Bridging the Income-Parenting Gap:
Three Papers on the Interrelationships of Household Income, Parenting Resources, and Child Outcomes

by

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CHAPTER I

Introduction

Income inequality has increased in the US in the last three decades for reasons that have been widely debated (Duncan and Murnane 2011, Piketty 2014), and intergenerational mobility in the US now appears lower than in the past, reducing a child's chances of moving from poverty to wealth (Reardon 2011). These separate but related trends (discussed below) are of concern because studies have consistently shown associations between household income during childhood and a variety of young-adulthood outcomes (Bourdieu 1977, Smith, Brooks-Gunn and Klebanov 1997). For example, relative to their higher-income peers, young adults from lower-income families had lower cognitive skill scores, fewer years of education, and more behavior problems; they also showed greater likelihoods of dropping out of high school, teen pregnancy, single motherhood, or unemployment (Mayer 1997). These effects can be particularly pronounced for children who experience poverty for extended periods or in very early childhood (Brooks-Gunn and Duncan 1997, Duncan, Brooks-Gunn and Klebanov 1994). Thus, increasing income inequality may result in greater inequality of opportunity and life outcomes between children, and thus a greater number of children with poor prospects for life.

However, it is important to distinguish within-generation inequality from intergenerational mobility, because they represent different phenomena with different implications (Putnam 2015). Specifically, intergenerational mobility refers to changes between parent and child in socioeconomic status; societal norms in the US support the view that children should be able to "rise" above the status held by their parents if they work hard (Putnam 2015).

In contrast, income inequality within a given cohort is not necessarily considered unusual or negative by most Americans (Putnam 2015), although recent analyses suggest that in fact income inequality was relatively low in the period between the end of World War II and the 1970s—a finding that implies that this period represented an historical anomaly compared to other time periods in the US (Piketty 2014).

Intergenerational mobility and intra-generational income inequality both contribute to rates of childhood poverty. If childhood poverty negatively impacts later cognitive or behavioral skills for children, then it may reduce intergenerational mobility or increase income inequality in the future, resulting in a vicious cycle of low socioeconomic status for some. Research has suggested that there are several mechanisms by which family income may influence child outcomes (Duncan, Magnuson and Votruba-Drzal 2015). This dissertation focuses on understanding the interaction of these mechanisms that explain the impact of income—material hardship, parent distress, parent behaviors, and choice of early childhood care providers—and effects of these mechanisms on child outcomes during the tween and teen years.

Child development between early childhood and adulthood can have a substantial impact on adult life trajectories. For example, cognitive skills—usually measured on the basis of standardized achievement test scores—predict educational achievement and earnings in adulthood and therefore directly impact intergenerational mobility (Nisbett 2009). Additionally, behavior problems related to "internalizing" (e.g., depression) and "externalizing" (e.g., aggression) are also associated with other important outcomes (e.g., educational achievement, employment, and criminal behavior) both early and later in life (Gershoff et al. 2007, Linver, Brooks-Gunn and Kohen 2002, Raver, Gershoff and Aber 2007, Yeung, Linver and Brooks-Gunn 2002). Thus, understanding the process of *how* income and other factors in childhood

shape child development in these areas represents a basic first step in predicting the effects of childhood poverty.

Though the presence and importance of the association between family income in childhood and later life outcomes are clear, how and why these associations exist is difficult to pin down. There are many proposed explanations and mechanisms (Putnam 2015): transfer of resources; parenting practices; quality of education and child care; neighborhood quality and effects; incarceration of parent(s); and genetics, to name just a few broad areas. Many different mechanisms have received empirical support, and it is probable that the association between family income and child outcomes is the result of multiple, interconnected mechanisms. Even a superficial survey of all these mechanisms is beyond the scope of one dissertation, so this dissertation will focus on two specific areas: (1) family income, parenting practices, and child outcomes in the tween to teen years; and (2) family income, child care use prior to kindergarten, and early child outcomes. These are two areas in which interventions on the mechanisms connecting family income and outcomes may be more feasible than others (e.g., by improving preparedness among low income children for college education) and could be important stepping stones to later interventions (e.g., improving rates of graduation from college among those low income children). Thus, it is important to explore (1) how strongly parenting and early child care are related to child outcomes; (2) how much family income affects these two mechanisms, which then may mediate or moderate the effects of income on child outcomes; and (3) how possible and effective it could be to improve children's outcomes by intervening on these mechanisms. These questions are the focus of this three-study dissertation, with results reported in Chapters 2 through 4. I summarize each study briefly below.

Chapter 2 examines the interplay among family income, parenting practices, and later

child outcomes by establishing a theoretically integrated model with multiple mechanisms linking the three. Prior research has proposed three general theories of how income influences child outcomes through parenting practices: (1) *parent distress theory*, which suggests that low income and material hardship cause parents psychological distress, which in turn negatively affects the quality and warmth of their parenting in ways that encourage problematic behavior by their children; (2) *parent investment theory*, that sufficient time and income allows parents to provide enriching activities and materials to and spend more time with the child to provide intellectual stimulation; and (3) *cultural parenting practices theory*, that social class membership (which is correlated with income) shapes the parent's style of parenting in ways that foster growth of particular skills, some of which are more useful than others in pursuing educational achievement and a middle-class career. I argue that these are three mechanisms through which income influences a single set of parenting behaviors that tend to occur together and have similar effects on child cognitive achievement and behavior skills. That is, I hypothesize that parents with higher levels of permanent income tend to: (1) have lower levels of distress that would negatively impact parenting warmth and cognitive stimulation toward the child, (2) invest more time and resources in their children's academic learning, and (3) hold higher educational aspirations for their child in ways that foster academic learning and behavioral skills.

The results presented in Chapter 2 provide information about the question of associations among the *levels* of income, parenting, and child outcomes over time, but do not address whether *changes* in these variables are related (i.e., a change in income and a subsequent change in parenting practices). Even if we observe cross-time associations between them it is possible that changes in the variables are unrelated, either because parenting practices may change little over time or because one or more of the associations is actually the spurious result of unmeasured

variables (Duncan, Magnuson and Votruba-Drzal 2015). Chapter 3 addresses these possible alternative explanations with additional analyses of the PSID-CDS using fixed-effects regression analysis of within-child five-year changes in the variables examined in Chapter 2. Use of fixed-effects regression reduces potential bias from unmeasured variables by eliminating effects of any variables that did not change over the time period, helping to verify that the associations are not spurious.

It is clear that parenting practices play an important role in the link between family income and child outcomes (Duncan, Magnuson and Votruba-Drzal 2015). Yet parents are not the only people who "parent" or influence children, even prior to the children entering primary school. In the contemporary U.S., dual-earner and single-parent households in which young children cannot be cared for all the time by working parents have become the norm, and other sources of early child care and education have become increasingly available and professionalized. Depending on their levels of accessibility and training, these care providers could act as social equalizers, supplementing the care that disadvantaged parents find difficult to provide, due to less training, less time, or fewer resources. Alternatively, high quality care may be available only to advantaged children whose families can afford it—in which case child care may not serve to increase social mobility but only to perpetuate the current situation. Chapter 4 delves into this question by exploring the links among family income, primary type of pre-kindergarten child care used, and child cognitive achievement and behavior problems five years later. My prediction is that high family income is associated with greater likelihood of using particular types of child care that are usually of higher quality (e.g., center-based care, which generally is more regulated and has more resources and staff training than home-based care), and

that type of care used is in turn associated with high child cognitive achievement and low child behavior problems.

These three studies examine the overarching research question about how family income is related to child outcomes through parenting and early child care in the contemporary U.S. Results from all three studies and their implications for intergenerational mobility are considered more fully in Chapter 5. Parenting variables and selection of high-quality early child care both represent potential mechanisms by which inequality between children (which is likely to persist into adulthood) is reinforced. On the other hand, these parenting mechanisms are not fully determined by family income, have a substantial impact on child outcomes on their own, and can be changed directly, suggesting they may be an effective point of intervention in the process that is more feasible than direct supplementation of families' incomes. Similarly, because some types of early child care may benefit child outcomes independently of the factors that affect their availability (including income), provision of quality public preschools may help to bridge the gap in school preparedness between high-income and low-income children (Burchinal et al. 2015).

CHAPTER II

Income and Child Outcomes:

Testing a Model of Parent Distress and Parenting Practices as Mediators

2.1 Introduction

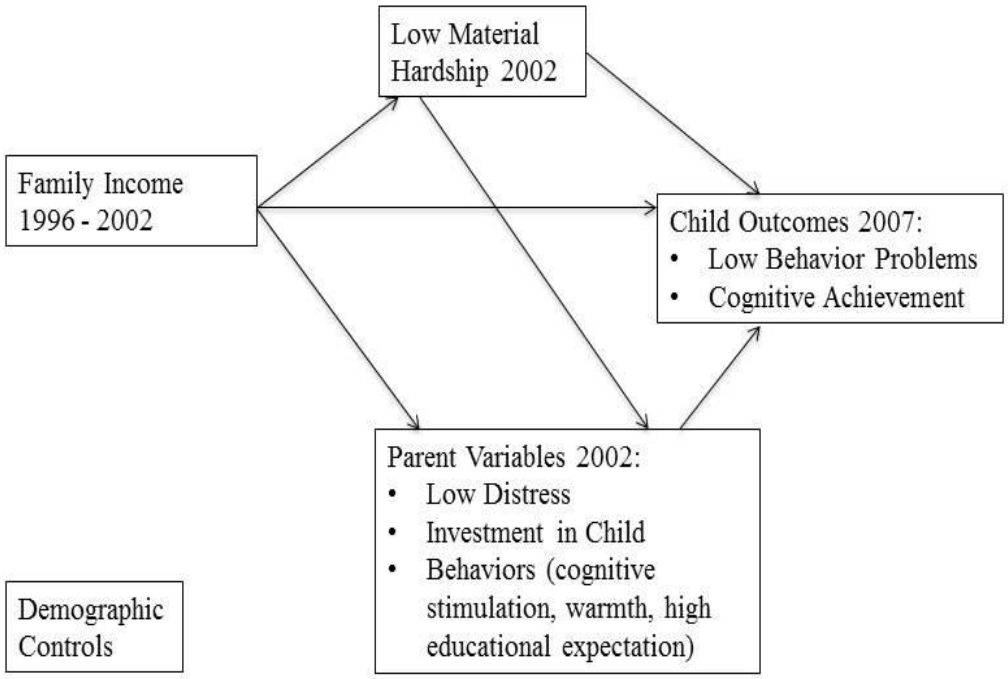
Parenting practices represent one mechanism linking family income and child outcomes outside of formal education. There are three major explanations of this mechanism in the literature (Duncan, Magnuson and Votruba-Drzal 2015) which overlap conceptually and may not be distinct empirically. In this study I examine the three streams to assess whether they represent three distinct mechanisms or in fact should be viewed as one or more pooled mechanisms that act in concert with one another. Three mechanisms have been postulated: (1) low income and resulting material hardship (e.g., food insecurity or housing instability) increase *parent distress or strain* (e.g., marital conflict, depression), which leads to negative parenting behaviors (e.g., spanking) that reduce child cognitive achievement and increase behavior problems (Gershoff et al. 2007); (2) high income supports *parent investment* of time and money in child enrichment (e.g., procuring educational materials and activities and attending school meetings), which stimulates child cognitive achievement and reduces behavior problems; and (3) high income and social class are correlated with more supportive parenting behaviors (e.g., cognitive stimulation, emotional warmth, and parent expectations for child educational achievement) according to *cultural theories of parenting practices and values*. Prior research shows that these mechanisms

are individually related to child cognitive achievement and behavior problems, but has less frequently tested them in conjunction. A joint test of the mechanisms is necessary for three reasons: (1) the parenting practices involved in these three explanations are in fact *interrelated* and complementary (Duncan, Magnuson and Votruba-Drzal 2015), so it is useful to test their relationships to income at the same time in order to assess relative strength of relationships; (2) the mechanisms posited by the explanations are generally assumed to be *separate and necessary but insufficient to explain child outcomes,* an assumption that should be tested empirically by investigating all three mechanisms simultaneously; and (3) the three mechanisms represent variables that theoretically *mediate the relationship of income* to child outcomes, but the possibility of mediation should be tested for all three mechanisms at the same time in order to assess their orthogonality.

