# Beyond Absenteeism: Father incarceration and its effects on children's development.

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## Abstract

High rates of incarceration among American men, coupled with high rates of fatherhood among men in prison, have motivated recent research on the effects of parental imprisonment on child development. We use data from the Fragile Families and Child Wellbeing Study to examine the effects of incarceration on approximately 3,000 urban children around the time of their fifth birthdays. We estimate a series of cross-sectional and longitudinal regression models for several measures of child development and school readiness, controlling not only for fathers' basic demographic characteristics and a rich set of potential confounders, (e.g, mothers' demographic background, and details of pre-incarceration family structure and parental behaviors), but also for several measures of pre-incarceration child development, and, for family fixed effects. We find that incarceration significantly aggravates children's externalizing behavior problems, but not physical health, social problems, or verbal ability. Results are mixed with respect to attention problems, and while the majority of models suggest no effects on internalizing behavior problems, one suggests that father incarceration may protect against children's anxious/depressed behavior.

While incarceration is just one of many factors that can contribute to father absence and negatively affect child development, the observed effects of incarceration on children's behavior problems are significantly more damaging for children than the effects of other forms of father absence. These findings suggest that children with incarcerated fathers are a population at particular risk, and require specialized support from caretakers, teachers, and social service providers. We recommend directions for future research to determine the most effective forms this support might take.

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## Introduction

By the end of 2004, the United States had over two million people incarcerated in Federal or State prisons or local jails (Harrison and Beck, 2005), an overwhelming majority of whom were male, and most of whom had children under 18. High rates of fatherhood among men in prison have motivated recent research on the effects of parental imprisonment on child development, and particularly on whether the effects of incarceration are more damaging than the effects of other father absence. Child development and family process theories suggest that parent-child separation carries serious risks for children's physical, cognitive, and socioemotional well-being; moreover, a growing empirical literature identifies barriers to family communication while men are incarcerated, and barriers to reintegration upon their re-entry, that have the potential to impede children's development even further. However, little is known empirically about the risks facing children whose fathers go to jail and prison, or the extent to which the effects of incarceration stand out from the numerous other risks facing disadvantaged families. This study uses a longitudinal survey of urban families to examine the developmental risks facing children of incarcerated men, and a series of statistical models to assess the causal effects of fathers' incarceration on child development.

## Literature Review

The increased use of incarceration since the 1970s has led to an unprecedented number of individuals in the nation's prisons and jails, and this phenomenon is no less striking among parents. In 2002, 1,150,200 parents, mostly fathers, with 2,413,700 minor children, were incarcerated in State and Federal prisons or local jails (Mumola, 2006). Several theoretical perspectives suggest mechanisms by which parental incarceration may create challenges for children; however, little is known empirically about the magnitudes of these effects.

First, attachment theory (Bowlby, 1973) suggests that forced separation from a parent affects children's well-being by disrupting parent-child bonds and generating emotional responses such as sadness, confusion, and anger that negatively impact child behavior and development (Solomon & Zweig, 2006; Sroufe, 1988). Separation as a result of parent incarceration, in particular, carries a unique set of challenges that may place children at even greater risk than other forms of parent-child separation, such as parental divorce. For example, the challenges inherent in

visitation during incarceration may have long-term effects on parent-child relationships (Dyer 2005). Additionally, the social stigma associated with the incarceration of a family member (Comfort 2007), may exacerbate children's response to parent separation.

Second, parent incarceration may impact children through its influence on the economic circumstances of families. The incarceration of a father, even when parents are no longer romantically involved, often leads to substantial decreases in household resources both during incarceration and upon release (Western 2002; Pager 2003; Kling 2006; Geller, Garfinkel, and Western 2008). Resource investment and financial capital models suggest that deprivation of resources, as well as material hardship and residential instability which often follow, negatively influence children's development (Hauser, Brown, & Prosser, 1997). In addition, family process models indicate that the psychological distress associated with economic hardship diminishes parents' capacity for the positive parenting behaviors that promote children's healthy development (McLoyd, 1998; Raver, Gershoff, & Aber, 2007).

Third, the negative effects of incarceration on parents' relationships likely have negative consequences for child well-being. Because criminal justice system involvement is generally a result of illegal activity and police contact, the incarceration of a husband or partner may stigmatize mothers and strain couples' relationships (Edin, 2004). Furthermore, the high costs (both monetary and emotional) of regular communication and visitation decrease the likelihood that couples can maintain healthy relationships during incarceration. The extent to which incarceration places couples at risk for conflict, separation, or divorce (Braman 2004; Lopoo and Western 2005), has important implications for children's development (Amato 2006).

On the other hand, the incarceration of a criminally involved father may prove to have positive consequences for children. Not only does the incarceration of a father have the potential to remove a destabilizing influence from the household, men may use their time in jail or prison as a "turning point", and resolve to redirect their lives, becoming better fathers upon their release. Their experiences in jail and prison may also have a deterrent effect, leading them to desist from future offending, or leading their children away from offending behavior as adolescents and adults (Edin 2004).

However, the empirical literature on parental incarceration and child development is quite limited. The incarcerated population is overwhelmingly young, minority, and poorly-educated (Western 2006, Petersilia 2003), a population whose children face substantial challenges even in

the absence of incarceration. Little data is available to isolate the causal effects of incarceration from the confounding effects of family disadvantage, and most studies in the area are limited by small convenience samples, and cross-sectional or short-term design. They therefore describe a sample of children whose parents have been incarcerated, and in fact suggest that young children of incarcerated parents are likely to exhibit externalizing and internalizing behavior problems (See Parke and Clarke-Stewart, 2002 for a review; Wilbur et al., 2008), but are not population-based, and thus cannot distinguish the challenges faced by children of incarcerated parents from challenges faced by disadvantaged children more generally.

A handful of studies do examine the children of incarcerated parents in the context of their local population, and find them to be at serious risk. Phillips et al (2006) examine a representative sample of school-aged children in rural North Carolina, and find that economic strain and residential instability are significantly associated with a parent's incarceration. While this study does not examine the causal nature of the incarceration relationship, it suggests that families in which a parent is incarcerated should be targeted for attention from social service providers, to help mitigate the risk of adverse child outcomes. Likewise, Geller, Garfinkel, Cooper, and Mincy (2008) examine a population-based sample of three-year-old children in large cities, and find that while children whose fathers have been incarcerated are statistically indistinguishable from their counterparts on some of developmental metrics, they face significantly more economic, family, and residential instability, and are marginally more likely to display aggressive behavior problems. Although this study controls for a rich set of observable characteristics that are likely to influence both incarceration history and child development, and identifies significant risks facing children of incarcerated parents, it does not attempt to control for unobserved characteristics that distinguish families with incarceration histories, and thus cannot attribute the observed instability or behavior problems to a causal effect of incarceration. Wildeman (2008), on the other hand, examines this same sample of families, and focuses on within-family changes to identify the effects of incarceration on children's physically aggressive behaviors. He finds that paternal incarceration does indeed increase boys' physical aggression, and suggests that the widespread use of incarceration may, with time, have the collateral consequence of transmitting criminal behavior from fathers to sons.

