

The Unequal Consequences of Mass Incarceration for Children *

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ABSTRACT

In response to the rising incarceration rates in the United States, a growing literature documents the mostly deleterious intergenerational consequences of paternal incarceration. But despite good reasons to suspect that paternal incarceration has unequal—and potentially countervailing—consequences for children, research almost exclusively considers the *average* effects of paternal incarceration. Therefore, in this manuscript, I use data from the Fragile Families and Child Wellbeing Study (N = 3,146) to estimate both the average and heterogeneous effects of paternal incarceration on children’s problem behaviors and cognitive skills in middle childhood. Results show that, on average, paternal incarceration is associated with problem behaviors but not cognitive skills at age nine. However, taking into account the social contexts that shape children’s likelihood of experiencing paternal incarceration documents a pattern of more complex findings. Paternal incarceration has deleterious effects on both problem behaviors and cognitive skills among children least likely to experience paternal incarceration. For children most likely to experience paternal incarceration, who also experience a multitude of other vulnerabilities, paternal incarceration is mostly inconsequential. Given that paternal incarceration is concentrated among the most vulnerable children, but is most consequential for the least vulnerable of these disadvantaged children, suggests that incarceration has complicated implications for the intergenerational transmission of disadvantage and the production of childhood inequalities.

The rapid growth of mass incarceration in the United States, a phenomenon characterized by its concentration among already marginalized individuals, means that a historically unprecedented number of children experience parental incarceration (Glaze and Maruschak 2008; Wakefield and Uggen 2010; Wildeman 2009). More than 2.6 million children currently have a parent incarcerated in federal prison, state prison, or jail, most of them for nonviolent offenses (Pettit 2012), and this number excludes children with a parent under other forms of correctional supervision. Given the absolute number of children affected by parental incarceration, especially *paternal* incarceration, scholars have developed an acute interest in understanding the intergenerational consequences of incarceration. By and large, research documents that paternal incarceration has deleterious educational, behavioral, and health effects for children across the life course (for reviews, see Johnson and Easterling 2012; Murray and Farrington 2005; Wildeman, Wakefield, and Turney 2013; Wildeman and Western 2010) and, given its concentration among already disadvantaged children, may increase inequality among children (Wakefield and Wildeman 2013).

But research on the intergenerational consequences of paternal incarceration almost exclusively considers the *average* effects of incarceration, despite good reasons to suspect that paternal incarceration has unequal—and potentially countervailing—consequences for children. The life course perspective provides a valuable framework for understanding both the average and unequal intergenerational consequences of paternal incarceration. A crucial tenet of this perspective is that of linked lives, the idea that individuals live their lives interdependently of one another and, as such, that the incarceration of a father may have cascading and unintended consequences for children. Another tenet of this perspective suggests that the social contexts of children's lives may render some children more vulnerable to the consequences of paternal

incarceration than other children (Elder 1998; Elder, Johnson, and Crosnoe 2003). For example, though the incarceration of a gainfully employed non-violent father may have deleterious consequences for children, the incarceration of a violent father may be beneficial or inconsequential (e.g., Wildeman 2010).

Therefore, in this manuscript, I draw on the life course perspective to build on previous research that has primarily examined the average intergenerational consequences of paternal incarceration. I use data from the Fragile Families and Child Wellbeing Study, a longitudinal cohort of children born to mostly unmarried parents living in urban areas, to examine the average and unequal effects of paternal incarceration on nine-year-old children. To begin with, I provide one of the first broadly representative estimates of the average effects of paternal incarceration on children's problem behaviors and cognitive skills in middle childhood, a period neglected in research on the intergenerational consequences of paternal incarceration that almost exclusively examines early childhood, adolescence, and adulthood (though see Haskins forthcoming; Kjellstrand and Eddy 2011; Murray and Farrington 2008a). Middle childhood is a critical life course stage when children develop academic and social competencies (Kowaleski-Jones and Duncan 1999; Magnuson 2007) and when key educational decisions, such as special education placement and retention, are made (Hibel, Farkas, and Morgan 2010; Warren and Saliba 2012). Additionally, I estimate the heterogeneous—and unequal—consequences of paternal incarceration for children's problem behaviors and cognitive skills. Specifically, I examine whether the effects of paternal incarceration vary by the social contexts that shape children's likelihoods of experiencing paternal incarceration. Given that problem behaviors and cognitive skills are linked to educational achievement and attainment throughout the life course (Farkas 2003), documenting the average and unequal intergenerational consequences of paternal

incarceration is crucial for constructing an “incarceration ledger” and precisely documenting how incarceration contributes to intergenerational social inequality (Featherman and Hauser 1978; Sampson 2011).

BACKGROUND

A Life Course Perspective Linking Paternal Incarceration and Child Wellbeing

The life course perspective provides an overarching framework for understanding the intergenerational consequences of paternal incarceration (Elder 1998; Elder et al. 2003). In accordance with this perspective, and its proposition that individuals live interdependently of one another, incarceration may be a turning point in the life course of fathers that has cascading consequences for their children. The majority of incarcerated men are fathers (Mumola 2000), and many of them contribute economically and emotionally to their families prior to incarceration (Geller, Garfinkel, and Western 2011; Turanovic, Rodriguez, and Pratt 2012). Incarceration forcefully removes fathers from households and places them in a liminal state where they are simultaneously members of and disconnected from their families.

The life course perspective, with its emphasis on the interdependency of parents and children, provides one way to unite the commonly posited explanations for incarceration’s deleterious average effects on children. First, children may experience trauma resulting from the removal of fathers from households via incarceration (Hagan and Dinovitzer 1999). This trauma, as well as the corresponding ambiguous loss, where incarcerated fathers are both physically and emotionally absent, may hinder children’s behavioral and cognitive development (Boss 2007; Sharkey 2010). Second, children of incarcerated fathers may experience resultant stigma and shame that impedes their social interactions and learning (Braman 2004; McKown and Weinstein

2003). Finally, paternal incarceration generates massive strain on many aspects of family life that have cascading consequences for children. Incarceration increases economic hardship (e.g., Schwartz-Soicher, Geller, and Garfinkel 2011), facilitates relationship dissolution and conflict (e.g., Western 2006), impairs mothers' and fathers' parenting (e.g., Turney and Wildeman 2013), and increases parental health problems (e.g., Wildeman, Schnittker, and Turney 2012), all of which have been linked to children's problem behaviors and cognitive skills (e.g., Carlson and Corcoran 2001).

Alternatively, though it is possible that paternal incarceration has average deleterious consequences for children's problem behaviors and cognitive skills, it is also possible that paternal incarceration exerts no independent effects given the unequal distribution of paternal incarceration across the population. Children of incarcerated parents, on average, are at risk of having problem behaviors and poor cognitive skills long before their fathers become incarcerated. For example, these children are more likely than their counterparts to be racial minorities. Their families are more likely to be economically marginalized. They are less likely to have married parents and are more likely to experience other types of father absence such as divorce or separation. Their parents are more likely to suffer from depression, experience high levels of parenting stress, and abuse drugs or alcohol (Wakefield and Wildeman 2013).

Existing Evidence of Average Effects. A rapidly growing literature—most of which focuses on early childhood, adolescence, or adulthood and ignores middle childhood—documents the consequences of incarceration for children (for reviews, see Johnson and Easterling 2012; Murray and Farrington 2005; Wildeman, Wakefield, and Turney 2013; Wildeman and Western 2010). By and large, this research consistently documents negative average effects of paternal incarceration on children's problem behaviors, especially children's

externalizing behaviors (Geller et al. 2009, 2012; Haskins forthcoming; Murray and Farrington 2008b; Wakefield and Wildeman 2011, 2013; Wilbur et al. 2007; Wildeman 2010; though see Kinner et al. 2007; Murray and Farrington 2005). In contrast, research on children's cognitive skills provides more nuanced findings, with most research documenting null effects (Geller et al. 2009, 2012) but some evidence of negative effects (Haskins 2013). Moving beyond cognitive skills, children with incarcerated parents, compared to their counterparts, are more likely to be placed in special education (Haskins forthcoming), have lower educational attainment (Foster and Hagan 2007, 2009; Hagan and Foster 2012), worse academic performance (Foster and Hagan 2009; Hagan and Foster 2012; Murray, Loeber and Pardini 2012), and more school absences (Murray and Farrington 2008b; Nichols and Loper 2012).

A Life Course Perspective Considering Heterogeneous Effects of Paternal Incarceration

The life course perspective also highlights that the social contexts of children's lives are crucial to development (Elder 1998; Elder et al. 2003; also see Bronfenbrenner and Morris 1998).

Accordingly, social contexts, especially the familial contexts that are particularly important to young children, may render some children more vulnerable to paternal incarceration than other children (Elder 1998; also see Wheaton 1990). For example, children living in poverty are more likely to experience paternal incarceration than their non-poor counterparts. It is likely that the effects of paternal incarceration are contingent on the social forces that shape children's risk of experiencing paternal incarceration. The heterogeneity in the effects of paternal incarceration is especially apparent in richly textured qualitative research, which suggests incarceration may be deleterious for some children, advantageous for other children, and inconsequential for still other

children (Braman 2004; Edin, Nelson, and Paranal 2004; Giordano 2010:147-150; Sampson 2011; Turanovic et al. 2012).

Paternal Incarceration as an Event Stressor. On the one hand, the negative intergenerational consequences of paternal incarceration may be strongest among children living in social contexts that make them unlikely to experience paternal incarceration. Prior to their father's confinement, these children otherwise experience a relatively advantaged social context. They generally have stable home environments, are shielded from severe economic deprivation, and live in resourceful neighborhoods. For these families, paternal incarceration may be an *event stressor* (Eaton 1978; Wheaton 1982; also see Wheaton 1990). Event stressors, which are unexpected life events, are especially detrimental to wellbeing because they are unanticipated (Eaton 1978; Wheaton 1982). Therefore, for children unlikely to experience paternal incarceration, incarceration may be a distinctive and unanticipated shock to their fathers, their mothers, and themselves that makes these children directly vulnerable to incarceration's negative and pervasive effects.

Furthermore, an unanticipated incarceration—through the strain imposed on familial economic resources, relationships, parenting behaviors, and physical and mental health—may be indirectly detrimental for children. For example, it is well known that incarceration produces economic insecurity among families (Comfort 2008; Schwartz-Soicher et al. 2011; Western 2006) and that economic insecurity is linked to both problem behaviors and cognitive skills in children (Carlson and Corcoran 2001; Duncan, Brooks-Gunn, and Klebanov 1994). But it is quite plausible that incarceration's deleterious economic consequences are largest when children are unlikely to experience paternal incarceration. Children with few risk factors for experiencing paternal incarceration are more likely than those with many risk factors to have employed fathers

who make substantial economic contributions to their families prior to incarceration. The economic loss resulting from incarceration may be especially detrimental for these unprepared families that are used to having economic resources.