Thus, in this study I test an integrated model (see Figure 2.1) of family income as a predictor of child cognitive scores and behavior problems in the teen and tween years. I postulate that the effects of income are mediated by two sets of variables: (1) material hardship and (2) parenting variables (parent distress, parent investment, and parenting practices that include cognitive stimulation, emotional warmth, and educational expectations for the child). I use structural equation modeling (SEM) to test: (1) a measurement model to assess whether the parenting variables represent separate and independent constructs; (2) a structural model to determine whether material hardship and the parenting variables partially or fully mediate the relationship between family income in the tween years (average age of 10 years) and child outcomes in the teen years (average age of 15 years); and (3) goodness of fit of the structural model relative to simpler alternative models that exclude one or both of the two types of mediating variables (to show the comparative importance of the different mediators).

Earlier research has examined relationships among some of these variables, but has been hampered by one of three problems: (1) it examined some but not all variables in the same study; or (2) it relied on cross-sectional data rather than longitudinal data; or (3) it used samples of young children and could not examine effects on cognitive and behavior problems for tweens and teens. In this study all parts of the model can be investigated using longitudinal data focused on the effects of family income and parenting variables in early childhood on child outcomes in the tween and teen years.

Figure 2.1. Predicted Relationships of Family Income to Other Variables



Family income may influence child outcomes both directly and indirectly (through mediating variables). I postulate two types of mediating variables in Figure 2.1: parent variables

and family material hardship. Below I briefly summarize past theory and research about the relationship between income and parent variables, followed by discussion of the relationship of income to material hardship. In both areas I also review the effects of family income, material hardship, and parent variables on child outcomes.

2.2 Background

2.2.1 Parent Variables as Mediators of the Relationship of Income to Child Outcomes

As noted above, there are three theoretical frameworks about parent variables that may mediate the relationship of income to child outcomes: parent distress (or strain) theory, parent investment theory, and cultural theories of parent behavior. The first framework, parent distress theory, posits that low income causes parents distress, resulting in less expression of warmth and support toward the child (Conger et al. 1992, Conger et al. 1994, Conger, Conger and Martin 2010, Elder et al. 1992, McLeod and Shanahan 1993) that would prevent behavior problems (e.g., aggression or depression). Empirical results from this literature, as reviewed by Duncan et al. (2015), have generally supported the propositions that income is related to parent distress, which in turn is related to parenting practices, and ultimately to child outcomes.

Second, parent investment theorists argue that high income permits parents to invest more money and time in materials (e.g., books or musical instruments) or activities (e.g., attendance at cultural events) that provide cognitive stimulation to the child and lead to development of cognitive skills (Mayer 1997). Empirically, there are significant differences between low and high income families in terms of the level of investments made in materials available and activities provided to the child (Kaushal, Magnuson and Waldfogel 2011). There are also differences in parental school involvement, due in part to the fact that high income

parents have more discretionary time to engage in such activities (Dumais, Kessinger and Ghosh 2012, Lee and Bowen 2006, Sui-Chu and Willms 1996). These school events may or may not involve the child, but they do serve to help to embed the parent and therefore the family in the community, providing social capital and knowledge that may help the child's overall development (Coleman 1988). As reviewed by Duncan et al. (2015), parent investment has been found to be related to child cognitive achievement.

Finally, cultural theories of parenting focus on parents' ideas, beliefs, and assumptions, and how they form particular "clusters" by social class. In the Bourdieusian tradition they are integrated and overarching ways of doing things that are "taken for granted" or expected, referred to as "habitus" (Bourdieu 1977, Lewis 1966), that confer advantages through exchangeable forms of capital (e.g., economic resources, social ties, and cultural repertoire). Other studies treat these clusters as more explicit values (Kohn 1959, Kohn 1963, Kohn and Schooler 1969) or discourses of parenting (Lareau 2011) that are associated with (but not wholly determined by) economic class. Lareau ([2003], 2011) in particular found that parenting practices were associated with child behavior and cognitive achievement. Several studies have found that the relationship between income and cognitive skills is partially mediated by habitus, often measured as the child's career or college aspirations (Bodovski and Farkas 2008, Dumais 2002, Gaddis 2013, Irwin and Elley 2011) or as parenting practices measured with indices (Redford, Johnson and Honnold 2009), latent constructs (Cheadle 2008, Cheadle 2009, Cheadle and Amato 2011), or independent constructs of individual parenting practices (e.g., warmth and cognitive stimulation) (Guo and Harris 2000).

2.2.2 Hypotheses about Family Income

As seen above, all three theories lead to a basic set of hypotheses that family income is related to parent behavior. Thus:

Hypothesis 1a. Family income is inversely related to parent distress.

Hypothesis 1b. Family income is positively related to parent investment.

Hypothesis 1c. Family income is positively related to parent behaviors of cognitive stimulation, warmth and education expectation.

Results from past research suggest a second set of hypotheses concerning the relationships between the three mechanisms and child outcomes. Therefore:

Hypothesis 2a. Parent distress is positively related to child behavior problems.

Hypothesis 2b. Parent investment is positively related to child cognitive achievement.

Hypothesis 2c. Parent behaviors of cognitive stimulation, warmth and education expectation are positively related to child cognitive achievement and inversely related to child behavior problems.

Finally, as reviewed above, parent distress theory also implies a connection to variables often associated with cultural and investment theories. Specifically, parent distress theorists have argued that distressed parents are less likely to express warmth toward the child, engage in cognitive stimulation, or hold high educational expectations for the child, and that these behaviors are in turn related to child cognitive achievement. This expected relationship between parent distress and parent behaviors suggests a third hypothesis:

Hypothesis 3. Parent distress is inversely related to parent behaviors of cognitive stimulation, warmth, and education expectation.

2.2.3 Assumptions about Family Income

All three sets of hypotheses make two implicit assumptions based on earlier theory and research. First, they assume that the three parent variables are separate, independent constructs; I test this assumption by comparing alternative factor models relating the parent variables. Second, these hypotheses assume that all three parent variables are related to family income and that they predict child outcomes; I examine this assumed mediation model through consideration of a structural model that assesses the relative strength of relationships of family income to the parent variables and of the parent variables to child outcomes. Further, I compare model goodness of fit when different parent variables are included or excluded from the overall model. As discussed above, Figure 2.1 also indicates a mediation effect by yet another variable, family material hardship. I next discuss the theory and research behind this idea.

2.2.4 Family Material Hardship as a Mediator of the Relationship of Income to Child Outcomes

Earlier results from Gershoff et al. (2007) indicated that material hardship experienced by the family partially mediated the relationships of income to parent distress, parent investment, and parenting behaviors. Further, they found that material hardship mediated the relationship of income to child outcomes. Income is a fluid asset that is readily available for use, easily measured in currency, likely to influence family behavior, and can be influenced through policy interventions that increase family income (e.g., the Earned Income Program of the US federal government). Nonetheless, a family's financial situation cannot be reduced to income alone; measures of material hardship (e.g., specific financial difficulties, such as eviction or difficulty paying bills) capture important additional information about a family's financial situation (Gershoff et al. 2007), because family income likely has a nonlinear "threshold effect" on the amount and kinds of financial troubles the family experiences that varies with regional costs of

living (i.e., a mediator effect). Parents in a family with high levels of material hardship are less likely to engage in parent involvement or in supportive parent behaviors, given the time and financial constraints that confront them (Gershoff et al. 2007, Raver, Gershoff and Aber 2007). Finally, earlier research has shown that measures of material hardship or economic strain may be directly associated with child behavior problems, independent of their association with parent distress; children may be unaware of actual income levels but are often cognizant of specific sources of material hardship, such as home instability or food insecurity, that then influence their behavior (Duncan, Magnuson and Votruba-Drzal 2015). For all these reasons, I predict that family material hardship mediates the relationship between family income and child behavior problems as well as the relationships between income and parent distress, parent involvement, and parent behaviors.

2.2.5 Hypotheses about Family Material Hardship

Potential mediation effects of material hardship are specified in the following hypotheses:

Hypothesis 4a. Family income is inversely related to family material hardship.

Hypothesis 4b. Family material hardship is positively related to child behavior problems.

Hypothesis 4c. Family material hardship is positively related to parent distress.

Hypothesis 4d. Family material hardship is inversely related to parent investment.

Hypothesis 4e. Family material hardship is inversely related to parent behaviors of cognitive stimulation, warmth and education expectation.

2.2.6 Summary of Proposed Model

The overall model proposed in Figure 2.1 provides the basis for my predictions that the

relationship between family income and child outcomes is mediated by three types of parent variables (distress, investment and behaviors) and by family material hardship. These predictions are specified formally in the four hypotheses discussed above.

Overall, the goal of this study is to assess family income's relationships to child outcomes and the extent to which those relationships are direct or indirect, as potentially mediated by three parent variables and by family material hardship. Only by investigating multiple paths through which income may influence child outcomes can we fully understand income's impact on children over time.

2.3 Data and Methods

This study was based on secondary analysis of the Panel Study of Income Dynamics (PSID), a longitudinal study that began with a representative sample of U.S. families in 1968, followed them and their descendants to the present, and added a refresher sample in 1997 to make it representative of the contemporary US. The main PSID provided a measure of baseline parents' education and five years of total household income data (from waves in 1996, 1998, 2002, 2004, and 2006). Other measures were taken from the Child Development Survey (CDS), a supplemental longitudinal study that provides additional information on PSID respondents' children who were under the age of 13 in 1997. The CDS began in 1997 with a subsample of 3563 children aged 0-12 in 2394 PSID households and has since collected two additional waves of information, one in 2002-03 (with 2907 children aged 5-18 in 2019 families) and one in 2007-08 (with 1506 children aged 10-19, reduced in size from the previous wave because respondents above the age of 18 were moved to the Transition to Adulthood (TA) supplement). Each of these three waves involved interviews with the primary caregiver and child regarding social

relationships, psychological well-being, family, neighborhood and school environment, parenting behavior, and activities and time use. Interviewers met with the parent or primary caregiver (PCG) in the home to observe interactions between the child and the PCG. Each wave also assessed the child's cognitive abilities and behavior problems for those subjects who were at least six years old.