The findings from these population-based samples suggest that children face significant negative consequences from their fathers' incarceration, and the current study advances our understanding of these consequences. Like the analyses of Geller, Garfinkel, Cooper, and Mincy

(2008) and Wildeman (2008), ours is based on data from the Fragile Families and Child Wellbeing Study ("Fragile Families"), a population-based sample of urban children well-suited for studying parental incarceration. The study's focus on large cities identifies a population where incarceration is particularly prevalent, and, as a population-based study of families, rather than a sample of inmates or offenders, it provides a large comparison sample of children whose fathers have not been incarcerated. Further, its focus on unmarried parents allows a unique comparison: that of children whose fathers become incarcerated and those whose fathers become absent for other reasons. Finally, the survey also asks a diverse set of questions about parents' demographic, socioeconomic, and behavioral backgrounds, and a number of child wellbeing outcomes.

This study extends the previous literature, and previous Fragile Families analyses in particular, both by examining a broad range of child development metrics, and the detailed comparison of children whose fathers were absent due to incarceration and those whose fathers were absent for other reasons. The analysis applies a number of statistical methods to distinguish the causal effect of incarceration on these outcomes from the confounding effects of other family characteristics, observed and unobserved.

### Data

The analysis is based on data from the Fragile Families study, which follows a cohort of nearly 5,000 couples with children born between 1998 and 2000 in twenty large U.S. cities. The study systematically oversamples unmarried parents, but when weighted or regression-adjusted is nationally representative of urban families with children. The study surveys both mothers and fathers at the time of their child's birth, with follow-up surveys conducted when the children are one, three, and five years old. The study was initially designed to address three areas of interest – nonmarital childbearing, the role of fathers, and welfare reform – and their effects on family formation and children's wellbeing. It has since expanded to further examine the roles of social and material disadvantage. (See Reichman et al., 2001 for further detail)

## Measuring paternal incarceration

Our measure of fathers' incarceration follows the survey construction, and is based primarily on both his and his partner's report of whether he has been to either jail or prison. These measures are then supplemented with "indirect reports" of incarceration, in which either parent may indicate that their lives have been affected by his incarceration (i.e., citing incarceration as a reason they were separated from their child, or were unable to find a job), even if they do not report the incarceration directly. In total, we

identify 1,341 families in which the father has spent some time in prison or jail. To fully assess the effects of incarceration, we focus on two distinct comparisons. We first identify a broad causal effect of fathers' incarceration on children, and then examine the effects of both incarceration and other forms of father absence, and then examine whether the effects of fathers' incarceration lead to more severe challenges for children. We first compare the 1,341 children whose fathers were incarcerated to all those whose fathers were never incarcerated, and then further distinguish the 841 children whose fathers were absent for reasons other than incarceration, to compare the effects of father incarceration to other forms of father absence.

In each of our examinations of fathers' incarceration, we also include a control for maternal incarceration in the time period of interest. Men with incarceration histories are significantly more likely to partner with women who have also been to jail or prison (Geller, Garfinkel, Cooper, and Mincy, 2008), and the incarceration of a mother may also have significant implications for child wellbeing (Parke and Clarke-Stewart 2002). While a detailed examination of maternal incarceration is beyond the scope of this analysis, controlling for mothers' incarceration history will help to isolate the effects of fathers' experiences.

## Child Development Outcomes

We examine ten developmental outcomes: reported child's health (i.e. whether mothers or other caregivers report their child to be in "excellent" or "very good" health, as opposed to "good", "fair", or "poor"), cognitive development (measured with the Peabody Picture Vocabulary Test of receptive vocabulary), and eight measures of child behavior based on the Child Behavioral Checklist: an index of externalizing behaviors and 2 components thereof, aggression and rule-breaking behavior, an index of internalizing behavior, plus 2 of its components, anxious/depressive behavior and withdrawal, and indices of both attention problems and social problems.

Table 1 examines child wellbeing among our analysis sample, and suggests that children whose fathers have been incarcerated face significantly more developmental challenges than their counterparts whose parents have never been incarcerated. Their mothers report that they display significantly more behavior problems (scoring higher on measures of aggression, withdrawal, social problems, attention problems, rule-breaking behavior, and externalizing behavior more generally), and they score lower on the PPVT. On the other hand, the two groups are statistically indistinguishable on measures of reported health, anxious/depressed behaviors, and internalizing behavior more broadly.

[Table 1 about here]

## Confounding Covariates: Family background

Although the observed challenges experienced by children whose parents have been incarcerated are pronounced and statistically significant, the families of these children also differ on a number of other dimensions that are likely to influence both the likelihood that a parent is incarcerated, and the wellbeing of his or her child. We assess differences between the families with and without a parental incarceration by a series of t-tests and chi-squared tests, presented in Table 2.

As the table shows, families experiencing a parental incarceration are significantly more likely to have parents who are racial and ethnic minorities, and the parents are younger than their counterparts, less educated, and more impulsive, and score lower on tests of cognitive ability. Both parents are significantly less likely to have been employed around the time of their child's birth, and mothers are significantly more likely to be living in poverty at that time. Each of these circumstances is likely to place their children at risk of developmental challenges, and the differences observed in Table 1 thus cannot, on their face, be attributed to the incarceration experience itself. In the sections that follow, we work to isolate the causal effect of parental incarceration from the confounding effects of other socioeconomic conditions that might influence child wellbeing.

[Table 2 about here]

### Modeling strategy

To examine the effects of paternal incarceration on children in detail, we begin by examining differences between children who have experienced a father's incarceration and those who have not, and progressively reducing the likelihood that these differences are caused by other family characteristics, observed or unobserved. We then test whether the observed effects of incarceration are significantly worse for children than the effects of other father absence.