Relatedly, family instability may be a pathway linking paternal incarceration and child wellbeing. It is well known that incarceration disrupts romantic relationships (Apel et al. 2010; Lopoo and Western 2005; Massoglia, Remster, and King 2011; Western 2006), and it is likely that the consequences of incarceration for romantic relationships are strongest among relatively advantaged fathers, those least likely to be incarcerated. These advantaged fathers are likely in romantic relationships with the mothers of their children, and the shock of incarceration may create conflict and instability in relationships that does not occur when incarceration is anticipated. In turn, relationship instability increases children's problem behaviors and decreases children's cognitive skills (Osborne and McLanahan 2007). Similarly, mothers' parenting and mental health may be most impaired when fathers have a low probability of experiencing incarceration (Turney 2014), both of which are linked to children's wellbeing (Hawkins, Amato, and King 2007; Turney 2011). There is also evidence that incarceration is most stigmatizing to those least likely to experience it (Braman 2004).

Parental Incarceration as a Chronic Stressor. On the other hand, the negative intergenerational consequences of paternal incarceration may be strongest among children most likely to experience paternal incarceration. Children who are especially vulnerable to paternal incarceration do not experience incarceration in isolation. Instead, prior to paternal incarceration, these children experience a complex array of disadvantages. Their vulnerable social contexts are fraught with family instability, poverty, and disadvantaged neighborhood environments (Wakefield and Wildeman 2013). For these children, paternal incarceration may be a *chronic*

stressor, a stressor that emerges gradually and deceptively from their social environments and one that can have deleterious effects on wellbeing (Pearlin 1989). Therefore, this accumulation of disadvantage may render paternal incarceration both directly and indirectly associated with children's problem behaviors and cognitive skills (DiPrete and Eirich 2006). For example, among children living in poverty, paternal incarceration may strain already tight economic resources or already tumultuous relationships and, therefore, impede mothers' ability to protect children from any deleterious effects of paternal incarceration.

Existing Evidence of Heterogeneous Effects. By and large, the majority of existing quantitative research treats children of incarcerated fathers as a monolithic group that equally experiences the consequences of incarceration (though, for research on the heterogeneous effects of maternal incarceration, see Turney and Wildeman 2014). There are several studies, however, that consider the possibility that the consequences of incarceration for children's problem behaviors and cognitive skills vary across social groups. For example, one study finds that the effects of paternal incarceration on physically aggressive behaviors are concentrated among boys, boys whose fathers were incarcerated for a non-violent offense, and boys whose fathers did not engage in domestic violence (Wildeman 2010; also see Haskins forthcoming; Wildeman 2012). Others have suggested that removal of father from home can be positive turning point for children (Eddy and Reid 2003; Giordano 2010; Hagan and Dinovitzer 1999). None of these studies, though, considers the full set of social forces—consistent with the realities of children's lives—that shape children's risk of experiencing paternal incarceration and how this risk shapes the intergenerational consequences of incarceration.

Threats to Causal Inference

Given the concentration of paternal incarceration among some of the most disadvantaged and vulnerable children, research investigating the intergenerational collateral consequences of incarceration must thoroughly consider selection into paternal incarceration. An ideal research design would involve the random assignment of fathers to incarceration. Given the infeasibility and impracticality of such a design, I instead employ propensity score matching, a quasi-experimental and counterfactual design for observational data, to estimate the average and heterogeneous intergenerational consequences of paternal incarceration (Morgan and Winship 2007). To investigate the average effects of paternal incarceration, I compare children who experienced paternal incarceration (the treatment group) to children with a similar distribution of observed covariates who did not experience paternal incarceration (the control group). To investigate the heterogeneous effects of paternal incarceration, I examine the effects of the treatment by children's vulnerabilities prior to paternal incarceration. Furthermore, to strengthen causal inference, I investigate the ignorability assumption, the supposition that there are no unobserved differences between the treatment and control groups. The result is a manuscript that documents complex, countervailing, and unequal effects of paternal incarceration on children.

DATA, MEASURES, AND ANALYTIC STRATEGY

Data

I use data from the Fragile Families and Child Wellbeing Study, a population-based sample of 4,898 children born to mostly unmarried parents, to estimate the average and heterogeneous effects of paternal incarceration on children's problem behaviors and cognitive skills. These data provide an unparalleled opportunity to understand the intergenerational consequences of paternal incarceration. First, unmarried parents are a relatively disadvantaged group (McLanahan 2009),

which means that many of these children experienced paternal incarceration. Second, these incarcerated fathers have demographic characteristics that are similar to fathers incarcerated in local jails, state prisons, and federal prisons (Turney and Wildeman 2013:957). Third, because these data include a vast amount of information about the social contexts of children's lives prior to paternal incarceration, it is both possible to precisely match children who do and do not experience paternal incarceration and to consider the effects of paternal incarceration contingent on these social contexts.

The Fragile Families study includes parents and children sampled from 20 U.S. cities, all with populations greater than 200,000, which were stratified by labor market conditions, child support policies, and welfare generosity (Reichman et al. 2001). Beginning in 1998, mothers and most fathers were interviewed in hospitals immediately following the birth of their child, and follow-up telephone interviews occurred when children were one, three, five, and nine years old. Children and children's primary caregivers (usually but not always a parent) were also interviewed at the nine-year survey. Baseline response rates were 86% for mothers and 78% for fathers. Completion rates for the one-, three-, five-, and nine-year interviews were 90%, 88%, 87%, and 76% for mothers and 74%, 72%, 70%, and 59% for fathers, respectively. The response rates for fathers are comparatively lower than those for mothers, but, in many cases, information about fathers is available from mothers.

To construct the analytic sample, I delete 1,539 observations missing a primary caregiver interview (when children's problem behaviors are measured) or a child interview (when children's cognitive skills are measured) at the nine-year survey. I then delete 124 observations missing any of the five dependent variables and an additional 89 observations in which the father is deceased. The final analytic sample comprises 3,146 children, and there are few observed

differences between the baseline and analytic samples. Children in the analytic sample, compared to those in the baseline sample, are statistically significantly less likely to have foreign-born mothers (14% compared to 17%) and fathers (15% compared to 18%), more likely to have mothers who expect to work in the next year at baseline (70% compared to 68%), and are younger (112 months compared to 113 months). Observations missing covariate values are preserved by producing five multiply imputed data sets (Allison 2001).

Measures

Dependent Variables. The dependent variables include two indicators of children's problem behaviors and three indicators of children's cognitive skills, all measured at age nine. To begin with, children's *internalizing behaviors* and *externalizing behaviors* are measured with the Child Behavior Checklist (CBCL), an established and commonly used measure for assessing problem behaviors in children (Achenbach 1992). Children's primary caregivers, nearly always their mothers, were asked to rate various aspects of the children's behaviors (0 = *not true*, 1 = *somewhat or sometimes true*, 2 = *very or often true*). I average caregivers' responses to 32 questions about internalizing behaviors (e.g., child cries a lot, child feels worthless or inferior; $\alpha = .88$) and 34 questions about externalizing behaviors (e.g., child destroys his or her own things, child is impulsive or acts without thinking; $\alpha = .91$).

Additionally, children's cognitive skills are measured by *reading comprehension*, *math comprehension*, and *verbal ability*. Reading comprehension is measured with the Passage Comprehension subtest of the Woodcock-Johnson III Tests of Achievement. This individually administered test measures a child's ability to understand words, phrases, and short passages. Children are asked to identify pictures that correspond with words and to use context clues to

identify missing words in a sentence. Math comprehension is measured with the Applied Problems subtest of the Woodcock-Johnson III Tests of Achievement. In this test, children are asked to orally solve math problems. Both Woodcock-Johnson tests are normed by age and increase in complexity as they advance ($M = 100$, $S.D. = 15$) (Woodcock, McGrew, and Mather 2001). Finally, verbal ability is measured with the Peabody Picture Vocabulary Test-Third Edition (PPVT). In this test, interviewers read words to children who then identified a picture (among four pictures) corresponding to the word. The PPVT is highly correlated with standardized measures of intelligence such as the Wechsler Intelligence Scale-Third Edition (Dunn and Dunn 1997).

To facilitate intuitive interpretation across measures of problem behaviors and cognitive skills, I standardize all dependent variables (mean = 0, standard deviation = 1), with higher scores indicating more problem behaviors and better cognitive skills.

Independent Variables. The key independent variable is paternal incarceration between the one- and nine-year surveys. There are several opportunities to identify paternal incarceration at each survey wave, and children are considered to experience paternal incarceration if mothers' or fathers' direct and indirect reports of paternal incarceration are affirmative. Direct reports include mothers' or fathers' reports—at the three-, five-, or nine-year surveys—that the father is currently incarcerated.¹ Direct reports also include mothers' (at the three-, five-, and nine-year surveys) and fathers' (at the nine-year survey) reports that the father experienced incarceration since the previous survey wave.² Indirect reports include other reports of incarceration that

¹ Fathers were interviewed in prison or jail at the three- and five-year surveys. But, at the nine-year survey, only fathers in two cities (and in early phases of interviewing in an additional five cities) were interviewed in prison or jail.

² At the nine-year survey, mothers were asked if the father had experienced incarceration in the past six years and fathers were asked about the date of their most recent incarceration. This information is used to identify paternal incarceration between the one- and nine-year surveys.

emerged during the surveys (e.g., the parents' romantic relationship ended because the father was incarcerated). Whenever possible, I use information from both mothers and fathers, and, given the under-reporting of incarceration (Groves 2004), consider the father to experience incarceration if either report is affirmative. This approach, as well as the reliance on both direct and indirect reports of incarceration, is consistent with other research using these data (see, especially, Geller et al. 2012; Wildeman and Turney forthcoming). About 31% of children experience paternal incarceration between the one- and nine-year surveys.

There are several caveats about the measure of paternal incarceration. First, I measure paternal incarceration between the one- and nine-year surveys instead of between the baseline and nine-year surveys. This is because many characteristics especially associated with selection into incarceration (e.g., depression, poverty status, domestic violence, substance abuse) were first measured at the one-year survey. These characteristics must be measured prior to paternal incarceration to ensure appropriate time-ordering between the dependent variables, independent variable, and control variables. Second, it is only possible to capture first-time paternal incarceration between the one- and three-year surveys, as mothers and fathers were not asked about paternal incarceration at the three-year survey if it was reported at earlier surveys that he experienced incarceration. This means that paternal incarceration is almost certainly under-reported. Third, a number of features of the incarceration experience remain uncertain. I cannot, for example, distinguish between stints in prison and jail, different sentence lengths, or the number of incarceration spells. I return to these caveats, and their implications, in the discussion.

Additional Covariates. The propensity score analyses match children on 47 observed maternal, paternal, and child characteristics to minimize the possibility that the effect of paternal incarceration on children's problem behaviors and cognitive skills is spurious. These variables

include demographic (e.g., race/ethnicity, immigrant status), socioeconomic (e.g., education, material hardship), and familial (e.g., relationship status, number of children) characteristics, as well as several behavioral characteristics that are especially associated with selection into incarceration (e.g., impulsive behaviors, prior incarceration). Importantly, with the exception of several measures that are considered stable characteristics, all of these characteristics are measured at the baseline or one-year surveys and, thus, prior to the measure of paternal incarceration.³ See Appendix Table A for a complete description of all covariates.

