0.02)	(0.02)	(0.02)	(0.02)
R²				
Bottom tercile	0.13	0.12	0.12	0.17
Middle tercile	0.08	0.11	0.13	0.17
Top tercile	0.08	0.17	0.18	0.11
N				
Bottom tercile	619	619	618	621
Middle tercile	623	617	622	624
Top tercile	646	646	646	646
Equality test (pooled interaction)				
F-statistic	0.41	1.24	2.10	1.29
p-value	0.67	0.29	0.13	0.28

*Note: OLS coefficients from the full specification (Model 4) estimated separately within each income tercile. All models include present bias, agency, growth mindset, depression, financial scarcity, household income, and demographic controls. Standard errors clustered at the school level in parentheses. Missing values in independent variables imputed at sample means. The equality test reports the joint F-test from a pooled model with income tercile × Attention Index interactions; the null hypothesis is that the attention coefficient is equal across all three terciles. The null cannot be rejected for any barrier (all $p > 0.10$). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.*

Table S9. Item-Level Attention Index Robustness and Confirmatory Factor Analysis

	No Quiet Place	Something Else	Too Busy	Too Tired
Panel A: “Easy to concentrate” (z)				
Coefficient	-0.04*** (0.01)	-0.03*** (0.01)	-0.06*** (0.01)	-0.07*** (0.01)
R ²	0.07	0.12	0.15	0.14
Panel B: “Able to pay close attention” (z)				
Coefficient	-0.04*** (0.01)	-0.05*** (0.01)	-0.04*** (0.01)	-0.06*** (0.01)
R ²	0.07	0.13	0.15	0.14
Panel C: “Not easily distracted” (z)				
Coefficient	-0.04** (0.01)	-0.07*** (0.01)	-0.09*** (0.01)	-0.09*** (0.01)
R ²	0.07	0.14	0.17	0.15
Main analysis: Attention Index (z)				
Coefficient	-0.06*** (0.01)	-0.07*** (0.01)	-0.08*** (0.01)	-0.10*** (0.01)
R ²	0.08	0.13	0.16	0.16
N	1,918	1,912	1,915	1,921
Confirmatory Factor Analysis (N = 1,895)				
Standardized loadings:				
“Easy to concentrate”	0.77			
“Able to pay close attention”	0.67			
“Not easily distracted”	0.47			
Cronbach’s alpha	0.67			
Model fit: CFI = 1.00, RMSEA = 0.00				

*Note: Each panel replaces the composite Attention Index with a single standardized component item. All models are estimated by OLS with the full specification (Model 4), including present bias, agency, growth mindset, depression, financial scarcity, household income, and demographic controls. Standard errors clustered at the school level in parentheses. Missing values in independent variables imputed at sample means. The bottom rows report standardized factor loadings from a single-factor confirmatory factor analysis. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.*

Table S10. Income–Cognition Gradient with Alternative Scarcity Measures

Panel A: Attention Index (z-score)

	Ordinal Scarcity (0–1–2)					Broad Binary (not enough + just enough)				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Financial scarcity	0.10*** (0.03)		-0.18*** (0.03)	-0.24*** (0.05)	-0.25*** (0.05)	-0.11** (0.05)		-0.22*** (0.05)	-0.35*** (0.07)	-0.35*** (0.07)
Household income (000s)		-0.00* (0.00)	-0.00*** (0.00)	-0.00*** (0.00)	-0.00** (0.00)		-0.00* (0.00)	-0.00*** (0.00)	-0.00*** (0.00)	-0.00** (0.00)
Scarcity × Income				0.00* (0.00)	0.00* (0.00)				0.00** (0.00)	0.00** (0.00)
Demographic controls	No	No	No	No	Yes	No	No	No	No	Yes
R ²	0.01	0.00	0.02	0.02	0.05	0.00	0.00	0.01	0.01	0.04
N	1,894	1,894	1,894	1,894	1,894	1,894	1,894	1,894	1,894	1,894

Panel B: Present Bias (binary)

	Ordinal Scarcity (0–1–2)					Broad Binary (not enough + just enough)				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Financial scarcity	0.07*** (0.02)		0.03* (0.02)	0.01 (0.02)	0.01 (0.02)	0.12*** (0.03)		0.06*** (0.02)	0.05 (0.04)	0.06 (0.04)
Household income (000s)		-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)	-0.00* (0.00)		-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)	-0.00 (0.00)
Scarcity × Income				0.00 (0.00)	0.00 (0.00)				0.00 (0.00)	0.00 (0.00)
Demographic controls	No	No	No	No	Yes	No	No	No	No	Yes
R ²	0.01	0.03	0.03	0.03	0.06	0.02	0.03	0.03	0.03	0.06
N	1,881	1,881	1,881	1,881	1,881	1,881	1,881	1,881	1,881	1,881

*Note: OLS coefficients replicating Analysis 2 with alternative felt scarcity measures. Ordinal uses the full three-category variable (0 = some money left over, 1 = just enough, 2 = not enough). Broad binary codes 1 = not enough OR just enough vs. 0 = some left over. Standard errors clustered at the school level in parentheses. Models progress from scarcity only (1), income only (2), both (3), with interaction (4), and full demographic controls (5). Missing values in independent variables imputed at sample means. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.*