## Establishing a causal effect

To establish the causal effects of incarceration, each outcome is examined using four different multiple regression models. The first model is cross-sectional and assesses the association between fathers' lifetime incarceration (i.e., whether fathers have ever been incarcerated) and each child outcome, controlling for a diverse set of family background characteristics. The controls isolate the relationship between incarceration and child wellbeing from the confounding effects of family structure, socioeconomic status, and other observable parental characteristics, including mothers'

incarceration as well as parents' impulsivity, cognitive ability, and family mental health history, characteristics that are likely to be associated with men's likelihood of incarceration and children's wellbeing. Each covariate, listed in Table 3, falls into one of two classifications. The first are the "early-life" characteristics, listed in the top panel of the table, which we expect were either established at birth (such as race/ethnicity), established before the fathers reached adulthood (such as their parents' mental health, or whether they lived with both their parents at age 15), or, while measured in adulthood, reflect characteristics that have been relatively stable over time (such as cognitive ability or impulsivity). The second are a set of behavioral characteristics, listed in the bottom panel of Table 3, which are measured at baseline or the one-year follow-up survey.

$$DEV5 = \beta_0 + \beta_1 INCARC + \beta_2 EARLYLIFE + \beta_3 ADULTCHAR + \varepsilon \quad (1)$$

Because the second set of covariates is established in adulthood, they might be affected by an incarceration experience earlier in life (if, for example, a juvenile incarceration limits educational attainment or delays childbearing). To the extent that these characteristics are directly affected by incarceration, the estimates of the "incarceration effect" in Model 1 are likely to be underestimated. On the other hand, if both early incarceration and these other covariates are caused by underlying personal characteristics which are not captured by the observed measures in the data, the estimates in Model 1 might be overestimated.

[Table 3 about here]

To resolve this theoretical ambiguity, we estimate a second model, which controls for the same set of covariates as Model 1, but focuses on fathers' incarceration between the third and fifth year surveys. In so doing, Model 2 assures that all covariates were measured before the period of incarceration; any remaining relationship between incarceration and child wellbeing is unlikely to be confounded by these observed characteristics.

$$DEV5 = \beta_0 + \beta_1 INCARC3\_5 + \beta_2 EARLYLIFE + \beta_3 ADULTCHAR + \varepsilon \quad (2)$$

To further isolate the causal effect of paternal incarceration, we estimate a third model, which also examines the relationship between child wellbeing and parental incarceration between years 3 and 5, net of the controls listed in Table 3, but also controls for previous levels of child wellbeing, measured at year 3 (also prior to the period of incarceration). For those child outcomes measured at both years 3 and 5

(i.e., aggression, anxious/depressive behavior, withdrawn behavior, attention problems, and mother-reported health), we control for their three-year value in predicting the five-year outcome. For those measures only observed at year 5, we control for child behavior measures at year 3 that, while not identical to the year five outcomes, are related. In the analyses of rule-breaking behavior, social problems, and the broad measure of externalizing behavior, we control for year 3 aggression, and in the analysis of year 5 internalizing behavior, we control for year 3 anxious/depressive and withdrawn behavior. By examining child development before and after a parental incarceration, particularly when compared to the wellbeing measures of children whose parents were not incarcerated, we gain confidence that changes in child wellbeing are caused by the incarceration experience, rather than pre-incarceration family circumstances. Still, it is important to note that some unmeasured change in family circumstances between years 3 and 5 may have caused both an incarceration and a decline in child well being.

$$DEV5 = \beta_0 + \beta_1 INCARC3\_5 + \beta_2 EARLYLIFE + \beta_3 ADULTCHAR + \beta_4 DEV3 + \varepsilon \quad (3)$$

As an even more stringent test of the causal relationship, for those measures reported at years 3 and 5 (mother reports of child health, aggression, attention problems, anxious/depressive behavior, withdrawal, and cognitive development), we estimate individual fixed effects models examining within-family changes in child development following a parental incarceration. This model is the strictest test of causality, as it controls for time-invariant family characteristics, and limits the analysis to within-family changes. While it is again possible that an unobserved change in family wellbeing drives the changes observed in this model, controlling for family fixed effects eliminates unobserved heterogeneity between families, and increases our confidence in a causal relationship. For measures from the CBCL, which are based on age-specific questions and thus measured on different scales, each year's score is standardized to a mean of 0 and a standard deviation of 1 to enable comparability across years.

$$DEV_{i,t} = \beta_1 INCARC3\_5_{i,t} + \alpha_i + \varepsilon \quad (4)$$

## Incarceration and father absence

To assess the extent to which a father's incarceration creates more risks for his children than other forms of father absence, we re-estimate our cross-sectional and longitudinal regression models (Models 1-3) to examine the relationships between our child wellbeing measures and both father incarceration and other forms of father absence. The most complete comparison is shown in Model 5:

$$DEV5 = \beta_0 + \beta_1 INCARC3\_5 + \beta_2 ABSENCE3\_5 + \beta_3 EARLYLIFE + \beta_4 ADULTCHAR + \beta_5 DEV3 + \varepsilon \quad (5)$$

By including controls for year three measures of child development in our examination of incarceration and absence between years three and five, we take the "incarceration" and "other absence" coefficients $\beta_1$ and $\beta_2$ as causal estimates of the effect of each experience. The reference group in this model is now limited to those families experiencing neither an incarceration nor another father absence, and is thus less disadvantaged than the reference group in the earlier models; we thus anticipate that the $\beta_1$ coefficient will be of larger magnitude. We then test for the equality of the $\beta_1$ and $\beta_2$ coefficients; a rejection of the null hypothesis in these tests suggests that the effect of fathers' incarceration differs significantly from that of other forms of absence.

## Gender Effects and Sensitivity Analysis

To provide a better understanding of the effects of incarceration, we examine the extent to which the effects of incarceration on child wellbeing differ by child gender. Examinations of adolescent delinquency (Murray and Farrington 2008) suggest that boys experiencing parental incarceration are more likely to become delinquent themselves. Likewise, our previous work and other analyses of the Fragile Families data (Geller et al 2008; Wildeman 2008) suggest that the effects of incarceration on children's aggressive behavior are limited to boys. In this analysis we examine whether observed effects are stronger for boys (or girls), or if gender differences exist in some of the outcomes that are not significant in the main analysis. We replicate the runs of Model 3, including interactions between incarceration and child gender.

We also test the robustness of our findings to alternative model specifications. In addition to the regression models detailed above, we also estimate a series of propensity score models in which each family's likelihood of experiencing (propensity to experience) a father's incarceration between years 3 and 5 is modeled based on the observable characteristics in Table 3, as well as year 3 measures of child development. We then use a stratification approach to compare families with paternal incarceration histories to others who closely resemble them on observed characteristics, but have not experienced the father's incarceration.