Analytic Strategy

I use a series of propensity score matching models to estimate the average and heterogeneous treatment effects of paternal incarceration on child wellbeing. Grounded in the counterfactual framework, propensity score models approximate an experimental design by facilitating a comparison between a treatment group and a control group (Rosenbaum and Rubin 1983; Morgan and Winship 2007). This approach allows me to consider differences in child wellbeing between children who experience paternal incarceration (the treatment group) to otherwise comparable children who do not experience paternal incarceration (the control group). The ability to match children on observed covariates, a key feature of propensity score matching, is especially important given the vast differences between children who do and do not experience paternal incarceration. Importantly, these propensity score analyses proceed under ignorability, the assumption that all relevant determinants of selection into incarceration are used to generate the propensity score (Morgan and Harding 2006; Shadish 2013). Though the propensity score is

³ Stable characteristics include mothers' and fathers' impulsivity (measured at the five-year and one-year surveys, respectively) and mothers' and fathers' cognitive ability (both measured at the three-year survey). Also, the analyses include a control for children's age at the nine-year survey, as that is more relevant—than measuring children's age at the one-year survey—to children's problem behaviors and cognitive skills at the nine-year survey.

based on a wide array of demographic, socioeconomic, and behavioral characteristics measured prior to incarceration, unobserved heterogeneity may exist, and some analyses investigate the tenability of the ignorability assumption.

Average Effects. In the first analytic stage, I use propensity score matching to estimate the average effect of paternal incarceration on children's wellbeing. First, a logistic regression model generates a propensity score, the probability of experiencing paternal incarceration, for each observation as a function of the covariates described above. Second, I restrict the analyses to regions of common support and ensure the averages of the covariates are statistically indistinguishable across the treatment and control groups. Third, I use kernel matching, which matches all treatment observations to control observations by weighting control observations by their distance from treatment observations (kernel = Epanechnikov; bandwidth = 0.06).⁴ I then use ordinary least squares (OLS) regression models, averaged across the five imputed data sets, to estimate children's problem behaviors and cognitive skills as a function of the treatment. Finally, because there may be subtle differences between the treatment and control groups after matching, I conduct doubly robust propensity score analyses by further adjusting for all covariates (Schafer and Kang 2008).

Heterogeneous Effects. In the second analytic stage, I estimate the heterogeneous treatment effects of paternal incarceration on child wellbeing (Xie, Brand, and Jann 2012). This approach considers how the effect of paternal incarceration varies by the observed propensity for paternal incarceration. I first group observations into three strata based on their propensity score

⁴ Results are robust to alternative matching strategies, including nearest neighbor matching (which matches each treatment observation to control observations with the closest propensity scores) and radius matching (which matches each treatment observation to control observations within a specific radius), and to different bandwidths.

($p = [.00 - .20)$, $p = [.20 - .40)$, $p = [.40 - .80)$).⁵ Children in Stratum 1 have the lowest likelihood of experiencing paternal incarceration, and children in Stratum 3 have the highest likelihood of experiencing paternal incarceration. Across all three strata, the treatment and control groups have a similar distribution of covariates and only vary by paternal incarceration. Some covariates used to generate the propensity score when estimating the average effects of paternal incarceration were excluded from these models in order to achieve balance between the treatment and control groups.⁶ Given that the covariates used to estimate the propensity score in the average effects models and the heterogeneous effects models explain a similar amount of the variance in paternal incarceration, it is unlikely the exclusion of these variables unduly biases the results.

These multilevel models have two components. Level 1 estimates strata-specific effects of paternal incarceration on child wellbeing. Level 2, a variance-weighted least squares regression, estimates the trend in the variation of effects across propensity score strata. A positive, significant Level 2 slope means that, for each unit change in strata, there is an increase in the effect of recent paternal incarceration on the dependent variable (and a negative, significant coefficient means that there is a decrease in the effect). These multilevel analyses, conducted using Stata-compatible software by Jann, Brand, and Xie (2007), have been recently used to consider variation in the effects of educational attainment (Brand 2010; Brand and Xie 2010; Musick, Brand, and Davis 2012; Schafer, Wilkinson, and Ferraro 2013), but have not been applied to research on the intergenerational effects of paternal incarceration. Because the Level 2

⁵ These strata allow for comparable numbers of observations in each stratum and natural cutpoints of the propensity scores (Xie, Brand, and Jann 2012; also see Rosenbaum and Rubin 1984). In supplemental analyses, I considered different strata cutpoints (for example, $p = [.00 - .10)$, $p = [.10 - .15)$, $p = [.15 - .20)$, $p = [.20 - .30)$, $p = [.30 - .40)$, $p = [.40 - .50)$, $p = [.50 - .60)$, $p = [.60 - .80)$), and results were substantively similar. Also, no children had a propensity score greater than .80.

⁶ Or, in some cases, I had to replace a variable with a related variable with less variation in order to achieve within-stratum balance. For example, I replaced the continuous measure of fathers' impulsivity, which would not balance across the treatment and control groups, with a dummy variable indicating high impulsivity (1 = *impulsivity in the top quartile*, 0 = *impulsivity not in the top quartile*).

trend coefficient and standard error cannot be estimated across the five multiply imputed data sets, these analyses use the first imputed data set. The point estimates remain substantively similar in supplemental analyses that use different single imputed data sets.

Sample Description

Descriptive statistics for the analytic sample are presented in Table 1. To begin with, the vast majority of children are born to mothers who are racial/ethnic minorities. Non-Hispanic Black mothers comprise half (50%) of the sample and Hispanic mothers comprise more than one-fourth (26%) of the sample. About one-sixth of children's parents (14% of mothers and 15% of fathers) were born outside the United States. Most children have parents in a romantic relationship with each other at the one-year survey, but less than one-third of parents (29%) are married. About 27% of parents are cohabiting, 10% are in non-residential romantic relationships, and 34% are not in a romantic relationship. About two-fifths of parents (38% of mothers and 40% of fathers) share children with another partner. Additionally, children suffer an array of socioeconomic disadvantages. The majority of parents (59% of mothers and 67% of fathers) have no education beyond high school. About 43% of children live in households with incomes below the poverty line, 14% live in public housing, and 26% have mothers who received welfare in the past year. About 5% of fathers engaged in domestic violence, 13% have a substance abuse problem, and 32% were incarcerated prior to the one-year survey.

[Table 1 about here.]

RESULTS

Estimating the Average Effects of Paternal Incarceration

Estimating the Propensity Score. To consider the average effects of paternal incarceration on child wellbeing, I first generate a propensity score for each observation. These logistic regression results, presented in Appendix Table B, show that various demographic, socioeconomic, and behavioral characteristics are independently associated with paternal incarceration. For example, compared to children with native-born parents, children with foreign-born mothers are less likely to experience paternal incarceration. Parents' relationship status is also predictive of paternal incarceration. Children of parents in cohabiting, non-residential romantic, and no romantic relationships, compared to those with married parents, have a greater likelihood for experiencing paternal incarceration. Children of fathers with high school diplomas or post-secondary education, compared to children of fathers without a high school diploma, have a lower likelihood of experiencing paternal incarceration. Furthermore, fathers' substance abuse, impulsive behaviors, and previous incarceration are all independently associated with the propensity children experience paternal incarceration between the one- and nine-year surveys. Results are substantively similar across the additional four imputed data sets.

Covariate Balance Across Treatment and Control Groups. Next, I examine covariate balance across the treatment (children who experienced paternal incarceration) and control (children who did not experience paternal incarceration) groups. The first three columns in Table 2 display the means of covariates in the treatment group prior to matching, the means of covariates in the control group prior to matching, and the p -value of the difference across the two groups for the first imputed data set. The unmatched means show that children with and without incarcerated fathers have very different early childhood experiences, as there are statistically significant or marginally significant differences across the treatment and control groups for 43 of the 47 covariates. Children of incarcerated fathers, compared to their counterparts, experience an

array of disadvantages prior to matching. For example, about 39% of mothers and 41% of fathers in the treatment group did not have education beyond high school, compared to 27% of both mothers and fathers in the control group ($p < .001$). Similarly, prior to matching, children in the treatment group are more likely to live in poverty (55% compared to 38%, $p < .001$), experience greater material hardship (1.448 compared to 1.040, $p < .001$) and are less likely to have married parents (12% compared to 36%, $p < .001$). Their fathers are more likely to engage in domestic violence (7% compared to 4%, $p < .001$), abuse substances (22% compared to 9%, $p < .001$), and be previously incarcerated (49% compared to 25%, $p < .001$). Their fathers also have higher impulsivity (2.154 compared to 1.952, $p < .001$) and lower cognitive ability (6.255 compared to 6.602, $p < .01$).

[Table 2 about here.]

The stark unmatched differences demonstrate the importance of accounting for observed pre-incarceration differences between children who do and do not experience paternal incarceration. The remaining columns in Table 2 display covariate balance after matching on propensity scores. The post-match means of the treatment and control groups, presented in the fourth and fifth columns, are similar across all covariates. For example, about 38% of children in the treatment and control groups have mothers without a high school diploma or GED. Matching substantially reduces bias (displayed in the sixth column) and makes the difference between the treatment and control groups statistically indistinguishable from one another (displayed in the seventh column). The final four columns, which display the p -value of the difference between the matched treatment and control groups for the remaining four imputed data sets, show no statistically significant differences between the matched treatment and control groups. Therefore, paternal incarceration is the only observed characteristic that varies across these two groups.

Estimating the Average Effects. The final step, as shown in Table 3, estimates the average effect of paternal incarceration on the five indicators of child wellbeing. The unmatched estimates (reported in standard deviation units), displayed in the first column, show that paternal incarceration is associated with more problem behaviors and less favorable cognitive skills. Children of incarcerated fathers, compared to their counterparts without incarcerated fathers, have more internalizing behaviors ($b = 0.163, p < .001$) and more externalizing behaviors ($b = 0.374, p < .001$). Children of incarcerated fathers also have lower test scores ($b = -0.245, p < .001$ for reading comprehension; $b = -0.281, p < .001$ for math comprehension; $b = -0.302, p < .001$ for verbal ability).

[Table 3 about here.]

The matched estimates, those that compare the treatment and control groups after matching on propensity scores, are displayed in the second column. Paternal incarceration remains statistically significantly associated with children's problem behaviors. Paternal incarceration is associated with higher internalizing behaviors ($b = 0.124, p < .01$) and higher externalizing behaviors ($b = 0.209, p < .001$). But these matched estimates show that the association between paternal incarceration and children's cognitive skills is small and statistically insignificant. On average, children who do and do not experience paternal incarceration have similar reading comprehension ($b = -0.066, n.s.$), math comprehension ($b = -0.046, n.s.$), and verbal ability ($b = -0.056, n.s.$). The doubly robust propensity score models, those that further adjust for all covariates, reveal nearly identical findings (and are not presented in the interest of parsimony).