Several factors reduced the size of the analytic sample used in the study. First, attrition of 649 children between the 1997 and 2002 waves, "graduation" of 1413 children of age 18+ to the Transition to Adulthood sample in 2007 (which did not collect the same measures and therefore could not be used in this study), and 97 non-responses to the 2007 child skill assessment surveys reduced the sample to 1397 cases with data in all three waves. Of these, 55 were removed because they were part of very small racial categories (those not classified as white, African American, or Hispanic) for which results might be unreliable (Davis-Kean 2005). Finally, because some families had multiple children in the study, 389 siblings were removed from the sample at random to preserve independence of cases (Davis-Kean 2005). The final analytic sample size was 953.

2.3.1 Measures of Child Cognitive Achievement and Behavior Problems

Test scores from the Woodcock-Johnson Revised Tests of Achievement (Woodcock 1977), measured according to the commonly used Woodcock-Johnson Psycho-Educational Battery-Revised (which compares test-takers' results with those of national averages for the child's age), were count variables reflecting cognitive achievement in three areas: Letter-Word Identification, Passage Comprehension, and Applied Problems. Child behavior problems are measured on two subscales of the Behavior Problems Index (BPI) developed (Peterson and Zill 1986) for the

National Longitudinal Survey of Youth: externalizing behavior, measured with 16 items reflecting aggressive and antisocial behavior toward others (e.g., bullying, disobedience, impulsivity); and internalizing behavior, measured with 13 items indicating levels of depression, anxiety, and loneliness (e.g., fearful, withdrawn, unhappy, worries often). Scale items were first recoded as binary variables (with 0 representing few or no behavior problems of the type and 1 representing problems that were sometimes or often true) and then summed to create the scales. Scales for externalizing (α = .86) and internalizing (α = .83) were reliable in the CDS data. These measures of cognitive achievement and behavior problems were also used by Gershoff et al. (2007), allowing for comparison of results between the two studies.

2.3.2 Measures of Parent Distress

Interviewers asked PCGs about frequency of emotional distress (e.g., nervousness, hopelessness, or worthlessness) experienced in the past month using six items from the K-6 Non-Specific Psychological Distress Scale (Kessler et al. 2003), which were rated on a scale from 1 (never) to 5 (often) and averaged. The survey also constructed an Aggravation in Parenting Scale with seven items (e.g., being a parent is constraining, exhausting, difficult, or frustrating) rated on a scale from 1 (not at all true) to 5 (completely true) and averaged. I used overall scores from both scales in the SEM.

2.3.3 Measures of Parent Behavior

For parent behavior, I used two scales that measured PCG behaviors as observed by the interviewer or PCG descriptions of their behavior with the child, both from the Home Observation for Measurement of the Environment-Short Form (HOME-SF): the Cognitive

Stimulation subscale and the Warmth and Support subscale (Caldwell and Bradley 1984). Both have been widely used and have high internal reliability and validity (Mott 2004, Smith, Brooks-Gunn and Klebanov 1997). The 15 items in the *Cognitive Stimulation* subscale concerned the child's intellectual environment, including (1) access to cognitively stimulating *materials* (e.g., books, magazines, newspapers); (2) *organized activities* (e.g., mother provides toys, family encourages hobbies, child is taken to theatre and museums frequently); and (3) *physical environment* (i.e., home environment is dark/monotonous, cluttered, clean, safe). Items in the *Warmth and Support* subscale from the HOME-SF (Caldwell and Bradley 1984) were recoded as binary variables and summed; they were rescaled to a standard range of 1-5 because different questions were asked of different child age categories (6-9 and 10+ in the 2002 wave of data collection). Seven items measured interaction with the child during the interview based on interviewer observation (e.g., PCG talked with, hugged, or spanked child). Eleven items asked PCGs to rate frequency of child interactions with family and friends, explain expectations concerning child behaviors (e.g., in completing chores), and describe typical disciplinary actions. High scores represented greater emotional warmth toward the child and less corporal discipline.

In addition I used two measures based on PCGs' ratings of single items in the interview. *Parent Involvement* in the child's school activities was based on a count of attendance at school events (e.g., PTA meetings, volunteering to help in school, and school events). *Parent Education Expectation* measured the highest level of education that the parent thought the child was likely to attain: high school or less (the reference), college degree, or advanced degree.

2.3.4 Measure of Family Material Hardship

I used the Economic Strain Scale (Conger and Elder 1994) to measure family material hardship

(i.e., the level of economic difficulties and adjustments made in response to those difficulties) in the 2002 wave. It was constructed as the count of 15 binary items each indicating whether the family had particular economic problems (i.e., filed for bankruptcy or had property repossessed) or made changes to cope with financial difficulties (i.e., foregone medical care or large purchases, or had children live with someone else) within the past year, resulting in a range of 0 to 15 financial problems.

2.3.5 Measure of Family Income

I constructed a continuous variable measuring family income as the average of the log household income in the past year measured in the 2002 wave of the PSID and the two preceding waves. It was used to approximate the average log household income over the past five years, a measure Mayer (1997) recommended to represent a family's "permanent income." Models using other specifications of income (e.g., spline function or non-log-transformed income) produced similar results, and other measures of socioeconomic status added to the analyses (e.g., wealth in 2001) had no effect net of average income; therefore I used this measure of the average log household income in 2001, 1997, and 1995.

2.3.6 Measures of Control Variables

I controlled for demographic background of the parents and child. Parents' highest level of education was a categorical variable constructed from the 2001 wave of the PSID as the household head's education or the education of the spouse or partner (if present), whichever was higher; it was coded with categories of less than high school, high school diploma or GED (reference category), college (bachelor's or associate) degree, and advanced degree. Categorical

measures were used in order to test for non-linear relationships. Two additional control variables were measured in 2001: number of siblings, coded as a count variable (top-coded at eight siblings); and whether both biological parents were present in the household in that year (with both present as the reference category). Child's age, in years, was measured as of 2002.

Three time-invariant control variables were used in the structural model: child's ethnicity, with categories of white (reference), Black, or any Hispanic ethnicity; parent's cognitive achievement, measured as raw Woodcock-Johnson passage comprehension score in 1997; and child's gender, with male as the reference category. Analyses presented below include all of these control variables.

2.3.7 Analytic Approach

I used structural equation modeling (SEM) to analyze the data for three reasons. First, I used SEM to calculate a measurement model for latent variables of parent distress, parent investment, parent behaviors, and overall cognitive achievement, which allowed me to verify that they represented coherent constructs in the data and to measure them based on their relationships to the indicator variables. Second, the structural models produced by SEM were used to test the hypotheses and to assess the relative strengths of income and the four hypothesized mediators, by examining goodness of fit for the alternative models. Third, SEM was ideal for performing formal mediation tests of the proposed path model in Figure 2.1, including decomposition of the total effects of income, parent variables and material hardship on the child outcomes into direct and indirect effects—that is, how much of each total association (e.g., between income and child cognitive achievement) is through the intervening variables. Using bootstrapping with 1000 replications allowed reliable assessment of relative direct, total, and indirect effects of key

variables on the dependent variables (Preacher and Hayes 2004, Preacher and Hayes 2008).

To handle missing data I used Stata's "MLMV" (maximum likelihood with missing values) option for SEM, which estimates the model using all available non-missing information from cases without using listwise deletion. Using multiple imputation was not feasible because the variance-covariance structure of estimates on multiply-imputed data is greatly complicated by the introduction of between-imputation-set variance, an issue that requires a very large number of imputation sets and special estimation methods that have yet to be fully developed (Little and Rubin 1987). I compared results using the raw data and results using the MLMV estimation method and found few differences. Use of MLMV permitted examination of more cases, and those results are discussed below.

2.4 Results

Descriptive statistics are presented in Table 2.1, results from the SEM measurement models in Table 2.2, and goodness of fit tests in Table 2.3. Results from the structural models permitted specification of paths for income and the mediating variables which were used to test the hypotheses (Tables 2.4 and 2.5). I subjected results of the structural models to examination of goodness of fit tests (Table 2.6) and decomposition of direct and indirect effects of income used to assess the strength of the mediation model (Table 2.7).

Table 2.1. Descriptive Information for Variables from MLMV Analyses (*n* = 953)

	Mean/ %	Standard Deviation
Control Variables		
Single biological parent in home 2001	42%	
Number of siblings 2001	1.28	1.04
Highest education level of either parent 2001		
Less than high school	18%	
High school (reference)	54%	
College	23%	
Advanced degree	6%	
Child's ethnicity		
White (reference)	48%	
Black	43%	
Hispanic	8%	
Child's gender: female	49%	0.50
Child's age 2002	9.47	2.19
Parent's cognitive achievement 1997	30.50	5.55
Independent Variable		
Log average income 1996-2002[a]	10.41	0.95
Mediating Variables		
Family material hardship 2002	1.66	1.97
Parent's cognitive stimulation of child 2002	6.32	1.70
Parent's warmth toward child 2002	4.04	0.60
Parent attendance at school events 2002	8.25	11.13
Parent's expected educational attainment for child 2002		
High school or less (reference)	29%	
College degree	59%	
Advanced degree	12%	
Parent psychological distress 2002	1.30	0.82
Aggravation in parenting 2002	4.13	3.72
Intensive parenting 2002 (latent estimate)	0.00	0.91
Parent distress 2002 (latent estimate)	0.00	0.41
Child Outcome Variables		
Child's cognitive achievement: Letter-word score 2007	100.76	16.55
Child's cognitive achievement: Passage comprehension score 2007	102.48	15.92
Child's cognitive achievement: Applied problems score 2007	98.06	14.30
Child's behavior problems: Externalizing	5.23	4.05
Child's behavior problems: Internalizing	2.93	3.16
Cognitive achievement 2007 (latent estimate)	0.00	12.38

[a] Mean family income was $57,000 for the sample in 2002 (i.e., not log transformed).

2.4.1 Descriptive Statistics

Descriptive statistics for the sample are shown in Table 2.1. Approximately half of the children were male (51%) and white (48%), and they averaged 10 years of age in 2002. The average child resided with 1.28 siblings and one parent (57%) who had completed high school (54%). Parents reported few sources of family material hardship, measured as economic strain (average of 2 out of 15 potential strain events). Median family income was $57,000. According to data from the US Census Bureau, median money income excluding capital gains and losses was $42,409 in 2002; however, there was considerable variance by state (DeNavas-Walt, Cleveland and Webster 2003), which may account for somewhat higher income in this sample.