Finally, for those outcomes measured at both years 3 and 5 where Model 3 suggests a significant effect of incarceration, we perform a falsification test to ensure that the observed relationships are not the result of unobserved selection into incarceration. We run additional regression models using incarceration between years 3 and 5 to predict child wellbeing at year 3. Due to the temporal ordering of the variables, incarceration between years 3 and 5 could not feasibly cause an outcome difference at the third-year survey, before the period of incarceration. A

significant relationship in these models would therefore suggest that some unobserved personal characteristic of families experiencing incarceration is driving the observed relationships. A null relationship, on the other hand, would increase our confidence that the relationship we observe between incarceration and child development at age five is due to a causal effect of incarceration.

## Results

### Effects of Incarceration

Table 4 presents the results of our cross-sectional and longitudinal regression analyses, comparing children whose fathers were incarcerated to those whose fathers were never incarcerated. Each row in Table 4 represents one of the outcomes of interest, and each cell entry contains the incarceration coefficient for a regression model examining the effects of incarceration on the outcome of interest. Each column represents, in succession, Models 1-4 listed above, with each model controlling for additional characteristics, and creating a more stringent test of the causal effect of incarceration.

As shown in Table 4, the estimates indicate that paternal incarceration has a statistically significant effect on children's externalizing behavior problems, aggression and rule breaking behavior in particular. As discussed below, the effect sizes are quite large. The relationship between incarceration and aggressive behavior is robust across all model specifications. On the other hand, there is no apparent effect of incarceration on internalizing behavior problems, social problems, cognitive development, or maternal reports of child health, with the exception of a protective effect of incarceration on anxious/depressive behavior, which emerges in the fixed effects model.

[Table 4 about here]

We also see mixed effects of incarceration on children's attention problems. Children whose fathers were incarcerated in the two years leading up to their fifth birthday display significantly more attention problems than their counterparts; however, the fixed effects model suggests that there are no significant within-family changes following a father's incarceration.

As noted above, CBCL subscales were standardized to a mean of zero and a standard deviation of one to enable comparisons across models. The regression coefficients in Table 4 can therefore be interpreted as effect sizes, or the percent of a standard deviation on each outcome that separates children whose fathers were and were not incarcerated. The incarceration effect sizes in

both the aggression and rule-breaking models are substantial; comparing coefficients across predictors suggests that incarceration leads to a larger increase in behavior problems than most other indicators of socioeconomic disadvantage, including being born into poverty or to unmarried parents[1]. Likewise, the protective effect of incarceration on anxious/depressive behavior is of considerable magnitude (though smaller than the aggravating effects on the externalizing subscales). The observed effects of fathers' incarceration on the externalizing behavior scale are of similar relative magnitudes, representing between 20 and 25 percent of a standard deviation, and also larger than the effects of other social disadvantage indicators.

## Incarceration and Other Father Absence

Table 5 compares the effects of incarceration to other forms of father absence. Children who experience incarceration between years 3 and 5 and children who experience father absence for reasons other than incarceration are compared to children whose fathers were consistently resident between their third and fifth birthdays. (Recall that the reference group children in this portion of the analysis, are more socioeconomically advantaged than the reference group in earlier models.) Children who lived apart from their fathers for other reasons were also harmed by the experience, scoring significantly higher than the reference group on scales of aggression, attention problems, and social problems. In addition, children experiencing either a father incarceration or other father absence score lower than their counterparts on the PPVT, and are more likely to experience social problems at age five, though no significant effect was observed in earlier models.

[Table 5 about here]

Comparing the two disadvantaged groups, we see that most of the significant incarceration effects observed in tables 4 and 5 are also robust to the more rigorous comparison. The effects of fathers' incarceration on child externalizing behavior, and on rule-breaking and aggressive behavior in particular, are significantly worse than the effects of other forms of father absence. Similarly, the effect of incarceration on attention problems is about twice that of other father absence, though the difference between them is not quite statistically significant. These findings underscore the challenges that a father's incarceration creates for child development.

[1] Full regression results available upon request.

## Gender Interactions and Sensitivity Analyses

Past examinations of parental incarceration suggest that the effects of fathers' imprisonment are felt more strongly by boys than girls. Examining gender interactions[2], we find that the effects of incarceration on externalizing behavior are significant for both boys and girls. However, consistent with previous findings, the effects on boys are of substantially greater magnitude, and more statistically significant (though the gender differences themselves are not statistically significant), underscoring the risk that boys in particular face when their fathers are incarcerated.

Sensitivity analyses reported in Appendix B indicate the findings are robust to alternative modeling strategies. The propensity score analyses suggest significant effects of incarceration on externalizing behavior problems, as well as the aggressive and rule breaking subscales. They also indicate a significant effect of paternal incarceration on children's attention problems, consistent with the findings of the second and third regression models, and no effect on internalizing behavior problems, social problems, cognitive development, or reported child health. Similarly, the falsification tests provide no evidence of selection on unobservables. These models focus on aggressive behavior and attention problems, which are measured at both the third and fifth year surveys. While incarceration between years 3 and 5 effects these outcomes at year 5, the falsification tests indicate that neither aggression nor attention at year 3 is significantly predicted by paternal incarceration in the two years that follow.

# Conclusions, Limitations, and Implications

## Summary of Findings

Our results suggest that parental incarceration has significant and damaging consequences for families that are left behind. We estimate a series of cross-sectional, longitudinal, and fixed-effects regression models, which suggest that incarceration increases children's aggressive and rule-breaking behaviors, and externalizing behavior problems more broadly. We also find increased levels of attention problems among children whose parents have been incarcerated. Each of the statistically significant effects is estimated to be quite large, increasing problem behaviors by a greater magnitude than many other measures of family disadvantage. Although our finding of increased attention problems is not robust to the fixed-effects estimation, the most stringent test of causality, a falsification analysis suggests that the significant association between incarceration and attention problems is not a result of unobserved

[2]Results are presented in Appendix A

selection into incarceration. On the other hand, our fixed effects analysis also suggests a significant and substantial protective effect of incarceration, by which paternal incarceration lowers children's anxious/depressive behavior. Although this relationship is not statistically significant in any of our other models, it suggests that the removal of a criminally involved father from the household might have positive effects on children, and warrants further investigation.

We also find that children whose fathers have been incarcerated have lower vocabulary scores than children who have lived with their parents consistently. Though their reading scores are no worse than those of children who experience father absence for other reasons, they are more likely to have aggressive and rule breaking behaviors.