Estimating the Heterogeneous Effects of Paternal Incarceration

Covariate Balance Across Treatment and Control Groups. I next consider the possibility that the average effects of paternal incarceration mask variation across children's propensities for experiencing paternal incarceration. Table 4 displays the means for the treatment and control groups across the three propensity score strata: children with a low propensity for experiencing paternal incarceration (those with a 0% to 20% chance), children with a moderate propensity for experiencing paternal incarceration (those with a 20% to 40% chance), and children with a high propensity for experiencing paternal incarceration (those with a 40% to 80% chance).

Table 4 yields two main conclusions. First, children in Stratum 1 are generally more advantaged than their counterparts in Stratum 2 or Stratum 3. For example, children in Stratum 1 are unlikely to be living in poverty and are likely to have married parents with post-secondary education. On average, their fathers have high cognitive skills, low impulsive behaviors, and are unlikely to be previously incarcerated. This is in comparison to children in Stratum 3. These children, on average, live in poverty, have unmarried parents, and have previously incarcerated fathers. Second, this table shows that within-strata covariate balance is achieved. Within Stratum 1, Stratum 2, and Stratum 3, the treatment and control groups have a similar distribution of observed covariates and only differ by paternal incarceration.

[Table 4 about here.]

Estimating the Heterogeneous Effects. In Table 5, I estimate the heterogeneous effects of paternal incarceration on children's problem behaviors and cognitive skills. I turn first to the matched estimates of children's problem behaviors. The Level 1 coefficients show that, in Stratum 1, children with incarcerated fathers have internalizing behaviors that are about one-third of a standard deviation higher than their counterparts without incarcerated fathers ($b = 0.313, p < .001$). This positive and statistically significant association also exists in Stratum 2,

though the coefficient is smaller in magnitude ($b = 0.174, p < .05$), and is statistically insignificant in Stratum 3 ($b = 0.045, n.s.$). The Level 2 slope demonstrates that, for each unit change in strata, there is a 0.134 standard deviation decrease in the effect of paternal incarceration ($p < .05$). Therefore, the deleterious consequences of paternal incarceration for internalizing behaviors are unequal and are concentrated among relatively advantaged children, those with low propensities for experiencing paternal incarceration.

[Table 5 about here.]

The matched estimates of externalizing behaviors produce similar results. Paternal incarceration is associated with two-fifths of a standard deviation increase in externalizing behaviors in Stratum 1 ($b = 0.393, p < .001$), one-third of a standard deviation increase in Stratum 2 ($b = 0.358, p < .001$), and one-sixth of a standard deviation increase in Stratum 3 ($b = 0.156, p < .01$). The Level 2 slope shows that there is a 0.121 standard deviation decrease in the effect of paternal incarceration across each unit change in strata ($p < .05$). Taken together, paternal incarceration is negatively associated with children's externalizing behaviors, regardless of their propensity for experiencing incarceration, but this association is strongest among children with low propensities for experiencing incarceration. Figure 1 shows graphical depictions of the heterogeneous relationships between paternal incarceration and children's problem behaviors.

[Figure 1 about here.]

I turn next to the matched estimates of cognitive skills. Across all three outcomes, children in Stratum 1, those least likely to experience paternal incarceration, suffer negative effects of paternal incarceration. In Stratum 1, children who experience paternal incarceration, compared to those who do not, have lower reading comprehension skills ($b = -0.256, p < .01$),

lower math comprehension skills ($b = -0.307, p < .01$), and lower verbal ability scores ($b = -0.277, p < .01$). Among children in Stratum 2 and Stratum 3, there are no statistically significant associations—negative or positive—between paternal incarceration and cognitive skills. The Level 2 slopes are statistically significant for reading and math comprehension, suggesting that these within-strata differences are statistically significant. For estimates of verbal ability, the Level 2 slopes are in the same direction but do not reach statistical significance.⁷ These results, especially in light of the null average effects of paternal incarceration on children’s cognitive skills, highlight the importance of considering variation across the propensity score distribution. See Figure 2 for graphical depictions of these heterogeneous relationships.

[Figure 2 about here.]

Robustness Checks. The results above show that children in Stratum 1, children who have relatively advantaged social contexts prior to paternal incarceration, experience the most deleterious consequences of paternal incarceration. One explanation for the concentration of this disadvantage may be that these children have further to fall than their counterparts. But because paternal incarceration is measured between the one- and nine-year surveys, and there are no measures of problem behaviors or cognitive skills at the baseline or one-year surveys, it is impossible to adjust for this possibility with lagged dependent variables. Therefore, in supplemental analyses, I estimate the outcome variables as function of paternal incarceration between the three- and nine-year surveys and control for lagged dependent variables measured at the three-year survey (and, thus, prior to this supplemental measure of paternal incarceration).⁸

⁷ The fact that the Level 2 slopes are statistically significant for four of the five outcomes is noteworthy, as these estimates are generated from only three data points (e.g., Schafer et al. 2013).

⁸ The estimates of internalizing and externalizing behaviors control for internalizing and externalizing behaviors, respectively, at the three-year survey. The estimates of reading comprehension, math comprehension, and verbal ability control for verbal ability at the three-year survey (as that is the only measure of cognitive skills measured then).

The results are similar to the main analyses presented in Table 4. First, for the estimates of internalizing behaviors and all three measures of cognitive skills, the deleterious effects of paternal incarceration are concentrated among children in Stratum 1, those who are least likely to experience paternal incarceration. Paternal incarceration is equally detrimental for externalizing problems across all three strata. Second, the between-stratum differences are statistically significant for all but one (verbal ability) of the five outcomes. Therefore, the results persist despite accounting for the possibility that relatively advantaged children have farther to fall.

Considering Selection into Incarceration. Taken together, results provide evidence of heterogeneous effects of paternal incarceration on child wellbeing. Paternal incarceration is more detrimental for children relatively unlikely to experience incarceration than for children relatively likely to experience incarceration. Further, in the case of cognitive skills, paternal incarceration is *only* detrimental to children with a low propensity for experiencing it. But, given that the propensity score framework only matches individuals on observable—and not unobservable—characteristics, it is possible that the observed patterns result from unobserved selection into incarceration. Therefore, in Table 6, I present results from Rosenbaum sensitivity analyses that document the amount of unobserved heterogeneity that would have to exist to render the observed relationships statistically insignificant (Rosenbaum 2002, 2010; also see Becker and Caliendo 2007). Given that Stratum 1 is the stratum that documents consistently significant and detrimental intergenerational consequences of paternal incarceration, I restrict these analyses to observations in this stratum ($n = 1,070$). These findings show that an unobserved characteristic would have to increase the odds of being incarcerated by 60% ($\Gamma = 1.6$) for internalizing behaviors, by 130% ($\Gamma = 2.3$) for externalizing behaviors, by 80% ($\Gamma = 1.8$) for reading comprehension, by 120% ($\Gamma = 2.2$) for math comprehension, and by 100% ($\Gamma = 2.0$)

for verbal ability. In Appendix Table B, which shows predictors of paternal incarceration, only parental relationship status is associated with a similar odds of paternal incarceration. Therefore, these percentages, in conjunction with the wide array of observed characteristics used to predict paternal incarceration, suggest that unobserved factors would need to be substantial to render these results statistically insignificant.

[Table 6 about here.]

DISCUSSION

The rise in mass incarceration and its unequal distribution across the population means that children, especially poor and minority children, are increasingly vulnerable to experiencing paternal incarceration (Wildeman 2009). Indeed, in response to this contemporary form of childhood vulnerability, researchers have increasingly investigated the unintended collateral consequences of paternal incarceration for children, mostly documenting negative effects (for reviews, see Johnson and Easterling 2012; Murray and Farrington 2005; Wildeman and Western 2010; Wildeman et al. 2013) and suggesting that incarceration may exacerbate inequality among children (Wakefield and Wildeman 2013). But there are good reasons to expect that the intergenerational collateral consequences of paternal incarceration are not distributed equally. The life course perspective, as well as complimentary theories about event and chronic stressors, suggest that some children are more vulnerable to paternal incarceration than other children, and understanding these inequalities is vital for documenting the complex and countervailing ways that paternal incarceration contributes to or exacerbates childhood inequalities (Sampson 2011).

Therefore, in this manuscript, I use longitudinal data from the Fragile Families and Child Wellbeing Study and a series of propensity score matching techniques to make two contributions

to the growing literature on the collateral consequences of paternal incarceration. First, the results provide the first broadly representative evidence estimating the average effects of paternal incarceration in middle childhood, a pivotal life course stage (Kowaleski-Jones and Duncan 1999). Consistent with the life course perspective that highlights the interdependency of parents and children, I find that, descriptively, children who experienced paternal incarceration between ages one and nine, compared to their counterparts, have more problem behaviors and fewer cognitive skills. The effect of paternal incarceration on children's problem behaviors, but not children's cognitive skills, remains after matching children with and without incarcerated parents. The deleterious consequences for children's problem behaviors are consistent with other research examining children's behaviors in early childhood (Geller et al. 2012; Wildeman 2010) and adolescence (Kjellstrand and Eddy 2011). The null average effects are consistent with the null average effects on test scores among younger children (Geller et al. 2009; Geller et al. 2012) though inconsistent with negative average effects on children's high school grade point averages (Foster and Hagan 2007). Together, these findings suggest that the negative average effects of paternal incarceration on children's cognitive skills may increase as children age, and future research should directly consider this possibility.

Second, and also consistent with the life course perspective that documents the importance of social contexts, the contexts that shape children's likelihood of experiencing paternal incarceration matter. Importantly, the Fragile Families data, with its over-representation of nonmarital births, is a relatively disadvantaged sample, so even those children with a relatively low risk of experiencing paternal incarceration are still a disadvantaged group. For children relatively unlikely to experience paternal incarceration (those with a 0% to 20% chance), incarceration is detrimental for their problem behaviors and cognitive skills. But for

children relatively likely to experience paternal incarceration (those with a 40% to 80% chance), incarceration, by and large, has no effect on problem behaviors or cognitive skills. Externalizing behaviors is the one exception, as incarceration is consequential for these problem behaviors across the propensity score distribution, but, even here, paternal incarceration is more detrimental at the lower end of the propensity score distribution. This may explain why existing research is remarkably consistent about paternal incarceration's effects on children's externalizing behaviors, almost always documenting negative effects, but less consistent about paternal incarceration's effects on internalizing behaviors (e.g., Geller et al. 2012; Murray and Farrington 2008a; Wilbur et al. 2007). The heterogeneous effects are especially informative for cognitive skills, as these findings suggest the null average effects may mask patterns of variation (Turney 2014). More generally, the heterogeneous effects are quite consistent with qualitative research that documents how incarceration can be detrimental, beneficial, or inconsequential for families (Braman 2004; Comfort 2008; Edin et al. 2004; also see Turney and Wildeman 2013).