Table 2.2. Unstandardized Loadings and Standardized Loadings for Two-Factor Model of Parent Variables and One-Factor Model of Child Cognitive Achievement

	Unstandardized	Standardized
Intensive parenting 2002		
Cognitive stimulation of child	1.00	.66***
Warmth toward child	0.20	.37***
Attendance at school events	4.23	.42***
Expected educational attainment: College degree	0.10	.22***
Expected educational attainment: Advanced degree	0.09	.29***
Parent distress 2002		
Psychological distress	1.00	.63***
Aggravation in parenting	4.94	.70***
Child cognitive achievement 2007		
Letter-word score 2007	1.00	.81***
Passage comprehension score	0.95	.88***
Applied problems score	0.90	.75***

Note. RMSEA = .032, CFI = .99, model chi-squared vs. saturated = 61.72 (31 df). ***$p < .001$; **$p < .01$; *$p < .05$.

2.4.2 Results of Measurement Model

First I used SEM to calculate a measurement model in order to examine how the indicators for the mediating and outcome measures loaded on coherent latent variables (Table 2.2) and then tested the measurement model for goodness of fit. The scales for these measures were used instead of the items of which they are composed because the scales have been well validated in previous research and because separating them into individual components would have prevented direct comparison of results obtained here to earlier published findings. The first indicator for each latent variable was set to 1.0 to set the metric for that factor. The model produced three latent variables, described below.

The four parent behaviors showed significant loadings ($p < .001$) on a single latent variable which I termed "intensive parenting": cognitive stimulation ($\beta = .66$), parent school involvement ($\beta = .42$), warmth and support ($\beta = .37$), and expected educational attainment ($\beta =$ .22 for college and .29 for advanced degree). These relatively strong associations with the latent variable provided support for an overall construct of intensive parenting that combined components as parenting behavior described by the three theoretical frameworks. Previous research has not viewed these two dimensions as overlapping in this way; for example, Gershoff et al. (2007) identified two different factors for these variables in their study of younger children, but used somewhat different methods (e.g., using AMOS, a slightly different program for confirmatory factor analysis, with different measures entered a few at a time due to small sample size and restricted power). This suggests that these behaviors are not as independent and separate for parents of tweens as they might perhaps be for younger children. Further analyses, reported below, suggest that this loading of the constructs on one latent variable was robust, showing strong model fit.

The second latent variable was composed of scales measuring parents' psychological distress and aggravation in parenting. The loadings for the two scales were roughly equal (β = .63 and .70, respectively; $p < .001$) on a latent variable that I named "parent distress."

Finally, the three Woodcock-Johnson Revised Test of Achievement scores loaded (β = .75 to .88, $p < .001$) on a single latent variable termed "cognitive achievement." In contrast, scales for the other dependent variable, behavior problems, did not converge, suggesting that they differ empirically as well as conceptually. The scales, externalizing and internalizing, were therefore treated as separate observed variables even though they were correlated ($r = .70$, $p < .001$). Previous research (Peterson and Zill 1986) empirically supports the idea that the two subscales are distinct, and recent studies (e.g., Gershoff et al., 2007) have separated them, so the model tested here permits direct comparison of results to those obtained in earlier studies.

Results from Table 2.3 describe fit statistics for the measurement model in comparison to alternative models of intensive parenting and parent distress. Model 1 represents the two-factor measurement model used in the later analyses, with two latent variables, intensive parenting and parent distress. Models 2 - 5 represent the model for intensive parenting when each one of the four component indicators (cognitive stimulation, warmth, parent school event attendance, and educational expectation, respectively) is excluded. Model 6 merges the two latent parent variables into one to test for their independence. Model 1—the two-factor model—shows stronger fit statistics than all of the other models (RMSEA = .03; CFI = .98). Further, comparison of chi square results indicates that all of the other models differ significantly from Model 1. These findings suggest an important conclusion. The model fit is best with two latent variables, referring to parent behaviors (i.e., intensive parenting) and parent psychological reactions (i.e., parent distress). This evidence for a two-factor model suggests that the three

theoretical frameworks for describing parent variables are not separate; instead, parent investment and parent behaviors of cognitive stimulation, warmth and education expectations are interrelated. In other words, parents who invest time in helping their children by attending school events also tend to engage in cognitive stimulation, show warmth, and hold high expectations for their child's educational level. These parent behaviors, however, appear to be distinct from parent feelings of distress with regard to the child and to child-rearing itself. I discuss the implications of this finding in the Discussion below.

Table 2.3. Comparison of Alternate Measurement Models to Intensive Parenting Latent Variable, Listing Fit Statistics when the Measure is Included or Excluded and Difference from Full Model

		Fit Statistics		Difference from Full Model	
Model		RMSEA	CFI	χ^2	df
1	Full model (Two-factor model, see Table 2.2)	0.03	0.98		
2	Intensive parenting factor excluding cognitive stimulation scale	0.09	0.88	250.82***	1
3	Intensive parenting factor excluding warmth toward child scale	0.06	0.95	73.65***	1
4	Intensive parenting factor excluding school attendance item	0.07	0.93	119.63***	1
5	Intensive parenting factor excluding expected educational attainment item	0.08	0.91	145.93***	2
6	One-factor model of all parent variables in one factor	0.07	0.92	150.35***	2

***$p < .001$.

2.4.3 Results of Structural Models

Direct effects of predictors on the mediating variables are listed in Table 2.4 and direct effects of the independent variable and mediating variables are shown in Table 2.5. I include results pertaining to the control variables but I do not discuss them because I predicted no effects for the controls.

All of the four sets of hypotheses were at least partially supported. As predicted in the first hypothesis, family income was inversely related (H1a) to parent distress ($\beta = -.11$, $p < .001$), as seen in Table 2.4. Income was also associated with indicators of (H1b) parent investment and (H1c) parent behaviors, both of which were part of the construct of intensive parenting ($\beta = .09$, $p < .001$).

Table 2.4. Direct Effects on Mediating Variables 2002

	Material Hardship 2002		Parent Distress 2002		Intensive Parenting 2002	
	b	β	b	β	b	β
Log average income 1996-2002	-0.24	-0.11***	-0.06	-0.13***	0.09	0.09***
Family material hardship 2002			0.06	0.29***	0.02	0.05*
Parent distress 2002					-0.77	-0.35***
Control Variables						
Single biological parent in home 2001	0.41	0.10***	0.03	0.04	-0.10	-0.05
Number of siblings 2001	0.10	0.05	0.01	0.02	0.00	0.00
Parent's education: less than high school	0.55	0.10***	0.10	0.09*	-0.07	-0.03
Parent's education: College	-0.62	-0.13***	-0.02	-0.02	0.39	0.18***
Parent's education: Advanced degree	-0.93	-0.11***	0.06	0.04	0.72	0.18***
Child's ethnicity: Black	0.27	0.07	0.01	0.01	-0.23	-0.12***
Child's ethnicity: Hispanic	-0.66	-0.09***	0.04	0.03	-0.25	-0.08**
Child's gender: female	-0.25	-0.06***	-0.04	-0.05	0.16	0.09***
Child's age 2002	-0.09	-0.10***	0.01	0.04	-0.03	-0.09***
Parent's IQ 1997	0.06	0.15***	-0.01	-0.14***	0.03	0.16***
Constant	3.21	1.60***	0.74	1.79***	-1.50	-1.66***

***$p < .001$; **$p < .01$; *$p < .05$.

In the second hypothesis I predicted that the parent variables would be related to the child outcome variables, and this was supported. Parent distress (H2a) was related to both externalizing ($\beta = .30$, $p < .001$) and internalizing ($\beta = .34$, $p < .001$), as seen in Table 2.5. Parent investment (H2b) and parent behaviors (H2c), both components of the intensive parenting

measure, were associated with externalizing (β = -.18, $p < .001$), internalizing (β = -.11, $p < .05$), and cognitive achievement (β = .58, $p < .001$). Supporting the third hypothesis, parent distress was inversely associated with parent behaviors (H3), reflected by the latent variable of intensive parenting (β = -.35, $p < .001$).

Table 2.5. Direct Effects on Child Outcomes 2007

	Cognitive Achievement		Externalizing Behavior		Internalizing Behavior	
	b	β	b	β	b	β
Log average income 1996-2002	-0.10	-0.01	-0.25	-0.06	-0.04	-0.01
Family material hardship 2002	-0.10	-0.02	0.20	0.10***	0.14	0.09**
Parent distress 2002	-1.00	-0.03	2.99	0.30***	2.60	0.34***
Intensive parenting 2002	7.98	0.58***	-0.80	-0.18***	-0.38	-0.11*
Control Variables						
Single biological parent in home 2001	0.57	0.02	0.35	0.04	-0.23	-0.04
Number of siblings 2001	-0.26	-0.02	-0.04	-0.01	-0.11	-0.04
Parent's education: < high school	0.21	0.01	0.02	0.00	0.19	0.02
Parent's education: College	0.02	0.00	0.58	0.06	-0.02	-0.00
Parent's education: Advanced deg.	1.32	0.02	1.60	0.09*	0.96	0.07*
Child's ethnicity: Black	-4.14	-0.17***	-0.86	-0.10**	-1.08	-0.17***
Child's ethnicity: Hispanic	-1.15	-0.03	-1.72	-0.11***	-0.82	-0.07*
Child's gender: female	-0.12	-0.00	0.17	0.02	0.27	0.04
Child's age 2002[a]			-0.10	-0.06	-0.03	-0.02
Parent's IQ 1997	0.27	0.12***	0.03	0.03	-0.00	-0.01
Constant	-5.08	-0.41	7.98	1.95***	4.11	1.31*

***$p < .001$; **$p < .01$; *$p < .05$.

[a]Child's age is not included in analysis of cognitive achievement, because achievement scores are age-adjusted.

The fourth hypothesis concerned family material hardship. As expected, family income (H4a) was inversely associated with material hardship (β = -.11, $p < .001$), as seen in Table 2.4. Material hardship was then positively associated with child behavior problems (H4b), including both internalizing (β = .09, $p < .01$) and externalizing (β = .10, $p < .01$), listed in Table 2.5. I found support for the prediction that material hardship would be positively associated with (H4c)

parent distress (β = .29, $p < .001$) but not the predictions that material hardship would be inversely related to (H4d) parent investment and (H4e) parent behaviors, as the relationship to the intensive parenting latent variable was instead positive (β = .05, $p < .05$). I discuss implications of this finding in the Discussion below.