## Limitations and Implications for Research and Policy

While the results presented in Tables 4 and 5 suggest that paternal incarceration has significant damaging effects on family economic wellbeing and child development, we are quite limited in our current understanding of the mechanisms governing these effects. While we therefore emphasize the importance of considering the effects of incarceration on families in a complete accounting of the policy's costs and benefits, our findings raise more questions than they answer.

In addition to stabilizing family economic circumstances while fathers are incarcerated, and removing the statutory barriers to housing and employment that can stand of the way of successful re-entry, more research is needed to examine other family circumstances that may be affected by a father's incarceration. For example, the stress associated with the incarceration might lead mothers to engage in negative parenting practices, or leave them less well-equipped to engage in supportive parenting, harming children's socio-emotional development as a result. Alternatively, mothers might re-partner while their child's father is in prison. A new partner has the potential to improve the family's financial circumstances, or to provide children with a positive role model, but also may destabilize the family. Further research is needed to understand how family dynamics are affected by fathers' incarceration, and how, in turn, these circumstances aid or impede child development.

Nonetheless, our findings identify significant effects of paternal incarceration on children, which exceed the risks faced by even other disadvantaged children. Caretakers, teachers, and service providers must be made aware of the economic and developmental risks faced by this population, to help enable family stability both during and after the period of incarceration.

# Tables

**Table 1: Child Wellbeing Indicators, Year 5**
**Full sample, and by Parental incarceration history**

| | Full sample | Incarceration history | No incarceration history | Significantly Different? |
|---|---|---|---|---|
| Aggression | 5.297 | 6.084 | 4.597 | *** |
| | [4.257] | [4.583] | [3.742] | |
| Anxious/depressed | 1.854 | 1.821 | 1.886 | |
| | [1.849] | [1.826] | [1.897] | |
| Withdrawn | 1.722 | 1.809 | 1.616 | ** |
| | [1.737] | [1.758] | [1.677] | |
| Social problems | 2.532 | 2.725 | 2.346 | *** |
| | [1.930] | [1.982] | [1.862] | |
| Rule breaking | 1.436 | 1.697 | 1.213 | *** |
| | [1.471] | [1.649] | [1.234] | |
| Attention | 1.072 | 1.219 | 0.937 | *** |
| | [1.339] | [1.417] | [1.239] | |
| PPVT | 93.2 | 91.488 | 95.781 | *** |
| | [15.413] | [14.420] | [15.963] | |
| Internalizing | 3.572 | 3.617 | 3.508 | |
| | [2.932] | [2.937] | [2.911] | |
| Externalizing | 6.722 | 7.747 | 5.814 | *** |
| | [5.248] | [5.709] | [4.521] | |
| Child rated as "excellent" or "very good" health | 88.3% | 88.4% | 89.2% | |
| | [0.321] | [0.321] | [0.311] | |

*P<.05, **P<.01, **P<.001, in comparison of children with and without parental incarceration.

| Table 2: Demographic and Socioeconomic Background, Fragile Families | | | |
|---|---|---|---|
| | Incarceration history | No incarceration history | Significantly different? |
| **Demographic factors** | | | |
| Mother's race | | | *** |
| White non-Hispanic | 14.58% | 28.61% | |
| Black non-Hispanic | 56.38% | 41.37% | |
| Hispanic | 20.97% | 25.96% | |
| Other | 2.15% | 4.05% | |
| Father's race | | | *** |
| White non-Hispanic | 11.09% | 27.73% | |
| Black non-Hispanic | 58.53% | 42.63% | |
| Hispanic | 21.57% | 25.29% | |
| Other | 2.89% | 4.35% | |
| Parents not same race | 0.154 | 0.131 | |
| | [0.363] | [0.337] | |
| Father immigrant | 0.054 | 0.168 | *** |
| | [0.225] | [0.374] | |
| Mother immigrant | 0.056 | 0.187 | *** |
| | [0.231] | [0.390] | |
| Relationship at child's birth | | | *** |
| Married | 7.12% | 41.22% | |
| Cohabiting | 36.69% | 33.48% | |
| Nonresident | 50.20% | 25.29% | |
| Missing | 5.98% | 0% | |
| Father's age | 25.996 | 29.182 | *** |
| | [6.902] | [7.346] | |
| Mother's age | 23.344 | 26.768 | *** |
| | [5.288] | [6.200] | |
| Father 5+ older | 0.264 | 0.245 | |
| | [0.441] | [0.430] | |
| Mother's education | | | *** |
| High school dropout | 39.45% | 22.86% | |
| High school | 31.59% | 28.10% | |
| Some college | 20.70% | 29.65% | |
| College or more | 2.22% | 19.32% | |
| Missing | 6.05% | 0.07% | |
| Father's education | | | *** |
| High school dropout | 39.65% | 21.76% | |
| High school | 34.34% | 30.90% | |
| Some college | 14.85% | 27.88% | |
| College or more | 1.28% | 18.66% | |
| Missing | 9.88% | 0.81% | |
| Father more educated | 0.207 | 0.23 | |
| | [0.405] | [0.421] | |

| **Table 3: Covariates Controlled in Regression Models** | |
|---|---|
| | Parental Incarceration (Y/N) |
| Early-Life Covariates | Mother Race/Ethnicity |
| | Father Race/Ethnicity different? |
| | Mother/Father Foreign Born? |
| | Mother/Father Impulsivity |
| | Mother/Father Cognitive Score |
| | Mother/Father Lived with both their parents at age 15? |
| | Parents (ie, child's grandparents) had MH problems? |
| Covariates Established in Adulthood | Parental relationship status |
| | Mother in poverty at child's birth? |
| | Mother age at child's birth |
| | Child born at low birthweight? |
| | Child mother's first? |
| | Father 5+ years older than mother? |
| | Mother's education attainment |
| | Father more educated than mother? |
| | Mother/Father employed? (at baseline) |
| | Fathers' wages (at child's first birthday) |
| | Mother self-reported health |
| | Did mother smoke while pregnant? |
| | Mother/Father drug use (Y1)? |
| | Mother/Father alcohol problem (Y1)? |
| | Mother reports domestic violence? |