Why are the intergenerational consequences of paternal incarceration concentrated among children whose social contexts put them at low risk of experiencing paternal incarceration? Theories about social stressors—and, specifically, event stressors—provide some guidance (Eaton 1978; Wheaton 1982). Children unlikely to experience paternal incarceration have a relatively advantaged social context and, for these children, paternal incarceration may be an unexpected event that is detrimental for family life. The effects of incarceration may be more dramatic and pronounced for these families, as it is likely these families that experience the biggest loss, suffer the most changes in family routines, are unprepared for the resultant hardship, and are unable to mobilize social support networks. Another explanation is that, given the relatively advantaged social contexts of these children's lives, they have farther to fall.

However, supplemental analyses that considered this possibility show a pattern of results suggesting this is not true.

Furthermore, by and large, there are no positive or negative intergenerational consequences of paternal incarceration among children whose social contexts put them at a high risk of experiencing paternal incarceration (Giordano 2010; Sampson 2011). These children are relatively disadvantaged and, for them, the descriptive differences by paternal incarceration are mostly explained by these social factors that select them in to experiencing paternal incarceration. For these children, paternal incarceration occurs amongst a saturation of additional disadvantages, and this constellation of disadvantages means that paternal incarceration produces no additional negative effects on children's internalizing behaviors and cognitive skills (though is still deleterious for children's externalizing behaviors). Importantly, there are also no positive effects of paternal incarceration among this group, suggesting that incarceration is neither harming nor helping these children.

Aside from the multi-faceted and complex disadvantages faced by these most disadvantaged children, which may explain the mostly null effects among children in this group, there are additional potential explanations for these null effects. One explanation may be that children stop accumulating adverse consequences once they hit a certain point of saturation (Hannon 2003). For example, fathers of these disadvantaged children are likely to have been incarcerated prior to their children's birth and it is possible that, for these fathers, earlier incarceration set in motion a saturation of disadvantages. A related explanation may be that incarceration offers relief from other stressors such as domestic violence or economic deprivation (Wheaton 1990). Finally, it may be that, for children in this group, the positive and negative effects of incarceration offset one another, as the heterogeneous treatment effects

models do not consider within-stratum heterogeneity. One could envision a scenario where incarceration simultaneously had negative effects on children's wellbeing because of its resultant severe economic deprivation but had positive effects on children's wellbeing because of its removal of violent men from households. Future research, ideally qualitative research more appropriately positioned to investigate such nuances, should rigorously interrogate these possibilities.

Limitations

These findings are not immune to limitations. Perhaps most importantly, children were not randomly assigned to paternal incarceration and observed associations may result from unmeasured variables that could render the average and heterogeneous effects of paternal incarceration statistically insignificant. I minimize this potential bias with quasi-experimental methods, a series of propensity score models that proceed under the ignorability assumption. It is possible that unobserved confounders exist, but two aspects of the methodological approach suggest it is unlikely. First, the Rosenbaum bounds suggest that unobserved forces would have to be considerable. It is unlikely there is an unobserved variable—one that is uncorrelated with any of the 47 variables used to generate the propensity score—that would render the observed relationships statistically insignificant. Second, and importantly, the models estimating heterogeneous effects show that the results are concentrated among children who are relatively unlikely to experience paternal incarceration. If there exists negative selection into incarceration, it seems likely that the effects would be instead concentrated among children who are relatively likely to experience incarceration.

Additionally, like nearly all research on the intergenerational consequences of paternal incarceration, the measures of paternal incarceration are limited. They do not allow me to disentangle the complex and heterogeneous incarceration experiences, and it is quite possible that different types of incarceration experiences differentially affect families and children. Children may be differentially affected by incarceration duration, the chronicity of incarceration stints, incarceration type (i.e., prison versus jail), reason for incarceration, and visiting policies. Future research should consider these possibilities.

Conclusions

Limitations aside, these findings extend prior research on the intergenerational consequences of paternal incarceration by considering problem behaviors and cognitive skills in middle childhood, an important life course period, and by showing that an examination of average effects masks substantial heterogeneity. Taken in conjunction with the fact that problem behaviors and cognitive skills may have lasting implications for future educational and occupational success (Featherman and Hauser 1978), these findings suggest that the implications of paternal incarceration may be long-lasting. But these findings also suggest the intergenerational consequences of paternal incarceration are more complicated than previously documented. Although children who experience paternal incarceration are some of the most disadvantaged and vulnerable children, the *effects* of incarceration are, by and large, confined to the least vulnerable of these vulnerable children, those children with relatively advantaged social contexts prior to incarceration. Therefore, as incarceration is concentrated among the most disadvantaged subgroups of the population, it is likely that incarceration increases inequality

among all children but may especially increase inequality among children for whom incarceration is unanticipated.

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Table 1. Descriptive Statistics of Variables Used In Analyses

	Mean	(S.D.)	Minimum	Maximum
<i>Child wellbeing</i>				
Internalizing behaviors	0.160	(0.178)	0	2
Externalizing behaviors	0.180	(0.197)	0	2
Reading comprehension	92.918	(13.538)	1	136
Math comprehension	98.244	(15.462)	1	152
Verbal ability	92.854	(14.795)	44	159
<i>Key independent variable</i>				
Paternal incarceration	0.307			
<i>Mother characteristics</i>				
Race (b)				
Non-Hispanic White	0.211			
Non-Hispanic Black	0.496			
Hispanic	0.261			
Non-Hispanic other race	0.033			
Foreign-born (b)	0.139			
Age at first birth (y1)	21.392	(5.140)	13	45
Lived with both biological parents at age 15 (b)	0.412			
Education (y1)				
Less than high school	0.305			
High school diploma or GED	0.282			
Post-secondary education	0.413			
Lives in public housing (y1)	0.144			
Receives welfare (y1)	0.259			
Neighborhood disadvantage index (y1)	0.026	(3.454)	-8	17
Lives with parent (y1)	0.190			
Number of children in household (y1)	2.318	(1.331)	0	10
Multi-partnered fertility (y1)	0.378			
In poverty (y1)	0.428			
Material hardship (y1)	1.165	(1.623)	0	9
Employed (y1)	0.547			
Relationship to child's father (y1)				
Married	0.288			
Cohabiting	0.271			
Non-residential romantic	0.103			
No romantic relationship	0.338			
Relationship quality with child's father (y1)	3.230	(1.437)	1	5
Engagement with focal child (y1)	4.846	(1.521)	0	7
Parenting stress (y1)	2.207	(0.676)	1	4
Fair or poor health (y1)	0.132			
Depression (y1)	0.154			
Substance use (y1)	0.087			
Impulsivity (y5)	1.525	(0.486)	1	4
Cognitive ability (y3)	6.775	(2.686)	0	15
<i>Father characteristics</i>				
Foreign-born (b)	0.150			
Education (y1)				

Less than high school	0.312			
High school diploma or GED	0.359			
Post-secondary education	0.330			
Multi-partnered fertility (y1)	0.404			
Shared responsibility in parenting (y1)	2.836	(1.119)	1	4
Cooperation in parenting (y1)	3.345	(0.912)	1	4
Engaged in domestic violence (y1)	0.045			
Substance abuse problem (b, y1)	0.131			
Impulsivity (y1)	2.014	(0.697)	1	4
Cognitive ability (y3)	6.495	(2.743)	0	15
Previously incarcerated (b, y1)	0.324			
<i>Child characteristics</i>				
Male (b)	0.523			
Age, in months (y9)	112.432	(4.337)	104	132
Born low birth weight (b)	0.092			
Fair or poor health (y1)	0.026			
N	3,146			

Notes: b = measured at the baseline survey; y1 = measured at the one-year survey; y3 = measured at the three-year survey; y5 = measured at the five-year survey; y9 = measured at the nine-year survey.

Table 2. Covariate Balance, By Paternal Incarceration

	Imputed data set = 1							= 2	= 3	= 4	= 5
	Unmatched mean			Matched mean							
	$E(X) d = 1$	$E(X) d = 0$	p	$E(X) d = 1$	$E(X) d = 0$	% bias reduction	p				
<i>Mother characteristics</i>											
Race											
Non-Hispanic White	0.149	0.238	0.000	0.150	0.151	99.6	0.981	0.888	0.953	0.867	0.834
Non-Hispanic Black	0.621	0.440	0.000	0.618	0.612	96.5	0.778	0.721	0.742	0.643	0.608
Hispanic	0.207	0.284	0.000	0.209	0.211	96.7	0.892	0.870	0.804	0.766	0.754
Non-Hispanic other race	0.023	0.037	0.037	0.023	0.026	76.7	0.636	0.713	0.806	0.773	0.763
Foreign-born	0.048	0.179	0.000	0.048	0.047	99.5	0.950	0.986	0.946	0.973	0.965
Age at first birth	19.561	22.203	0.000	19.571	19.571	100.0	0.999	0.884	0.913	0.966	0.974
Lived with both biological parents at age 15	0.302	0.461	0.000	0.303	0.299	97.6	0.859	0.942	0.976	0.890	0.906
Education											
Less than high school	0.388	0.267	0.000	0.385	0.383	97.8	0.905	0.962	0.955	0.939	0.931
High school diploma or GED	0.315	0.268	0.007	0.316	0.318	96.7	0.942	0.993	0.959	0.990	0.907
Post-secondary education	0.297	0.465	0.000	0.299	0.300	99.3	0.958	0.967	0.995	0.924	0.979
Lives in public housing	0.183	0.127	0.000	0.184	0.181	94.4	0.858	0.934	0.855	0.892	0.947
Receives welfare	0.392	0.200	0.000	0.387	0.387	99.8	0.988	0.788	0.877	0.901	0.935
Neighborhood disadvantage index	0.839	-0.335	0.000	0.850	0.875	97.9	0.872	0.774	0.849	0.754	0.856
Lives with parent	0.246	0.165	0.000	0.245	0.246	99.3	0.976	0.959	0.982	0.902	0.980
Number of children in household	2.432	2.267	0.001	2.432	2.427	96.7	0.932	0.988	0.920	0.813	0.896
Multi-partnered fertility	0.434	0.353	0.000	0.432	0.438	92.2	0.781	0.893	0.691	0.828	0.872
In poverty	0.545	0.377	0.000	0.541	0.534	96.0	0.770	0.763	0.769	0.696	0.706
Material hardship	1.448	1.040	0.000	1.436	1.424	96.9	0.874	0.855	0.966	0.958	0.775
Employed	0.511	0.563	0.007	0.513	0.524	78.5	0.624	0.655	0.666	0.566	0.616
Relationship to child's father											
Married	0.117	0.363	0.000	0.118	0.116	99.1	0.885	0.871	0.822	0.805	0.900
Cohabiting	0.274	0.269	0.768	0.277	0.301	-190.0	0.232	0.260	0.268	0.232	0.182
Non-residential romantic	0.152	0.082	0.000	0.150	0.140	84.8	0.506	0.603	0.636	0.498	0.556
No romantic relationship	0.457	0.286	0.000	0.455	0.443	93.0	0.599	0.578	0.593	0.657	0.467
Relationship quality with child's father	2.880	3.385	0.000	2.887	2.897	98.1	0.882	0.955	0.844	0.902	0.876
Engagement with focal child	4.922	4.812	0.063	4.920	4.930	91.4	0.889	0.987	0.929	0.968	0.979
Parenting stress	2.241	2.192	0.065	2.236	2.227	79.8	0.753	0.923	0.886	0.873	0.937
Fair or poor health	0.147	0.125	0.096	0.148	0.149	95.6	0.953	0.983	0.888	0.943	0.968
Depression	0.181	0.142	0.005	0.181	0.180	98.4	0.971	0.933	0.940	0.977	0.848
Substance use	0.117	0.074	0.000	0.113	0.114	96.2	0.911	0.987	0.975	0.983	0.963