Table 2.6. Comparison of Alternate Structural Models to the Full Model, Listing Fit Statistics when the Variable is Included or Excluded and Difference from Full Model

		Fit Statistics		Difference from Full Model	
Model		RMSEA	CFI	χ^2	df
1	Base model with income predicting child outcomes	0.23	0.70	774.92***	12
2	Income and parent distress predicting child outcomes	0.22	0.79	529.08***	9
3	Income and intensive parenting predicting child outcomes	0.19	0.85	381.11***	9
4	Income, parent distress, and intensive parenting predicting child outcomes	0.12	0.96	86.69***	5
5	Full model with all variables (income, parent distress, intensive parenting and material hardship) predicting child outcomes	0.08	0.99		

***$p < .001$.

The results in Tables 2.4 and 2.5 show the strength and significance of the individual path associations but they do not provide a full test of the different mechanisms predicted by the three theoretical explanations. Table 2.6 compares fit statistics and results from likelihood-ratio chi-squared tests for the structural model and several simpler alternative models that effectively exclude important mediating variables by constraining their effects to zero. In this series of nested models, Model 1 includes only paths from income and the control variables to the outcomes, Model 2 adds paths from parent distress to the outcomes to Model 1, Model 3 adds paths from intensive parenting to the outcomes to Model 1, Model 4 includes both parent distress

and intensive parenting, and Model 5 (the full model) includes the material hardship variable as well. Fit statistics suggest that the full model (Model 5) has a better fit (RMSEA = .08, CFI = .99) than the simpler models. Further, likelihood-ratio chi-squared tests of the fit of the alternative models relative to the full model are all significant, suggesting that the alternative models lose significant amounts of information by excluding paths from any of the mediating variables to child outcomes. Thus, my results suggest that all three mediating variables (parent distress, intensive parenting, and material hardship) play important roles in predicting child outcomes.

Finally, Table 2.7 shows the results of mediation analyses that decompose the total associations of income and mediating variables with later variables into direct effects, total indirect effects, and portion of total effect mediated (calculated as the total indirect effect divided by the total effect) using the Sobel test for significance with bootstrapping (Preacher and Hayes 2004, Preacher and Hayes 2008). These results show that, even though income did not have significant direct effects on child cognitive achievement and behavior problems net of the mediating variables, it did have significant total and indirect effects on these variables through mediators (total β =.09 on achievement, -.14 on externalizing, and -.10 on internalizing, $p < .05$). Most of income's effects on these outcomes (~100% of the total effect on achievement, 64% for externalizing and 80% for internalizing) appeared to be mediated by other variables. Less of income's effect on the mediating variables (18% on parent distress and 33% on intensive parenting) was mediated by other variables. Material hardship did not have significant total effects on intensive parenting or cognitive achievement, but approximately 50% of its associations with behavior problems were mediated by parent distress and intensive parenting. Finally, while most (83%) of the association of parent distress with cognitive achievement was

mediated by intensive parenting, very little (11 - 17%) of the total association of parent distress with behavior problems was through intensive parenting. Thus, parent distress appears to be a stronger predictor of child behavior problems and intensive parenting seems to be a stronger direct predictor of child cognitive achievement; nonetheless, parent distress still influences child cognitive achievement through its association with intensive parenting.

Table 2.7. Summary of Decomposition of Effects (Standardized Coefficients), with Control Variables included in the Analysis but not listed in the Table

	Indirect effects	Total effects	Portion mediated
Parent Distress 2002			
Log average income 1996-2002	-0.03*	-0.17***	18%
Material hardship 2002		0.29***	0%
Intensive Parenting 2002			
Log average income 1996-2002	0.05**	0.15***	33%
Material hardship 2002	-0.10***	-0.05	ns
Parent distress 2002		-0.35***	0%
Cognitive Achievement 2007			
Log average income 1996-2002	0.09***	0.09*	100%
Material hardship 2002	-0.04*	-0.05	ns
Parent distress 2002	-0.20***	-0.24***	83%
Intensive parenting 2002		0.58***	0%
Externalizing 2007			
Log average income 1996-2002	-0.09***	-0.14**	64%
Material hardship 2002	0.10***	0.20***	50%
Parent distress 2002	0.06***	0.36***	17%
Intensive parenting 2002		-0.18***	0%
Internalizing 2007			
Log average income 1996-2002	-0.08***	-0.10*	80%
Material hardship 2002	0.10***	0.20***	50%
Parent distress 2002	0.04***	0.38***	11%
Intensive parenting 2002		-0.11*	0%

Note. The mediated portion represents the percentage of total effects represented by indirect effects. Total effects that were non-significant were treated as 0, so no mediated portion could be estimated. ***$p < .001$; **$p < .01$; *$p < .05$.

2.5 Discussion

As noted above, the overall goal of this study was to test an integrated model of the relationship between family income in a sample of children in their tweens (average 10 years old) and child outcomes for those children in their teens (average 15 years old). The model, proposed in Figure 2.1, is based heavily on theories about possible mediators of the relationship between income and child outcomes, including theories about parent variables (reviewed most recently by Duncan et al., 2015) and material hardship (proposed by Gershoff et al. 2007). This study supports many of the previous studies' findings and expands on them in important ways. First, previous studies included fewer variables so that comparison among competing theories was not feasible. Second, data were cross-sectional, not longitudinal, so direction of relationships could not be assessed. Finally, previous studies measured child outcomes only for young children, not tweens or teens; the present study provides a comparable examination of children in this older age group, for whom outcomes are more proximate to adult outcomes and the relationship of income to child outcomes may differ.

Compared to results from earlier studies, differences in the findings reported here have important implications for theory in several ways. First, income's associations with child outcomes appeared to be almost entirely indirect, mediated by material hardship, parent distress, and "intensive parenting" practices. This suggested that family income does "matter" for children's cognitive and behavior outcomes, in that more affluent families tended to experience less material hardship and parent distress and to engage in more intensive parenting, which were in turn associated with better cognitive achievement and fewer behavior problems for the child. However, it also meant that parent distress, intensive parenting, and material hardship were what directly "mattered" for child outcomes, and therefore that it may be possible to improve child

outcomes by intervening on these variables without changing income. Second, testing of overall structural model suggested two patterns, related to two sets of child outcomes. Child behavior outcomes, including internalizing and externalizing behaviors, were strongly associated with parent distress, which largely mediated the relationship of family material hardship to child behaviors. This finding suggests a long and complex path between family socioeconomic status and child behavior outcomes, involving income, material hardship and parent distress in response to income and hardship. In contrast, child cognitive achievements were strongly related to intensive parenting, which served to mediate the relationship between parent distress and child cognitive achievements. When compared to other models, this overall structural model showed the best fit, suggesting that the relationships of income to parent variables to child outcomes are anything but simple. I discuss each in turn.

2.5.1 Family Income and Child Outcomes

Early research (e.g., Mayer, 1997) suggested that family income in the early childhood years was not strongly related to outcomes for young adults. Many researchers have suggested that this is because the effect of income on child outcomes is mediated by other economic and parent variables (Duncan et al., 2015). Results of the present study support this notion that income's association with child outcomes is largely mediated, but that is not to say income has no effect.

First, decomposition of the total effects of income on child outcomes into direct and indirect effects showed that indirect effects accounted for much of their relationships (ranging from 63% to about 100% of the total effects, Table 2.7). I used two methodological tools not used in previous work that lend greater confidence in these results: bootstrapped standard errors for the mediation model, which produces more valid and reliable results (Preacher and Hayes

2004); and longitudinal data in which income and mediator data were measured prior to child outcomes, which prevents bias due to simultaneity of data collection as would be the case with cross-sectional data (Duncan, Magnuson and Votruba-Drzal 2015).

Second, results found here showed that three constructs were significantly related to family income and served to mediate its effects on child outcomes (Tables 2.4 and 2.5): family material hardship, parent distress, and intensive parenting (a latent variable composed of parent investment, cognitive stimulation, warmth, and parent education expectations). Tests for goodness of fit in the structural model showed that the strongest model included all three of the mediators; exclusion of paths to and from any one of these constructs significantly decreased model fit (Table 2.6).

Thus, results support findings and theories derived from earlier studies of family income: its effects on child outcomes seem to be largely indirect, mediated by other variables, but not negligible; and this association is bridged by multiple, distinct mediating economic and parent variables. One of these mediators appears to be family material hardship, which I discuss next.

2.5.2 Family Material Hardship and Child Outcomes

As noted above, family income was inversely associated with family material hardship, although the relationship was not as strong as that found by Gershoff et al. (2007). This may have occurred because the measure used for material hardship in the present study used a different scale (i.e., the Economic Strain Scale) and because the sample was composed of older children (10 years old on average versus 6 years old). Nonetheless, consistent with Gershoff et al. (2007), family material hardship positively predicted parent distress and child behavior problems. About half of the total effects of material hardship on child behavior problems were indirect, mostly

through parent distress. Thus, family material hardship partially mediated the relationship between family income and parent distress (Table 2.4) as well as the relationship of family income to child behavior problems (Table 2.5). These findings supported the argument of Gershoff et al. (2007) that family income alone is insufficient as a measure to predict the relationship between the family financial situation and child outcomes; instead, the actual financial situation of the family—including expenditures as well as income—helps to predict parents' distress level and the child's behavior problems. Because family income and material hardship were measured five years prior to child behavior problems, the current study suggests that the relationship between income and child behavior problems is at least partly due to the influence of the material hardship on later child behavior problems, and that the direction of the relationship is from hardship to behavior problems. It is possible there is also a reverse or recursive relationship (e.g., if costs for treatment of a child's mental illness represent a substantial expenditure for a family), but temporal priority suggests material hardship does impact later child behavior problems.

Unexpectedly, I found that family material hardship in 2002 was positively—rather than negatively—associated with intensive parenting in 2002. The relationship was significant, but not as strong as the relationship between family income (a five-year average, from 1997 - 2002) and intensive parenting. This result suggests that intensive parenting may be more strongly related to long-term financial situation than short-term—and that parents may sometimes compensate for material hardship by engaging in more rather than less intensive parenting. For example, a parent who is laid off temporarily may in some cases end up spending more time with the child than is possible when that parent is working full-time.

In summary, the findings of this study support the contention of Gershoff et al. (2007)

that material hardship is an important mediator in the parent distress path from income to child outcomes. Overall, this suggests that material hardship during the tween years plays a substantial role above and beyond income in influencing child behavior in the teen years, both through and in addition to parent distress (Gershoff et al. 2007).

2.5.3 Parent Variables and Child Outcomes

As discussed earlier, there are three basic theories about the mechanisms by which parents affect child outcomes (Duncan, Magnuson and Votruba-Drzal 2015) that have been viewed as separate and independent but are conceptually complementary. Results of SEM in this study in fact produced a measurement model (Table 2.2) showing best fit with two factors (Table 2.3) instead of three. Specifically, measures related to parent distress and psychological reactions to the child loaded on one latent variable; measures related to four parent behaviors (investment, cognitive stimulation, warmth, and educational expectations) loaded on a second latent variable. This finding may in part reflect the particular measures used here (e.g., the investment measure focused on attendance at school events) or the sample of parents and children studied here (e.g., with widely varying levels of income rather than a focus on low-income families, as is sometimes the case).