**Table 4: Four Estimates of the Effects of Fathers' Incarceration on Child Wellbeing**

| | Cross-section | Incarceration Y3-Y5 | Lagged DV | Individual FE model |
|---|---|---|---|---|
| Standardized CBCL Subscales | | | | |
| Aggressive behavior | 0.121** | 0.206** | 0.220*** | 0.180*** |
| Attention problems | 0.030 | 0.165* | 0.140* | -0.019 |
| Anxious/depressive behavior | -0.035 | 0.026 | 0.048 | -0.149* |
| Withdrawal | -0.048 | -0.090 | -0.085 | -0.038 |
| Rule-breaking behavior | 0.114** | 0.274*** | 0.285*** | ---- |
| Social problems | -0.032 | 0.052 | 0.063 | ---- |
| Externalizing and Internalizing Scales (Full scores) | | | | |
| Externalizing Behavior | 0.672** | 1.252*** | 1.322*** | ---- |
| Internalizing Behavior | -0.167 | -0.100 | -0.053 | ---- |
| Cognitive development and health | | | | |
| PPVT Score | 0.139 | -0.583 | -0.155 | -0.128 |
| Child Health (odds ratios) | 1.155 | 0.997 | 1.009 | 1.200 |

PPVT Models also control for child's age (in months) at the time test was administered.
Rule-breaking behavior, social problems, and full externalizing and internalizing scales were not measured at Year 3; FE models thus cannot be estimated.

**Table 5: Comparing the effects of incarceration and other father absence (reference group: father consistently resident between years 3 and 5)**

| | Father Incarceration | Other Father Absence | P-value comparison |
|---|---|---|---|
| Standardized CBCL Subscales | | | |
| Aggressive behavior | 0.288*** | 0.120** | P=0.014* |
| | [0.071] | [0.047] | |
| Attention problems | 0.244*** | 0.117* | P=0.061+ |
| | [0.074] | [0.049] | |
| Anxious/depressive | 0.051 | 0.037 | P=0.814 |
| behavior | [0.068] | [0.049] | |
| Withdrawal | -0.068 | 0.032 | P=0.099+ |
| | [0.069] | [0.050] | |
| Rule-breaking behavior | 0.314*** | 0.060 | P<0.001*** |
| | [0.073] | [0.046] | |
| Social problems | 0.122 | 0.103* | P=0.781 |
| | [0.074] | [0.050] | |
| Externalizing and Internalizing Scales (Full scores) | | | |
| Externalizing Behavior | 1.705*** | 0.553* | P<0.001*** |
| | [0.350] | [0.237] | |
| Internalizing Behavior | -0.008 | 0.135 | P=0.412 |
| | [0.195] | [0.142] | |
| Cognitive development and health | | | |
| PPVT Score | -1.821+ | -1.870* | P=0.956 |
| | [0.992] | [0.744] | |
| Child Health | 0.872 | 0.807 | P=0.682 |
| (odds ratios) | [0.184] | [0.124] | |

*P<.05, **P<.01, ***P<.001

Coefficients and odds ratios estimate effects of incarceration and absence between years 3 and 5 on child outcomes, compared to children whose fathers were neither incarcerated nor absent. Models control for full set of covariates, and child development at age 3.

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## Appendix A: Gender differences in the Effects of Incarceration

In Table A.1, we examine the gender-specific effects of incarceration on child outcomes, and find that the effects of incarceration on externalizing behavior are salient for girls as well as boys. However, the effects on boys are substantially stronger; the incarceration coefficients are more statistically significant, and for both the externalizing scale and its two subscales, are more than twice the magnitude.

Table A.1: Gender differences in the effects of fathers' incarceration on child wellbeing

| | Effect among girls | Effect among boys | Gender differences significant? |
|---|---|---|---|
| Standardized CBCL Subscales | | | |
| Aggressive behavior | 0.137+ | 0.276*** | No |
| | [0.076] | [0.085] | |
| Attention problems | 0.116 | 0.150 | No |
| | [0.097] | [0.097] | |
| Anxious/depressive behavior | 0.092 | 0.030 | No |
| | [0.086] | [0.080] | |
| Withdrawal | -0.118 | -0.066 | No |
| | [0.083] | [0.080] | |
| Rule-breaking behavior | 0.172* | 0.351*** | No |
| | [0.082] | [0.100] | |
| Social problems | 0.152 | 0.016 | No |
| | [0.107] | [0.084] | |
| Externalizing and Internalizing Scales (Full scores) | | | |
| Externalizing Behavior | 0.856* | 1.627*** | No |
| | [0.394] | [0.455] | |
| Internalizing Behavior | -0.003 | -0.073 | No |
| | [0.234] | [0.233] | |
| Cognitive development and health | | | |
| PPVT Score | -0.092 | 0.054 | No |
| | [1.276] | [1.172] | |
| Child Health | 0.938 | 1.074 | |
| | [0.277] | [0.244] | |

*P<.05, **P<.01, ***P<.001

Coefficients and odds ratios estimate gender-specific effects of incarceration between years 3 and 5 on child outcomes, controlling for full set of covariates, and appropriate child development measure at age 3.

# Appendix B: Sensitivity Analysis

## Propensity Score Stratification

To further assess the causal relationship between parental incarceration and child wellbeing, we perform a series of propensity score analyses. Like OLS regression modeling, propensity scores are a method of isolating the relationship between incarceration and child wellbeing from the effects of observable confounding characteristics (Rosenbaum 2002, Rosenbaum and Rubin 1983). Propensity scores are a more flexible method of assessing treatment effects than regression analysis, are less dependent on model form, and restrict comparisons to individuals who share similar observed characteristics. We estimate a series of binary logit models with parental incarceration between years 3 and 5 as the outcome, predicted by a combination of the baseline and year 1 covariates described in Table 2, and a measure of child wellbeing measured at the third-year survey (ie, before the period of incarceration would be observed). The functional form of the propensity score models is considered less important than the covariate balance achieved (Rosenbaum and Rubin 1984), so the functional form varies in order to balance on as many covariates as possible, particularly the pre-incarceration measure of child wellbeing. The predicted probability from these models, for each individual, in each set of calculations, $\hat{e}(\mathbf{x})_i$, is the individual's individual propensity score.

We compare the sample of children experiencing a parental incarceration to their counterparts using a stratification approach (Becker and Ichino 2002, Rosenbaum and Rubin 1984). Rather than pairing individual families with parental incarceration to other families with similar propensity for incarceration, the stratification method groups subjects by the range of their propensity scores, and then makes comparisons within the groups. The average effect of the incarceration treatment on the treated (ATT) can be estimated as a weighted average of within-stratum differences in child wellbeing at the five-year follow-up, with greater weight given to strata containing larger portions of the incarcerated sample.

$$ATT_{incarc} = \sum_{j=1}^{J} \frac{n_{incarc,j}}{n_{incarc}} \left[ \bar{Y}_{incarc,j} - \bar{Y}_{noincarc,j} \right]$$

Rosenbaum and Rubin (1984) contend that stratification using quintiles (i.e., five equally sized subgroups) can remove approximately 90% of the initial imbalance in each of the baseline covariates. We therefore split the sample into J=5 quintiles, and assess differences in each outcome Y, as described above. Although the exact details of each propensity score estimation vary slightly in order to achieve

balance on the sample of interest for each outcome, a sample model, matching on year 3 child aggression and a number of other family characteristics, is provided in Table B.1.