Impulsivity	1.586	1.498	0.000	1.578	1.582	94.7	0.836	0.956	0.977	0.803	0.933
Cognitive ability	6.575	6.864	0.005	6.588	6.626	86.8	0.738	0.811	0.972	0.866	0.987
<i>Father characteristics</i>											
Foreign-born	0.069	0.186	0.000	0.070	0.070	99.9	0.989	0.818	0.984	0.873	0.934
Education											
Less than high school	0.412	0.267	0.000	0.408	0.392	89.2	0.483	0.714	0.502	0.572	0.514
High school diploma or GED	0.389	0.345	0.018	0.391	0.411	56.0	0.390	0.612	0.460	0.465	0.518
Post-secondary education	0.199	0.388	0.000	0.200	0.197	98.1	0.845	0.862	0.934	0.838	0.994
Multi-partnered fertility	0.49	0.366	0.000	0.489	0.490	99.2	0.964	0.712	0.766	0.691	0.926
Shared responsibility in parenting	2.609	2.936	0.000	2.608	2.664	89.0	0.500	0.590	0.473	0.574	0.389
Cooperation in parenting	3.231	3.396	0.000	3.229	3.237	94.9	0.846	0.911	0.835	0.945	0.782
Engaged in domestic violence	0.066	0.036	0.000	0.065	0.063	95.3	0.899	0.878	0.906	0.908	0.871
Substance abuse problem	0.215	0.094	0.000	0.209	0.209	99.9	0.994	0.986	0.837	0.907	0.943
Impulsivity	2.154	1.952	0.000	2.147	2.132	92.3	0.642	0.729	0.633	0.665	0.691
Cognitive ability	6.255	6.602	0.001	6.267	6.305	89.0	0.746	0.679	0.683	0.698	0.716
Previously incarcerated	0.490	0.250	0.000	0.485	0.473	95.0	0.598	0.605	0.552	0.656	0.765
<i>Child characteristics</i>											
Male	0.532	0.519	0.507	0.530	0.534	70.3	0.867	0.991	0.908	0.927	0.900
Age	112.520	112.390	0.458	112.500	112.450	57.4	0.790	0.837	0.965	0.825	0.953
Born low birth weight	0.104	0.088	0.156	0.104	0.109	68.5	0.723	0.936	0.954	0.945	0.792
Fair or poor health	0.037	0.021	0.007	0.037	0.033	79.0	0.678	0.768	0.701	0.612	0.602
N	958	2,180		958	2,180						

Note: $E(X) | d = 1$ indicates means for treatment group (children with incarcerated fathers). $E(X) | d = 0$ indicates means for control group (children without incarcerated fathers). Postmatch estimates based on kernel matching.

Table 3. Propensity Score Matching Estimates of the Average Effects of Paternal Incarceration on Child Wellbeing

	Unmatched		Matched	
Internalizing behaviors	0.163	(0.039) ***	0.124	(0.049) **
Externalizing behaviors	0.374	(0.038) ***	0.209	(0.051) ***
Reading comprehension	-0.245	(0.038) ***	-0.066	(0.044)
Math comprehension	-0.281	(0.038) ***	-0.046	(0.044)
Verbal ability	-0.302	(0.038) ***	-0.056	(0.039)
Treatment N	958		958	
Control N	2,180		2,180	

Notes: All dependent variables are standardized (mean = 0, standard deviation = 1). Propensity scores are estimated with a logistic regression model estimating paternal incarceration (between the one- and nine-year surveys) as a function of pre-incarceration covariates in Table 1. Matched estimates are based on kernel matching. Standard errors are in parentheses. * $p < .05$, ** $p < .01$, *** $p < .001$ (two-tailed tests).

Table 4. Covariate Balance, by Paternal Incarceration and Propensity Score Strata

	Stratum 1 $p = [0 - .20)$			Stratum 2 $p = [.20 - .40)$			Stratum 3 $p = [.40 - .80)$		
	$E(X) d = 1$	$E(X) d = 0$	p	$E(X) d = 1$	$E(X) d = 0$	p	$E(X) d = 1$	$E(X) d = 0$	p
<i>Mother characteristics</i>									
Race									
Non-Hispanic White or other race	0.293	0.318	0.668	0.195	0.181	0.646	0.081	0.086	0.800
Non-Hispanic Black	0.244	0.235	0.865	0.573	0.583	0.775	0.748	0.747	0.948
Hispanic	0.398	0.416	0.780	0.212	0.209	0.909	0.156	0.157	0.959
Foreign-born	0.293	0.309	0.786	0.029	0.024	0.691	0.000	0.000	1.000
Lived with both biological parents at age 15 (b)	0.545	0.554	0.883	0.352	0.349	0.938	0.211	0.214	0.920
Post-secondary education	0.602	0.600	0.981	0.381	0.383	0.962	0.164	0.159	0.810
Lives in public housing	0.089	0.096	0.861	0.134	0.136	0.917	0.241	0.243	0.942
Lives with parent	0.114	0.112	0.972	0.201	0.194	0.823	0.312	0.301	0.700
Number of children in household	2.041	2.045	0.977	2.380	2.406	0.811	2.554	2.532	0.793
Multi-partnered fertility	0.309	0.302	0.907	0.433	0.436	0.945	0.469	0.472	0.911
In poverty	0.236	0.238	0.965	0.433	0.424	0.813	0.696	0.700	0.881
Employed	0.634	0.634	0.999	0.593	0.593	0.990	0.424	0.424	0.994
Married to or cohabiting with child's father	0.846	0.844	0.969	0.570	0.578	0.829	0.150	0.156	0.790
Fair or poor health	0.130	0.132	0.960	0.125	0.124	0.982	0.168	0.175	0.788
Depression	0.106	0.104	0.974	0.148	0.150	0.959	0.219	0.209	0.693
Cognitive skills (high)	0.341	0.338	0.959	0.218	0.214	0.902	0.138	0.137	0.965
<i>Father characteristics</i>									
Post-secondary education	0.512	0.519	0.914	0.265	0.263	0.961	0.075	0.071	0.810
Multi-partnered fertility	0.252	0.262	0.866	0.471	0.459	0.763	0.564	0.574	0.741
Engaged in domestic violence	0.033	0.026	0.748	0.029	0.029	0.949	0.099	0.102	0.880
Substance abuse problem	0.407	0.389	0.778	0.360	0.352	0.819	0.274	0.278	0.877
Cognitive skills (high)	0.325	0.313	0.833	0.212	0.217	0.872	0.154	0.155	0.981
Impulsivity (high)	0.138	0.140	0.974	0.244	0.233	0.738	0.471	0.469	0.956
Previously incarcerated	0.065	0.063	0.942	0.267	0.262	0.866	0.751	0.751	0.978
<i>Child characteristics</i>									
Male	0.496	0.506	0.877	0.520	0.514	0.858	0.550	0.550	0.983
Born low birth weight	0.098	0.088	0.798	0.099	0.100	0.947	0.108	0.111	0.847
N	124	946		347	753		495	481	

Notes: $E(X) | d = 1$ indicates means for treatment group (children with incarcerated fathers). $E(X) | d = 0$ indicates means for control group (children without incarcerated fathers). Children in Stratum 1 have the lowest propensity for experiencing paternal incarceration. Children in Stratum 3 have the highest propensity for experiencing paternal incarceration.

Table 5. Propensity Score Matching Estimates of the Heterogeneous Effects of Paternal Incarceration on Child Wellbeing

	Level 1						Level 2	
	Stratum 1 <i>p</i> = [0 - .20)		Stratum 2 <i>p</i> = [.20 - .40)		Stratum 3 <i>p</i> = [.40 - .80)		Trend	
Internalizing behaviors	0.313	(0.085) ***	0.174	(0.068) *	0.045	(0.067)	-0.134	(0.054) *
Externalizing behaviors	0.393	(0.076) ***	0.358	(0.067) ***	0.156	(0.069) *	-0.121	(0.051) *
Reading comprehension	-0.256	(0.090) **	-0.103	(0.062)	-0.060	(0.067)	0.091	(0.049) *
Math comprehension	-0.307	(0.091) **	-0.079	(0.063)	-0.034	(0.062)	0.121	(0.053) *
Verbal ability	-0.277	(0.106) **	-0.050	(0.059)	-0.082	(0.052)	0.058	(0.053)
Treatment N	124		347		495			
Control N	946		753		481			

Notes: Propensity scores are estimated with a logistic regression model estimating paternal incarceration (between the one- and nine-year surveys) as a function of pre-incarceration covariates in Table 1. Children in Stratum 1 have the lowest propensity for experiencing paternal incarceration. Children in Stratum 3 have the highest propensity for experiencing paternal incarceration. Results are based on kernel matching. Standard errors are in parentheses. * $p < .05$, ** $p < .01$, $p < .001$ (two-tailed tests).

Table 6. Results from Sensitivity Analysis for Treatment Effect on Child Wellbeing, Assuming Overestimation of the Treatment Effect and Restricted to Children in Stratum 1 (N = 1,070)

Gamma (T)	Internalizing	Externalizing	Reading	Math	Verbal ability
	behaviors	behaviors	comprehension	comprehension	
	p	p	p	p	p
1.0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
1.1	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
1.2	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
1.3	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
1.4	0.002	< 0.001	< 0.001	< 0.001	< 0.001
1.5	0.030	< 0.001	< 0.001	< 0.001	< 0.001
1.6	0.158	< 0.001	0.001	< 0.001	< 0.001
1.7		< 0.001	0.009	< 0.001	0.001
1.8		< 0.001	0.055	< 0.001	0.007
1.9		< 0.001		< 0.001	0.039
2.0		0.001		0.004	0.138
2.1		0.005		0.021	
2.2		0.026		0.076	
2.3		0.083			
2.4					
2.5					

Figure 1. Heterogeneous Treatment Effects of Paternal Incarceration on Children's Problem Behaviors