Nonetheless, the finding of a two-factor solution indicates two patterns. First, parent distress appears to be conceptually and empirically distinct from parent behaviors, suggesting that parent distress does not always translate into the same parenting behaviors. Second, parent behaviors may be conceptually distinct, but empirically they seem to covary: model fit statistics preferred a measurement model in which the four parenting practices loaded on a single latent

variable I termed "intensive parenting." In short, in this study parents who engage in cognitive stimulation of their child (e.g., buying books or musical instruments) also show warmth (e.g., not using harsh discipline), invest their time in attendance at school events, and hold high expectations for the child's level of educational attainment. This does not mean that parents who engage in one of these behaviors will always engage in all four, but it does suggest that there is a tendency for parents to do so.

Having found that the parent variables clustered on two factors instead of three, the second task was to compare the effects of the two factors on child outcomes. It is perhaps not surprising that parent distress showed significant direct relationships to child behaviors but not to child cognitive achievements; in contrast, intensive parenting showed significant direct effects on all three child outcomes, although the direct relationship to cognitive achievement was stronger than the direct relationships to the behavior problems of internalizing and externalizing (Table 2.5). This model, which included parenting variables and material hardship, showed stronger fit than alternate models that excluded one or more of these constructs (Table 2.6).

This is not to say that parent distress was unrelated to child cognitive achievements, however. As shown by calculation of the decomposition of effects (Table 2.7), parent distress had indirect effects on cognitive achievement; in fact, 83% of its effect on cognitive achievement was mediated by intensive parenting. Intensive parenting also mediated the effects of parent distress on behavior problems, but the portion of total effects was quite small (11 – 17%). This suggests that both parent distress and intensive parenting influence child outcomes over time, but that part of the effect of parent distress is mediated by intensive parenting. These findings are consistent with the overall theory of parent distress (Duncan, Magnuson and Votruba-Drzal 2015), suggesting that distressed parents often engage in parent behaviors that are less supportive

of the child.

2.5.4 Limitations

The analyses here focused on income, material hardship, parent distress, and parent behaviors during a limited time period with children who were between 6 and 12 years of age in the first time period (2002), so these variables' associations may not be generalizable to younger children. It was also not possible to check temporal priority, and therefore directionality, of the relationships among material hardship, parent distress, and intensive parenting, because they were all measured in the same wave from 2002. It was, however, possible to assess temporal priority of these variables in relationships to child outcomes measured in 2007. Additionally, most items were self-reported by parents and some were single-item, raising the possibility of some reporting bias by the parents. Fortunately, most measures used standard scales, which may have reduced bias and also produced results that could be more directly compared to those of earlier studies.

Finally, the sample used here was small, but still generally representative of the population cohort of American children aged 0-6 years old in 1997. Loss of cases that occurred due to attrition between waves of sampling and non-completed child assessment surveys in 2007 (from which cognitive achievement scores were taken) may have affected representativeness. Additionally, I removed cases of ethnic minorities for whom sample size was very small (i.e., Asian Americans and the "other" category) and siblings (because their inclusion would have violated the assumption of independent cases) in accordance with previous studies (Davis-Kean 2005), so it may not be representative of all ethnic groups or families with siblings close in age.

2.5.5 Conclusions

Analysis of my proposed model suggested that permanent family income (measured as average income from 1997 – 2002) significantly predicted child cognitive achievement and behavior problems in 2007, but that these relationships were mostly mediated by three distinct but related variables measured in 2002: family material hardship, parent distress, and intensive parenting. Further, parent distress and intensive parenting partially mediated the relationship of family material hardship to child outcomes. Parent distress was directly related to child behavior problems, but its relationship to child cognitive achievement was mediated by intensive parenting. Finally, intensive parenting showed direct effects on child behavior problems and to cognitive achievement. Overall, these results suggest that family income can influence child outcomes, but that it does so through a complex system with multiple paths.

CHAPTER III

Tweens to Teens: Testing a Model of Income Change and Changes in Child Outcomes during Adolescence

3.1 Introduction

As noted by many previous studies and shown in analyses presented in Chapter 2, children's family income has an enduring association with their cognitive achievement and level of behavior problems through mechanisms like parenting behaviors (Mayer 1997). The logical next question is whether—and how—changing children's income or the mechanisms it affects could improve children's skill development and later outcomes dependent on these. The strength of the associations that income and its mechanisms have with child outcomes suggest they should be effective sites of intervention, but finding solutions has been much more complex than finding the problem.

This question of how to promote economic equality of opportunity for children has been a major topic of public debate in the U.S. for over a century. As Mayer notes, different solutions to the issue have been proposed at different points in history, from direct monetary supplements for disadvantaged parents (e.g., welfare payments) to care for children outside the home (e.g., boarding schools) or supplemental care to children still at home (e.g., Head Start); these solutions have had varying degrees of success, but none have "solved" the issue. Indeed, despite the association between family income and child outcomes, Mayer found that change in income

was not strongly related to change in any of these outcomes (Mayer 1997).

Three possibilities may account for this conundrum: (1) the outcomes may be associated with income, but income does not change enough for enough families to observe an impact that differentiates child outcomes; (2) persistent poverty, rather than income changes, may be what matters most for child development; or (3) that there may be unmeasured confounding factors producing a spurious relationship between the two (e.g., a variable like parent intelligence may be the cause of both family income and child outcomes) (Duncan, Magnuson and Votruba-Drzal 2015). For these reasons, Duncan et al. (2015) argued that it is important to examine the effects of income change on child outcomes, not just the relationship between income "level" (their term) and child outcomes, to elucidate the relationships between income and child outcomes.

One solution to separating the effects of income levels from those of income change is to use fixed-effects regression analysis to examine within-person change, where the potential effect of time-invariant unmeasured variables is minimized. Vortruba-Drzal used fixed effect approaches to address the threat of omitted variables in samples of young children (ages 4 to 8 years of age) and those in the tween years (ages 11 to 12). Using cross-sectional and longitudinal data from the 1986 – 1998 National Longitudinal Survey of Youth (NLSY), she found that change in household income during early childhood was positively related to change in cognitive stimulation by parents, and that this relationship was stronger in low-income households (Votruba-Drzal 2003). She also used fixed-effects analyses to assess relationships of change in income to change in home environment and child outcomes, and found that changes in behavior problems were associated with changes in both early childhood income and tween income but changes in academic achievement test scores were related only to changes in early childhood income (Votruba-Drzal 2006). She found stronger relationships among variables for children in

low-income homes than in high-income homes. Thus, fixed-effects regression analysis of individual-level data provides a stronger method for analyzing change than the descriptive analysis of population-level changes provided by Mayer (1997), but appears to have been used in only two studies focused on early and middle childhood according to the recent review by Duncan et al. (2015).

In this study I use fixed-effects analysis to explore the relationships between changes in income and outcomes for children in their tween years (age 10) to teen years (age 15). Children in this age range require further study for three reasons. First, teens' cognitive and behavior outcomes may be very different from those seen in early and middle developmental periods (e.g., violence and depression may take different forms for teens than for children in earlier developmental periods). Second, change in family income may have a different impact on teens' outcomes than it would for younger children; if nothing else, teen "toys" (e.g., cell phones, videogame consoles and extra-curricular activities) are usually more expensive than the toys enjoyed by small children, and lack of access to these activities may have greater ramifications for teen social interactions (e.g., bullying) than would be the case among very young children. Finally, teen outcomes may be more directly linked to adult outcomes (e.g., occupational achievement, incarceration, drug use) that impact adult socioeconomic status because of their temporal proximity to those adult outcomes. For example, teens who engage in delinquent behavior (e.g., gang violence) are more likely to be punished than are young children who do so, possibly with greater impact on their chances of incarceration as adults. If income change is unrelated to changes in child cognitive and non-cognitive outcomes during the teen years, then it is difficult to see how teens' household income changes would influence important adult outcomes.

I use data from a large, nationally representative longitudinal sample, the Panel Study of Income Dynamics (PSID) with the Child Development Survey (CDS) supplement. By comparison with the NLSY data used in the few prior studies, the CDS data offer three advantages. First, as noted above, the CDS data provide the chance to consider effects of changes from tween (aged 10 – 11 years) to teen years (aged 15 – 16 years), not just in earlier developmental periods. Second, the CDS data provide a measure of material hardship in addition to family income. Results from my study reported in Chapter 2 suggested that material hardship mediates the relationship of income to both parent distress and child outcomes; for this reason it is important to include this ancillary measure of family financial pressures. Finally, the CDS data include more measures of parent-related variables than do the NLSY data. As reported in Chapter 2, the relationship between family income and child outcomes was mediated by both parent distress and a broad measure of parent behaviors (including parent investment, parent cognitive stimulation and warmth, and parent expectations of child's educational achievement), so it is useful to be able to calculate change scores for all the parent variables.

3.2 Background

There has been a great deal of empirical investigation leading to general agreement that parent behaviors that provide cognitive stimulation and warm, supportive caregiving to the child affect child development in areas of cognitive, academic and social domains (Bradley and Corwyn 2002). Many studies have proposed parent behavior as a variable that mediates the relationship between family income and child outcomes, but there is little consensus on the mechanisms by which these variables are interrelated (Yeung, Linver and Brooks-Gunn 2002). Three main positions have emerged from survey-based research concerning the nature of these relationships

(Duncan, Magnuson and Votruba-Drzal 2015), that income affects: (1) parents' levels of *distress*, which then affect their warmth and disciplinary behaviors towards their children; (2) the family's ability to *invest* time and financial resources in the child's development; and (3) parenting *practices* (e.g., cognitive stimulation, warmth, investment in the child and expectations for the child). Most analyses of survey data have focused on relationships between *levels* of income and *levels* of child outcomes, and are thus subject to the problem of potential bias due to omitted variables (Duncan, Magnuson and Votruba-Drzal 2015) as discussed above.

The analyses I presented in Chapter 2 suggested that the three mechanisms outlined by Duncan et al. (2015) actually converged in a two-factor model, in which parent distress represented one factor but parent investment and other behaviors represented a second and separate factor, which I termed "intensive parenting." Levels of both parent distress and intensive parenting were related to levels of family income and family material hardship. It is important, however, to consider whether changes in parent distress and intensive parenting over time are associated with change in child outcomes. Finding evidence of such changes would represent an important step toward identifying the direction of relationship between variables by addressing a question which has previously received very little empirical attention (Duncan, Magnuson and Votruba-Drzal 2015).

In this study I build on the model that I tested in Chapter 2 (which concerned *levels* of SES, parent distress, parent investment, and parenting behavior, and their relationships to levels of child outcomes; see Figure 2.1) by testing a model of *changes* in these relationships (see Figure 3.1). The latent variables constructed and used in Chapter 2 (shown as ovals in Figure 3.1) are re-created and used here, again using the CDS data.