Table B.2 checks the balance on each of our potential confounding characteristics. In a stratification analysis, a covariate is considered balanced if, within each strata, there are no statistically differences in the covariate between the treated and comparison groups. We test this using an ANOVA analysis, and expect that both the "main effect" of treatment, and the "interaction effect" of treatment and quantile are insignificant predictors of each covariate.

**Table B.1: Probit coefficients predicting fathers' incarceration between years 3 and 5**

| | Probit Coefficient | |
|---|---|---|
| Mothers' Incarceration History | 0.202 | |
| | [0.120] | |
| Child Aggression at age 3 | 0.014 | |
| | [0.036] | |
| Mother in poverty at time of birth | -0.006 | |
| | [0.081] | |
| Child low birth weight | -0.028 | |
| | [0.118] | |
| Child mother's first birth | -0.040 | |
| | [0.085] | |
| Parents cohabiting at baseline | 0.529 | *** |
| | [0.142] | |
| Parents nonresident at baseline | 0.596 | *** |
| | [0.147] | |
| Mother black | 0.015 | |
| | [0.117] | |
| Mother Hispanic | -0.110 | |
| | [0.133] | |
| Mother other race | -0.037 | |
| | [0.261] | |
| Father different race than mother | 0.117 | |
| | [0.120] | |
| Mother foreign born | -0.291 | |
| | [0.181] | |
| Father foreign born | 0.015 | |
| | [0.173] | |
| Father impulsivity | 0.018 | |
| | [0.023] | |
| Mother impulsivity | 0.030 | |
| | [0.021] | |
| Father cognitive ability | -0.021 | |
| | [0.016] | |
| Mother cognitive ability | -0.017 | |
| | [0.015] | |
| Mother employed at baseline | -0.102 | |
| | [0.083] | |
| Father employed at baseline | -0.286 | ** |
| | [0.093] | |
| Mother reports domestic violence | 0.149 | |
| | [0.143] | |
| Father reports hard drug use | 0.631 | |
| | [0.540] | |
| Mother reports hard drug use | -0.188 | |
| | [0.612] | |

| | | |
|---|---|---|
| Father reports problem drinking | -0.044 | |
| | [0.098] | |
| Mother reports problem drinking | 0.151 | |
| | [0.139] | |
| Mother lived with both parents at age 15 | -0.108 | |
| | [0.083] | |
| Father lived with both parents at age 15 | -0.176 | * |
| | [0.089] | |
| Mother age at birth | -0.027 | *** |
| | [0.008] | |
| Father 5+ years older than mother | 0.132 | |
| | [0.091] | |
| Mother has less than HS education | -0.071 | |
| | [0.093] | |
| Mother attended some college | -0.164 | |
| | [0.101] | |
| Mother college graduate | -0.385 | + |
| | [0.231] | |
| Father has more education than mother | -0.362 | *** |
| | [0.098] | |
| Mother reports excellent or v. good health | 0.032 | |
| | [0.076] | |
| Mother's mother had mental health problems | 0.196 | * |
| | [0.083] | |
| Father's mother had mental health problems | 0.162 | + |
| | [0.091] | |

Missing data indicators are included in model, but not in table.

Table B.1 suggests several family characteristics that are significant predictors of fathers' incarceration between the third and fifth year surveys. Men unmarried at the time of their child's birth are significantly more likely to become incarcerated. On the other hand, men who lived with both their biological parents at age 15 were less likely to become incarcerated, as were men employed at baseline, and those with more education than their partners. Age also emerges as a significant predictor of incarceration, as men's risk of incarceration declines if their partners are older at the time their child is born. Finally, men are at increased risk of incarceration if their partners have a family history of mental health problems.

After contstructing the propensity score, and stratifying the sample into quintiles based on this score, we then test whether these quintiles are balanced on the covariates of interest. Table B.2 presents the result of the balance check for each of the 49 covariates that we test balance. The table presents the ANOVA P-values of both the main treatment effect and interaction effects[3]; a covariate is considered in balance if each of those P-values is greater than 0.05, suggesting that the treated and control groups do not significantly differ on the covariate of interest.

[3] Covariates are excluded from the balance check if there is insufficient variation to perform the ANOVA checks. This is most frequently the case for missing data indicators, which take values of zero for all but a few cases.

Table B.2: Balance checking of potentially confounding covariates, propensity score analysis of fathers' incarceration and child aggression