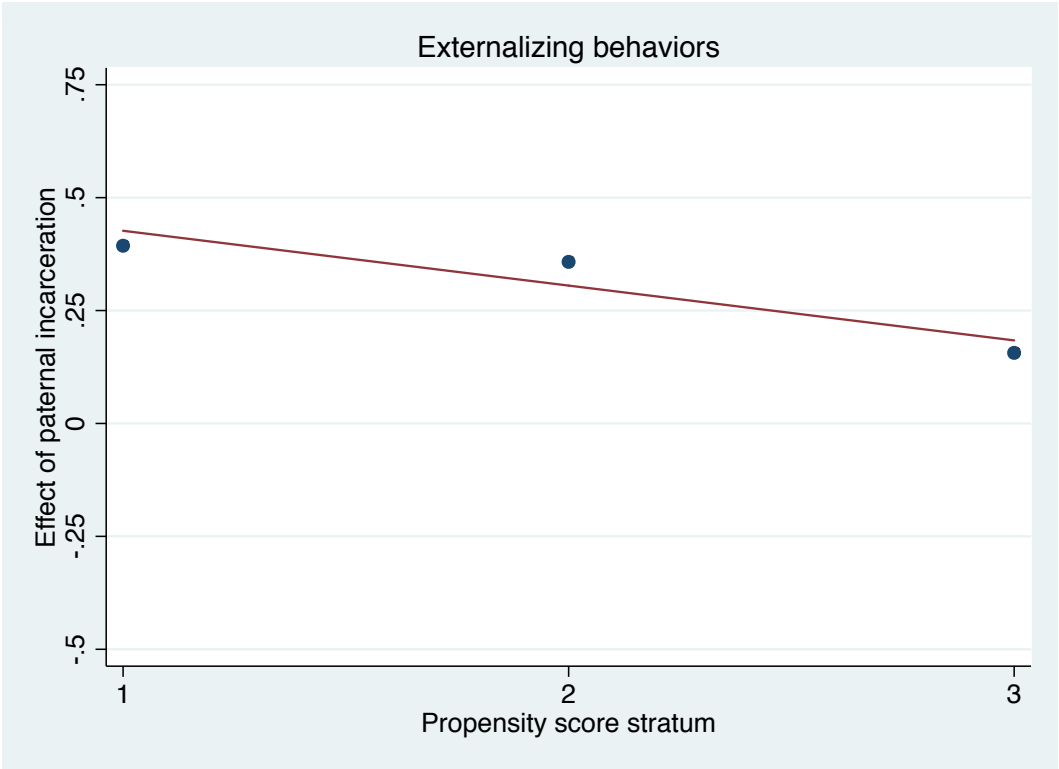
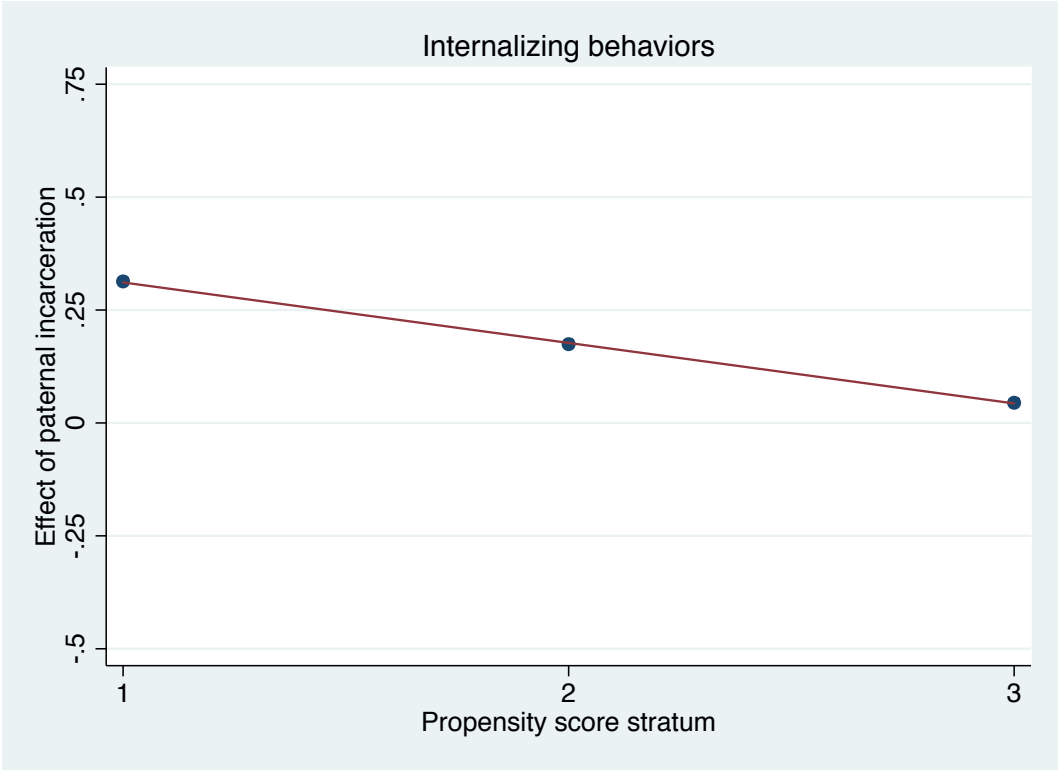
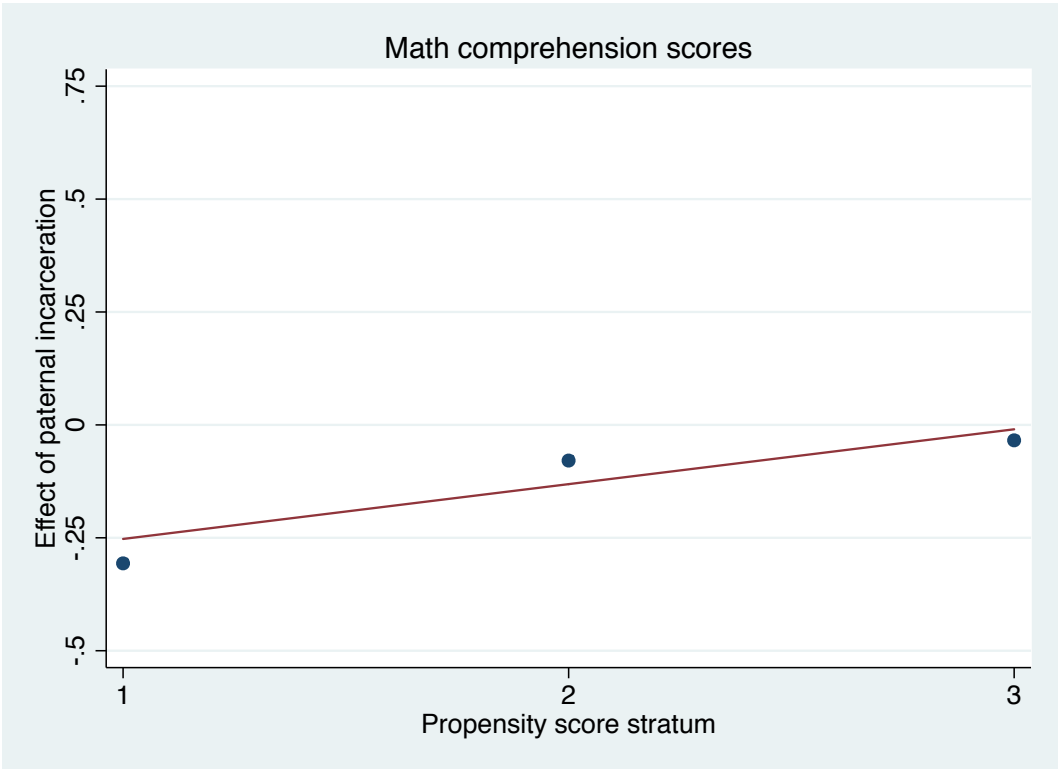
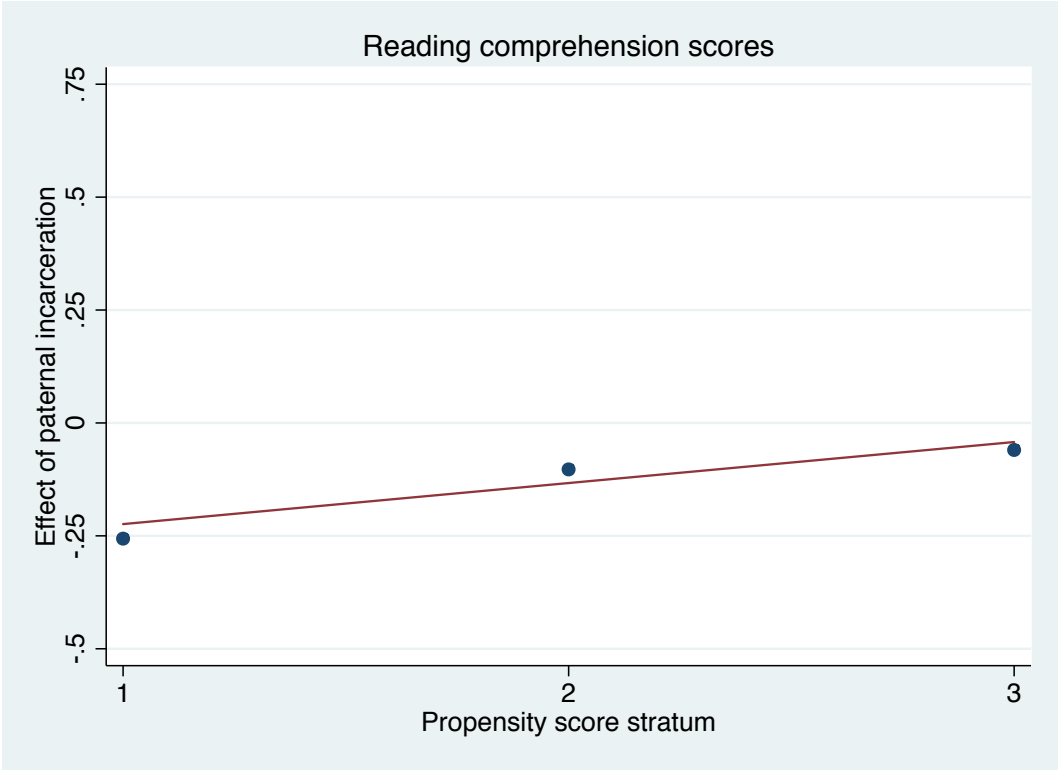
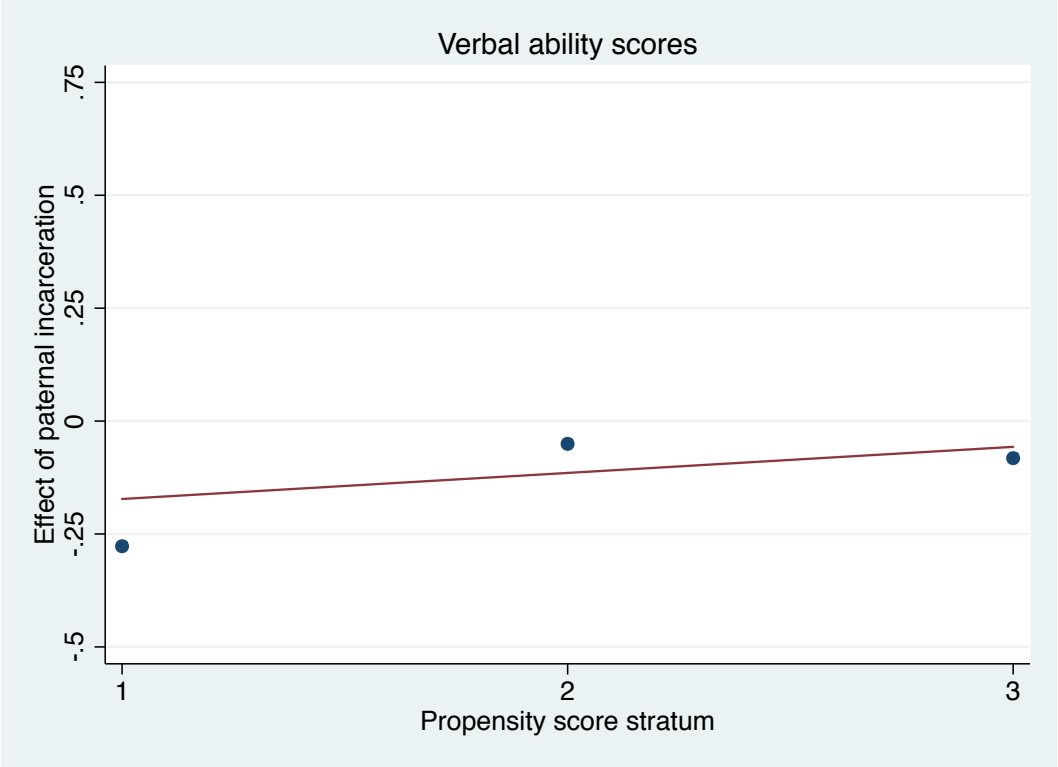