The overall question that I test in this change study is whether increases in family income

are associated with decreased material hardship and parent distress as well as increased intensive parenting—and whether any of these changes improve child outcomes over time. A related question is whether such changes differ by levels of average family income; I indicate this possibility in Figure 3.1 by specifying interaction effects of being in a moderate-income family (versus low-income or high-income). Among high-income families I expect that change in income will not have as strong an association with change in parent-related variables or child-related variables (due to a threshold effect or diminishing returns of income level); instead, these associations will be strongest in moderate-income families and perhaps in low-income families (unless there is also a lower threshold for income change effects). I use fixed-effects regression analysis to test for relationships among changes in these variables between the tween years (i.e., middle childhood) and teen years. Both research questions are discussed in more detail below as I posit specific hypotheses.

3.2.1 Hypotheses about Changes in Family Income

As discussed in Chapter 2, parent distress theory posits that low socioeconomic status (SES) for parents often results in increased distress that can negatively impact expression of warmth and support toward their child, thereby increasing the risk of child behavior problems (e.g., aggression or depression) (Mayer 1997). These stress-induced effects may also negatively affect parents' social relationships (e.g., marital or workplace relationships); increase the parent's risk of alcohol and drug abuse as a coping mechanism, affecting competence and warmth in parenting; or be transferred to the child, hindering cognitive and social skill development and increasing risk of behavior problems (Conger et al. 1992, Conger et al. 1994, Conger, Conger and Martin 2010, Elder et al. 1992, McLeod and Shanahan 1993, McLoyd et al. 1994, Sampson

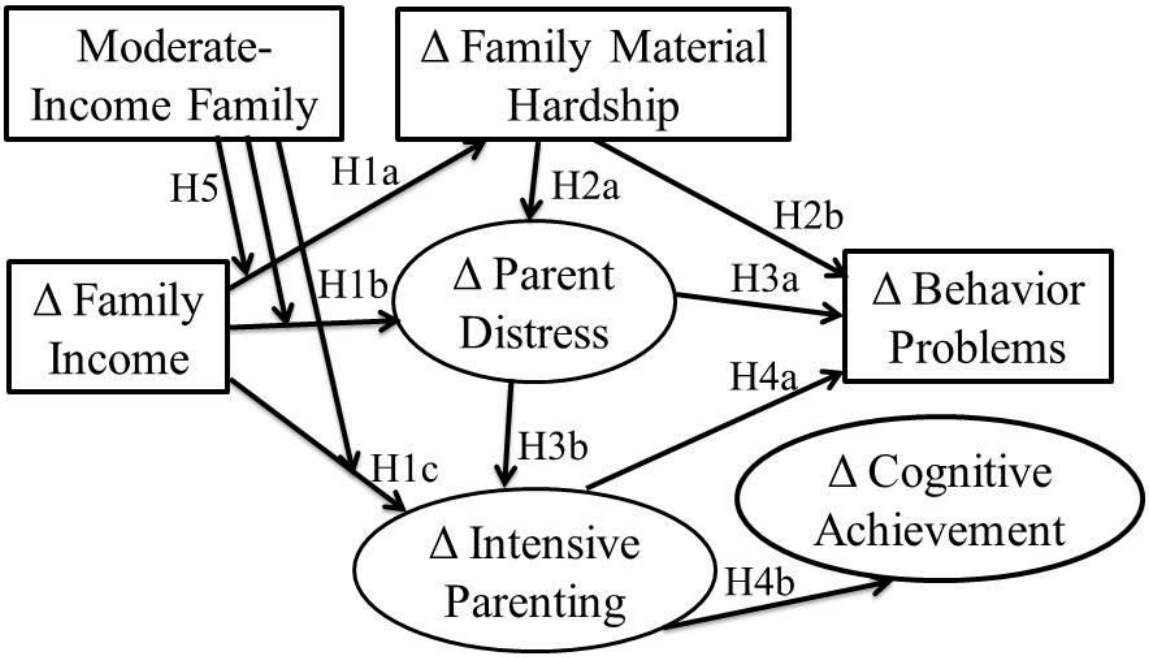
and Laub 1994). Further, low income is a direct cause of distress in children (Nelson and Sheridan 2011), as early or chronic distress induced by income-associated environmental conditions alter brain development in ways that negatively affect cognitive achievement, behavior, and mental health. The results I presented in Chapter 2 supported this idea that income level has "main effects" on child outcomes, although much of that effect was mediated by other variables in my study. Thus, this study examines only whether change in income is similarly associated with change in child outcomes.

However, also noted in Chapter 2, a family's financial situation cannot be reduced to income alone. Measures of material hardship (e.g., specific financial difficulties such as difficulty paying bills) capture important additional information about a family's SES (Gershoff et al. 2007), because family income likely has a nonlinear "threshold effect" on the amount and kinds of financial troubles the family experiences that varies with regional costs of living or other living conditions. Findings from Chapter 2 suggest level of material hardship can also have a substantial impact on level of parent distress problems net of raw income level, and earlier research has shown that material hardship may be directly associated with child distress and behavior problems, independent of its association with parent distress (Duncan, Magnuson and Votruba-Drzal 2015).

Based on these arguments concerning the relationship among levels of family income, material hardship, and parent distress, one might postulate that increasing family income between a child's tween and teen years would decrease material hardship and parent distress over that period. Subsequently, these changes should be reflected in improvements in the child's outcomes during the period, specifically reduced behavior problems and higher cognitive achievement. I predict that the reductions in family material hardship and parent distress mediate

the relationship between increased family income and improved child outcomes, as shown in Figure 3.1. In other words, I expect that one reason that increased income ameliorates child outcomes is because it reduces family material hardship and parent distress; however, I do not believe that this is the only reason for improved child outcomes.

Figure 3.1. Proposed Integrative Model



My first hypotheses focus on the first part of the model.

Hypothesis 1a. Increased family income is associated with decreased family material hardship.

Hypothesis 1b. Increased family income is associated with decreased parent distress.

There are several potential reasons that change in income might be related to change in parent behaviors. Parent investment theory views income as a necessary but insufficient

condition for investing in goods and services that provide cognitive stimulation and supplement education for the child (Mayer 1997). Expenditures on educational supports (e.g., books, study materials, summer camps, etc.) can improve a child's cognitive and social skill development, but require that the parents can afford them and consider them sufficiently useful to purchase. Thus, simply by virtue of having more disposable income and free time, middle-class parents can give their young children greater advantages than working-class parents through spending, and are more likely to do so even when educational supplements are not their highest priority (Chin and Phillips 2004). Low-income parents who experience a temporary boost in income may not spend on such advantages: parental investment theory is often used in conjunction with the permanent income hypothesis, which posits that people anticipate trends in their income and therefore change their spending habits little in response to most short-term fluctuations in income, borrowing money or using savings to make up for temporary decreases, or saving after increases (Mayer 1997).

Cultural theories of parenting focus on parents' ideas, beliefs, and assumptions, and how they form particular "clusters" by social class. This theoretical framework does not lead to the prediction that increased income would necessarily change parent behaviors. Yet in results from my study summarized in Chapter 2, I found that parent investment and other parent behaviors both were associated with the same latent variable, which I called "intensive parenting." That is, parent investment was empirically related to parent behaviors of cognitive stimulation and warmth as well as expected educational attainment for the child. This linking of aspects of cultural theory (e.g., cognitive stimulation by parents, parents' emotional warmth, and parents' expectations for their child's educational attainment) to investment theory raises questions about whether increased income could change cultural aspects of parenting at the same time as it may

increase parent investment practices (e.g., if parents join new social groups and pick up or desire to implement different parenting practices as a result).

Further, my study and earlier studies alike found empirical evidence that *levels* of income are associated with *levels* of parent variables. There have been only two studies that examined the relationship between *change* in income and *change* in parent behaviors (including parent investment) or the relationship of these changes to changes in child outcomes. Neither study examined change processes in the developmental period between the tween years and the teen years. It is possible that change in intensive parenting between the tween and teen years has greater or lesser effects on child outcomes; arguments could be made in either direction. On the one hand, this is a developmental period when the child turns increasingly to peer interactions and is viewed as capable of operating more independently from parents, so intensive parenting may have less impact on child outcomes. Yet it is also a time period when the child may be heavily involved in school events (e.g., sports, theatre, band) that parents attend; parents may also spend more time engaged in cognitively stimulating activities that both child and parent find attractive (e.g., visiting museums instead of playgrounds); and parents may gain a more realistic sense of the kinds of academic achievement of which the child is capable and therefore give more serious consideration to the educational goals they hold for the child. For all these reasons, increases in intensive parenting from the tween to teen years may improve child outcomes. The first question, however, is whether increased family income is linked to increased intensive parenting—and this represents my next hypothesis.

Hypothesis 1c. Increased family income is associated with increased intensive parenting.

3.2.2 Hypotheses about Changes in Mediator and Moderator Variables

I also expect that increased family material hardship is associated with increased parent distress and child behavior problems based on earlier theories and empirical findings (including mine reported in Chapter 2) that level of family material hardship mediated income's associations with parent distress and child behavior problems. These predictions lead to the following hypotheses:

Hypothesis 2a. Increased family material hardship is associated with increased parent distress.

Hypothesis 2b. Increased family material hardship is associated with increased child behavior problems.

Theory and research concerning parent distress, most recently reviewed by Duncan et al. (2015), show that parent distress may affect child behavior problems (e.g., child depression) as well as parenting practices (e.g., harsh discipline or low levels of warmth). My findings from Chapter 2 supported this argument. Extending this idea to the change model proposed in Figure 3.1 produces the following hypotheses:

Hypothesis 3a. Increased parent distress is associated with increased child behavior problems.

Hypothesis 3b. Increased parent distress is associated with reduced intensive parenting.

Both *parental investment theories* and *theories of parenting practices* predict that parenting behaviors influence child outcomes (McLoyd, Mistry and Hardaway 2013), but for different reasons. In Chapter 2, I reported that the best fitting SEM measurement model produced one latent variable representing both parent investment and other parenting behaviors, which I labeled intensive parenting, and that level of intensive parenting was associated with level of child outcomes. Although there has been no previous research on the question of whether increased intensive parenting from tween to teen years is associated with improved child

outcomes during that period, theory reviewed above suggests that there should be such an association. Thus:

Hypothesis 4a. Increased intensive parenting is associated with reduced child behavior problems.

Hypothesis 4b. Increased intensive parenting is associated with improved child cognitive achievement.

In addition to the above hypotheses, I predict an interaction effect between level of income and change in income. Votruba-Drzal (2003, 2006) found that the relationships she observed among variables were stronger for children from low-income households than high-income households. Specifically, the effects of change in income seemed to be magnified when it occurred in lower income households. Perhaps it is not surprising that a positive change in income would result in greater change in parenting behavior in households where income was lower initially—even if the percentage change is the same, overall buying power is affected differently in a household with lower income than in a household with higher income, as there is more pent-up demand for goods that could not previously be purchased (Mayer 1997). On the other hand, it is also possible that in low-income households a positive change in income is quickly spent to pay off bills rather than on "extras" for children, whereas in moderate--income households this might not be the case. For this reason it is important to examine change in income as a predictor of change in parenting resources in relation to "permanent income" or the normal family income level of the household. Thus analyses in this study include interaction terms between family income change and average permanent income levels to assess whether change in income has differing relationships to change in parenting behavior and to change in child outcomes depending on the level of permanent or average family income of the household.