| | Main Effect P-value | Interaction P-value | Balanced? |
|---|---|---|---|
| Mothers' Incarceration | 0.832 | 0.984 | YES |
| Child Aggression (Y3) | 0.456 | 0.277 | YES |
| Fathers' Wages (Y1) | 0.264 | 0.803 | YES |
| Fathers' Wages Missing (Y1)[4] | 0.311 | 0.799 | YES |
| Mother in Poverty (Baseline) | 0.607 | 0.962 | YES |
| Child Low Birth Weight | 0.560 | 0.061 | YES |
| Child Mother's First Birth | 0.434 | 0.498 | YES |
| Parents Cohabiting at Baseline | 0.210 | 0.501 | YES |
| Parents Nonresident at Baseline | 0.916 | 0.954 | YES |
| Mother Black | 0.865 | 0.875 | YES |
| Mother Hispanic | 0.816 | 0.978 | YES |
| Mother Other Race | 0.711 | 0.351 | YES |
| Parents Different Races | 0.374 | 0.341 | YES |
| Mother Immigrant | 0.513 | 0.883 | YES |
| Father Immigrant | 0.857 | 0.908 | YES |
| Father Impulsivity | 0.639 | 0.632 | YES |
| Mother Impulsivity | 0.427 | 0.405 | YES |
| Father Cognitive Ability | 0.558 | 0.933 | YES |
| Mother Cognitive Ability | 0.270 | 0.163 | YES |
| Mother Employed | 0.994 | 0.834 | YES |
| Father Employed | 0.151 | 0.657 | YES |
| Domestic Violence | 0.274 | 0.217 | YES |
| Father Drug Use | 0.998 | 0.923 | YES |
| Mother Drug Use | 0.897 | 0.932 | YES |
| Father Drinking | 0.111 | 0.228 | YES |
| Mother Drinking | 0.911 | 0.719 | YES |
| Mother Smoked During Pregnancy | 0.147 | 0.130 | YES |
| Mother Drug Use Missing | 0.834 | 0.915 | YES |
| Father Drug Use Missing | 0.564 | 0.758 | YES |
| Mother Drinking Missing | 0.753 | 0.906 | YES |
| Father Drinking Missing | 0.575 | 0.808 | YES |
| Mother Employment Missing | 0.725 | 0.403 | YES |
| Father Employment Missing | 0.749 | 0.335 | YES |
| Father Cognitive Ability Missing | 0.568 | 0.467 | YES |
| Mother Lived With Both Parents | 0.717 | 0.020 | NO |
| Father Lived With Both Parents | 0.305 | 0.221 | YES |
| Mother's Age at Baseline | 0.641 | 0.493 | YES |
| Father 5+ Years Older than Mother | 0.200 | 0.173 | YES |
| Father's Impulsivity Missing | 0.466 | 0.694 | YES |
| Father's Age Missing | 0.733 | 0.342 | YES |
| Mother <HS Education | 0.623 | 0.945 | YES |
| Mother Attended Some College | 0.296 | 0.688 | YES |
| Mother Graduated College | 0.053 | 0.017 | NO |
| Father More Educated than Mother | 0.275 | 0.700 | YES |
| Mother Health | 0.680 | 0.551 | YES |
| Maternal Grandmother MH Problems | 0.480 | 0.760 | YES |
| Maternal Grandmother MH Missing | 0.932 | 0.132 | YES |
| Paternal Grandmother MH Problems | 0.434 | 0.522 | YES |
| Paternal Grandmother MH Missing | 0.416 | 0.564 | |
| Total Covariates Checked | | | 49 |
| % in Balance | | | 96% |

[4] Following the example of D'Agostino and Rubin (2000), we balance on missing data indicators as well as substantive covariates.

Balance checking indicates that of the 49 covariates of interest, all but two of them are in balance. This balance rate, 96%, is approximately the level that we would expect from a randomized experiment (as 5% of randomized covariates would be expected to differ across groups at a significance level of 0.05). Propensity scores were constructed for each outcome, and for both fathers' incarceration and the incarceration of either parent, so that no fewer than 95% of covariates were balanced. However, qualitative differences between the propensity scores were few.

Finally, once we have established that the matched groups are balanced on the covariates of interest, we estimate the average treatment effect on the treated (ATT), using a Stata program designed by Becker and Ichino (2002). The stratification procedure estimates an ATT of 0.240, with a standard error of 0.072, for a t-statistic of 3.325. Given a sample of nearly 2300 observations (307 treated, and 1,980 in the comparison group), this estimate is highly significant, at $P<0.001$.

Table B.3 summarizes the ATT estimates from the propensity score analysis of each outcome, along with the t-scores and stars to indicate significance levels. In examining the effects of our incarceration "treatment on the treated", our findings closely resemble those of regression model 3; we find significant effects of fathers' incarceration on children's aggressive and rule-breaking behavior, on externalizing behavior problems more broadly, and on attention problems, but no significant associations between incarceration and internalizing behavior, child health, or cognitive development.

| **Table B.3: Propensity score estimates of the effect of treatment (fathers' incarceration between years 3 and 5) on the treated, Child wellbeing outcomes** | |
|---|---|
| Outcome of interest | ATT |
| Standardized CBCL Subscales | [Std. Error] |
| Aggressive behavior | 0.240*** |
| | [0.072] |
| Attention problems | 0.181* |
| | [0.071] |
| Anxious/depressive behavior | 0.074 |
| | [0.062] |
| Withdrawal | -0.093 |
| | [0.062] |
| Rule-breaking behavior | 0.292*** |
| | [0.071] |
| Social problems | 0.069 |
| | [0.068] |
| Externalizing and Internalizing Scales (Full scores) | |
| Externalizing Behavior | 1.402*** |
| | [0.383] |
| Internalizing Behavior | -0.009 |
| | [0.181] |
| Cognitive development and health | |
| PPVT Score | -0.395 |
| | [0.097] |
| Child Health | 0.010 |
| | [0.016] |
| Propensity scores constructed as detailed in Table B.1<br>*P≤.05, **P≤.01, ***P≤.001 | |

## Falsification Test

As noted in table 4, we observe several effects of paternal incarceration on child behavior, in particular on externalizing behavior and specific problems such as aggression, rule-breaking behavior, and attention problems. These relationships are robust to a number of model specifications, including cross-sectional regressions, longitudinal regressions with controls for lagged behavioral measures, and propensity score analysis, increasing our confidence that these relationships are causal in nature. The observed effects of incarceration on aggression are also robust to a test that controls for family fixed effects, increasing our confidence further. The effects on attention problems, on the other hand, are not observed in the fixed effects model, suggesting that the observed relationship might be attributed to unobserved selection into incarceration.

To further test the relationships between incarceration, aggression, and attention problems, we perform an additional test, a "falsification test" (a variation on Kaushal, 2007), to rule out the possibility

that our significant findings are due to unobserved selection. The first row of numbers in Table B.4 replicates the results from the aggression and attention problem analyses in Regression Model 3, the lagged dependent variable model displayed in Table 4. As described earlier, the placebo tests predict the three-year behavioral outcomes with the measure of incarceration between years 3 and 5. The temporal ordering of incarceration and behavior in this model suggests that there could not be a causal effect of later incarceration on year 3 behavior; a significant relationship in these models would therefore suggest that the relationship between incarceration and child behavior was driven by unobserved heterogeneity between families where the fathers have and have not been incarcerated.

**Table B.4: Results of Falsification Tests**

| | Aggression | | Attention problems | |
|---|---|---|---|---|
| Model 5 results | 0.220 | *** | 0.140 | * |
| (Predicting Y5 behavior) | [0.060] | | [0.070] | |
| Placebo test results | 0.043 | | 0.094 | |
| (Predicting Y3 behavior) | [0.065] | | [0.068] | |

Predictor of interest = incarceration between years 3 and 5
Both Model 5 and the placebo test control for full set of covariates listed in Table 3.

As seen in the bottom row of Table B.4, this is not the case. Neither aggression nor attention problems at year 3 are significantly predicted by paternal incarceration in the two years that follow. This is consistent with the idea that the relationship between incarceration and these problems is in fact causal, since the effects on child behavior are evident in the period following the incarceration of interest, but not in the period preceding it.