Figure 2. Heterogeneous Treatment Effects of Paternal Incarceration on Children’s Cognitive Skills





APPENDIX

Appendix Table A
Description of Control Variables Included in Analyses

Mother characteristics

Race/ethnicity (b)	Mutually exclusive dummy variables indicating the mother's race/ethnicity: non-Hispanic white, non-Hispanic Black, Hispanic, non-Hispanic other race
Foreign-born (b)	Dummy variables indicating the mother was born outside of United States
Age at first birth (b)	Continuous variable measuring the mother's age at first birth
Lived with both parents at age 15 (b)	Dummy variables indicating the mother lived with both biological parents at age 15
Education (y1)	Mutually exclusive variables indicating the mother's educational attainment: less than high school degree, high school diploma or GED, more than high school
Lives in public housing (y1)	Dummy variable indicating the mother lives in public housing
Receives welfare (y1)	Dummy variable indicating the mother received Temporary Assistance to Needy Families (TANF) in the past year
Neighborhood disadvantage index (y1)	Continuous variable comprised of summing the following four standardized Census tract characteristics: percentage unemployed in the civilian labor force, percentage living below the poverty line, percentage receiving public assistance, and percentage more than 25 years old without a high school degree
Lives with parent (y1)	Dummy variable indicating the mother lives with her mother and/or father
Number of children (y1)	Continuous variable indicating number of children in mother's household
Multi-partnered fertility (y1)	Dummy variable indicating mother shares a child with a partner who is not the focal child's father
In poverty (y1)	Dummy variable indicating the mother has a household income below the official poverty threshold established by the U.S. Census Bureau
Material hardship (y1)	Sum of mother's responses to the following about hardship in the past year: (a) received free food or meals; (b) child/children went hungry; (c) went hungry; (d) did not pay full amount of rent or mortgage payments; (e) were evicted from home or apartment for not paying the rent or mortgage; (f) did not pay the full amount of a gas, oil, or electricity bill; (g) had service turned off by the gas or electric company, or had oil company not deliver oil; (h) had service disconnected from telephone company because payments were not made; (i) borrowed money from friends or family to help pay bills; (j) moved in with other people even for a little while because of financial problems; (k) stayed at a shelter, in an abandoned building, an automobile, or any other place not meant for regular housing even for one night; (l) had someone in household who needed to see a doctor or go to the hospital but couldn't go because of the cost ($\alpha = .70$)

Employed (y1)	Dummy variable indicating the mother worked in the past week
Relationship status (y1)	Mutually exclusive variables indicating the mother's and father's relationship with one another: married, cohabiting, nonresidential romantic relationship, separated
Relationship quality (y1)	Continuous variable indicating mother's relationship quality with the father (1 = <i>poor</i> to 5 = <i>excellent</i>)
Engagement with focal child (y1)	Average of mother's responses to the following about engagement in a typical week (0 = 0 days per week to 7 = 7 days per week): (a) play games like "peek-a-boo" or "gotcha" with child; (b) sing songs or nursery rhymes to child; (c) read stories to child; (d) tell stories to child; (e) play inside with toys such as blocks or legos with child; (f) take child to visit relatives; (g) hug or show physical affection to child; (h) put child to bed ($\alpha = .81$)
Parenting stress (y1)	Average of mother's responses to the following (1 = <i>strongly disagree</i> to 4 = <i>strongly agree</i>): (a) being a parent is harder than I thought it would be; (b) I feel trapped by my responsibilities as a parent; (c) taking care of my children is much more work than pleasure; (d) I often feel tired, worn out, or exhausted from raising a family ($\alpha = .61$)
Fair or poor health (y1)	Dummy variable indicating the mother reported fair or poor health
Major depression (y1)	Dummy variable indicating the mother experienced major depression in the past year, as measured by the Composite International Diagnostic Interview-Short Form (CIDI-SF)
Substance use (y1)	Dummy variable indicating that, in the past month, mother had five or more drinks in one sitting or used illicit drugs
Impulsivity (y5)	Average of mother's responses to the following (1 = <i>strongly agree</i> to 4 = <i>strongly disagree</i>): (a) I often say and do things without considering the consequences; (b) I often get into trouble because I don't think before I act; (c) I do things that may cause trouble with the law; (d) I lie or cheat; (e) I frequently get into fights; (f) I don't seem to feel guilty when I misbehave ($\alpha = .86$)
Cognitive ability (y3)	A continuous variable, measured by the Similarities subtest of the Wechsler Adult Intelligence Scale-Revised (WAIS-R)
<i>Father characteristics</i>	
Foreign-born (b)	Dummy variables indicating the father was born outside of United States
Education (y1)	Mutually exclusive variables indicating the father's educational attainment: less than high school degree, high school diploma or GED, more than high school
Multi-partnered fertility (y1)	Dummy variable indicating father shares a child with a partner who is not the focal child's father
Shared responsibility in parenting (y1)	Average of mother's responses to the following (1 = <i>never</i> to 4 = <i>always</i>): (a) when father is with child, he acts like the father you want for your child; (b) you can trust father to take good care of child; (c) he respects the schedule and rules you make for child; (d) he supports you in the way you want to raise child; (e) you and father talk about problems that come up with raising child; (f) you can count on father for help when

	you need someone to look after child for a few hours ($\alpha = .88$)
Cooperation in parenting (y1)	Average of mother's responses to the following (1 = <i>never</i> to 4 = <i>often</i>): (a) how often father looks after child when you need to do things; (b) how often he runs errands like picking things up from the store; (c) how often he fixes things around the house, paints, or makes it look nicer in other ways; (d) how often he takes child places he/she needs to go, such as to daycare or the doctor ($\alpha = .96$)
Engaged in domestic violence (y1)	Dummy variable indicating father hit, slapped, or kicked mother
Substance abuse problem (b, y1)	Dummy variable indicating mother or father reported father has problems such as keeping a job or getting along with family and friends because of alcohol or drug use
Impulsivity (y1)	Average of father's responses to the following (1 = <i>strongly disagree</i> to 4 = <i>strongly agree</i>): (a) I will often say whatever comes into my head without thinking first; (b) often I don't spend enough time thinking over a situation before I act; (c) I often say and do things without considering the consequences; (d) I often get into trouble because I don't think before I act; (e) many times, the plans I make don't work out because I haven't gone over them carefully enough in advance; (f) I often make up my mind without taking the time to consider the situation from all angles ($\alpha = .84$)
Cognitive ability (y3)	A continuous variable, measured by the Similarities subtest of the Wechsler Adult Intelligence Scale-Revised (WAIS-R)
Previously incarcerated (b, y1)	Dummy variable indicating the father was incarcerated at or prior to the one-year survey
<i>Child characteristics</i>	
Gender (b)	Dummy variable indicating the child is male
Age (y9)	Continuous variable indicating the child's age in months
Born low birth weight (b)	Dummy variable indicating the child was born low birth weight
Fair or poor health (y1)	Dummy variable indicating the mother reports the child is in fair or poor health

Notes: b = measured at baseline survey, y1 = measured at one-year survey, y3 = measured at three-year survey, y5 = measured at the five-year survey, y9 = measured at the nine-year survey.

Appendix Table B. Logistic Regression Model Estimating Paternal Incarceration

<i>Mother characteristics</i>		
Race (reference = non-Hispanic White)		
Non-Hispanic Black	0.120	(0.138)
Hispanic	-0.102	(0.153)
Non-Hispanic other race	0.249	(0.302)
Foreign-born	-0.848	(0.236) ***
Age at first birth	-0.060	(0.013) ***
Lived with both biological parents at age 15	-0.157	(0.096)
Education (reference = less than high school)		
High school diploma or GED	-0.062	(0.113)
Post-secondary education	-0.186	(0.126)
Lives in public housing	-0.070	(0.123)
Welfare	0.217	(0.102) *
Neighborhood disadvantage index	0.012	(0.015)
Lives with parent	0.242	(0.111) *
Number of children in household	-0.060	(0.035)
Multi-partnered fertility	-0.142	(0.101)
In poverty	0.103	(0.100)
Material hardship	0.062	(0.028) *
Mother employment	0.003	(0.093)
Relationship with child's father (reference = married)		
Cohabiting	0.410	(0.140) **
Non-residential romantic	0.758	(0.173) ***
No romantic relationship	0.557	(0.168) **
Relationship quality	-0.130	(0.049) **
Engagement with focal child	0.047	(0.032)
Parenting stress	-0.091	(0.068)
Fair or poor health	-0.042	(0.128)
Depression	-0.052	(0.122)
Substance use	0.245	(0.146)
Impulsivity	0.138	(0.199)
Cognitive ability	-0.007	(0.018)
<i>Father characteristics</i>		
Foreign-born	-0.321	(0.208)
Education (reference = less than high school)		
High school diploma or GED	-0.340	(0.100) **
Post-secondary education	-0.535	(0.128) ***
Multi-partnered fertility	0.180	(0.093)
Shared responsibility in parenting	-0.029	(0.065)
Cooperation in parenting	0.254	(0.076) **
Engaged in domestic violence	-0.099	(0.199)
Substance abuse problem	0.483	(0.127) ***
Impulsivity	0.173	(0.064) **
Cognitive ability	-0.019	(0.017)
Previously incarcerated	0.424	(0.095) ***
<i>Child characteristics</i>		
Male	0.067	(0.086)
Age, in months	0.009	(0.010)
Born low birth weight	-0.180	(0.144)
Fair or poor health	0.474	(0.257)
Log likelihood	-1,645	
Constant	-1.705	
N	3,146	

Notes: Results presented for first imputed data set. Standard errors are in parentheses. * $p < .05$, ** $p < .01$, *** $p < .001$ (two-tailed tests).