Hypothesis 5. Average income level and change in income together produce an interaction effect, such that effects of increased income are greater in moderate-income families than in other families.

3.3 Data and Methods

This study used the Child Development Survey (CDS) supplement of the Panel Study of Income Dynamics (PSID) for data analysis, including most of the same variables and cases, as in Chapter 2. Here, multiple imputation was used (m = 25) to handle missing data for incomplete cases. Of the 953 cases used for the analyses in Chapter 2, 46 did not respond to the cognitive assessment portion of the 2002 wave and about 25 did not have fully imputed missing data for the 2002 wave, resulting in an analytic sample of 877 individuals in two waves. This sample size is a bit smaller than that reported in Chapter 2 because the fixed effects analysis required that variables be non-missing in both waves (rather than just one wave) in order to compute a difference score.

3.3.1 Measures of Child Outcome Variables

Cognitive achievement scores from the Woodcock-Johnson Revised Tests of Achievement (Woodcock 1977), measured according to the Woodcock-Johnson Psycho-Educational Battery-Revised (which compares test-takers' results with those of national averages for the child's age), were count variables reflecting achievement in one or more areas. These included: (1) the Applied Problems score (math); (2) the Passage Comprehension score (reading); and (3) the Language-Word Recognition Score (vocabulary). As reported in Chapter 2, the three cognitive achievement scores loaded on one latent variable, which is used in study to simplify the model. In this study I calculated a score for change in overall cognitive achievement from 2002 to 2007

(i.e., score in 2002 subtracted from score in 2007).

Changes in behavior problems from 2002 to 2007 were measured with the Behavior Problems Index, which has two subscales (externalizing and internalizing, denoted BPI-E and BPI-N, respectively). This measure was constructed from a set of items asked of the parent or child guardian (PCG) regarding the child's internalizing and externalizing behaviors. Externalizing BPI, a measure of aggressive and antisocial behavior toward others, was calculated as the count of binary items checked from a list of 17 items ($\alpha = .86$ in the CDS) describing the child's behavior (e.g., cheats or tells lies; argues too much). Internalizing BPI, which reflects levels of depression, anxiety, and loneliness, was calculated as the count of binary items selected from a list of 14 items ($\alpha = .83$ in the CDS) describing the child's behavior on these measures (e.g., is too fearful/anxious; cries too much). It is a standard scale commonly used in studies on this topic.

3.3.2 Measure of Parent Distress

Interviewers asked PCGs in 2002 and 2007 about frequency of emotional distress (e.g., nervousness, hopelessness, or worthlessness) experienced in the past month, adapting six items from the K-6 Non-Specific Psychological Distress Scale (Kessler et al. 2003), which were rated on a scale from 1 ("never") to 5 ("often"). The survey also constructed an Aggravation in Parenting Scale with seven items (e.g., being a parent is constraining, exhausting, difficult, or frustrating) rated on a scale from 1 ("not at all true") to 5 ("completely true"). Scores on the two scales loaded on one latent variable representing parent distress with strong fit statistics, reported in Chapter 2.

3.3.3 Measure of Intensive Parenting

Four measures of parenting practices were available in the CDS in 2002 and 2007: cognitive stimulation; warmth and support; parent involvement in schooling; and parent education expectations for the child. Factor analysis (reported in Chapter 2) showed that the four parenting practice scores loaded on one latent variable with strong fit statistics, termed "Intensive Parenting."

Cognitive stimulation and warmth scores were based on two scales that measured PCG behaviors toward the child as observed by the interviewer or described by the PCG, both from the Home Observation for Measurement of the Environment-Short Form (HOME-SF): the Cognitive Stimulation subscale and the Warmth and Support subscale (Caldwell and Bradley 1984). Both have been widely used and have high internal reliability and validity (Mott 2004, Smith, Brooks-Gunn and Klebanov 1997). The 15 items in the Cognitive Stimulation subscale concerned the child's intellectual environment, including (1) access to cognitively stimulating *materials* (e.g., books, magazines, newspapers); (2) *organized activities* (e.g., mother provides toys, family encourages hobbies, child is taken to theatre and museums frequently); and (3) *physical environment* (i.e., home environment is dark/monotonous, cluttered, clean, safe). Items in the Warmth and Support subscale from the HOME-SF (Caldwell and Bradley 1984) were recoded as binary variables and summed, then rescaled to a standard range of 1-5 because some different questions were asked of different child age categories (6-9 and 10+ in the 2002 wave of data collection). Seven items measured interaction with the child during the interview based on interviewer observation (e.g., PCG talked with, hugged, or spanked child). Eleven items asked PCGs to rate frequency of child interactions with family and friends, explain expectations concerning child behaviors (e.g., in completing chores), and describe typical disciplinary actions.

High scores represented greater emotional warmth toward the child and less corporal discipline.

Two measures were based on PCG ratings of single items in the interview. Parent Involvement in the child's school activities was based on a count of attendance at several types of school events (e.g., PTA meetings, volunteering to help in school, and school events). Parent Education Expectation measured the highest level of education that the parent thought the child was likely to attain: high school or less (the reference), college degree, or advanced degree.

3.3.4 Measure of Family Income

Family income was a continuous variable constructed as the log annual household income in a single year (2002 and 2006). I also constructed three categories of average income in 2002, 2004, and 2006 for use in subgroup analyses: low income, meaning less than $40,000 annually (reference group, n = 370); moderate income, meaning $40,000-$80,000 annually (n = 318); and high income, meaning greater than $80,000 annually ($n$ = 189). I used these income categories in order to create approximately equal subgroups. Recall that data were collected nationally, so in relative terms an income of $40,000 in 2002 might not be low in some parts of the US (e.g., rural areas of the Midwest or South) but would be in others. According to US Census data, the median family income in 2002 was $42,409, but there was considerable variance across states (DeNavas-Walt, Cleveland and Webster 2003).

3.3.5 Measure of Family Material Hardship

Number of economic difficulties and adjustments made in response to those difficulties were measured with the Economic Strain Scale in 2002 and 2007 (Conger and Elder 1994). This scale was constructed as the count of 15 binary items each indicating whether the family had particular

economic problems (i.e., filed for bankruptcy or had property repossessed) or made changes to cope with financial difficulties (i.e., foregone medical care or large purchases) within the past year.

3.3.6 Measures of Control Variables

Analyses included several control variables to further disentangle direct associations with income and parenting behavior from other associations. As fixed-effects regressions these analyses implicitly control the effects of time-invariant characteristics (e.g., gender and race) as part of the regression equation's individual term, so only demographic characteristics that can change over time are included. I controlled for changes from 2002 to 2007 in three demographic characteristics: child's age in years, number of siblings (top-coded at eight siblings), and whether both biological parents were present in the household (with both present as the reference category, such that a change score of 1 represents separation).

3.3.7 Analytic Approach

In this study I used fixed effects regression analysis to assess the relationship between changes in income from 2002 – 2007 on changes in parent variables and child outcomes during the same time period. Use of this method of analysis provides stronger protection from the problem of unmeasured variables because the analysis is conducted within-cases rather than across cases (Votruba-Drzal 2003, Votruba-Drzal 2006),

3.4 Results

I present results below. Means and statistics are listed in Table 3.1 and correlations among the

variables in Table 3.2. In Table 3.3 I list descriptive statistics for two subsamples: those who experienced increased income and those who experienced decreased income. Table 3.4 provides a comparison of descriptive statistics for three different subsamples based on income groups (low, middle and high). In Table 3.5 I list descriptive statistics for the change measures themselves. Descriptive statistics for period-specific change (in two-year periods) are listed in Tables 3.6 and 3.7, presented separately for subsamples with increased income and decreased income. Results of the fixed effects analysis are shown graphically in Figures 3.2 and 3.3.

3.4.1 Descriptive Statistics

Table 3.1. Descriptive Information for Change Variables (with Multiple Imputation)

	2002 Mean/%	2002 SD	2007 Mean/%	2007 SD	Change Mean/%	Change SD
Income (in thousands)	61.74	67.69	69.99	68.92	0.16	0.99
Log average income	10.59	1.19	10.75	1.07	8.29	55.31
Single biological parent in home	0.42	0.49	0.45	0.50	0.03	0.22
Number of siblings	1.27	1.05	1.34	1.05	0.07	0.49
Child's age	9.47	2.22	14.38	2.22	4.92	0.20
Family material hardship	1.65	1.99	1.65	2.10	-0.01	2.17
Parent distress	-0.02	1.01	-0.01	0.94	0.02	0.89
Intensive parenting	0.13	0.95	0.02	1.01	-0.10	0.74
Average cognitive achievement	0.11	0.99	0.02	0.96	-0.09	0.65
Child's externalizing behavior	5.98	4.14	5.30	4.10	-0.67	3.64
Child's internalizing behavior	3.26	3.20	2.97	3.20	-0.30	2.92

$N = 881$

Descriptive statistics for observations in 2002 and 2007 are presented in Table 3.1. Average income increased from $62,000 in 2002 to $70,000 in 2007, with standard deviations exceeding $67,000 for both time periods. This is somewhat higher than the income means reported by Votruba-Drzal (2006) in her analyses of the NLSY data from 1988 – 2000; converted to 2000

dollars, her mean income for young children (ages 5 – 6) of $34,775 (*SD* = $21,789) increased to $40,784 775 (*SD* = $25,518) five years later (children aged 11 -12 years).

Table 3.2. Correlations among Change Scores

		1	2	3	4	5	6	7	8	9	10
1	Log income (positive)										
2	Log income (negative)	.18									
3	Single parent	.06	.02								
4	Number of siblings	.07	-.01	-.02							
5	Child age	.06	.02	-.02	.01						
6	Material hardship	-.04	-.07	-.02	.01	.02					
7	Parent distress	.05	.00	-.08	-.04	-.01	.09				
8	Intensive parenting	.01	.00	-.02	.00	.06	.03	-.39			
9	Cognitive achievement	.00	-.02	-.05	-.04	.00	.02	-.11	.47		
10	Externalizing behavior	-.06	-.04	-.03	-.03	.00	.05	.25	-.09	.01	
11	Internalizing behavior	-.02	-.05	.02	-.02	-.05	.00	.17	-.05	.05	.51

Correlations among change scores are listed in Table 3.2. They were generally low to moderate and should not create multicollinearity problems in the analyses.

Table 3.3. Descriptive Information for Change Variables (with Multiple Imputation) for Families with Increases and Reduction in Measures

	Reduction in Measure			Increase in Measure		
	Change in Mean	Change in SD	*N*	Change in Mean	Change in SD	*n*
Income (in thousands)	-0.58	0.80	308	0.56	0.84	569
Log average income	-28.82	58.27	308	28.52	41.91	569
Family material hardship	-2.12	1.45	302	2.36	1.62	266
Parent distress	-0.66	0.54	454	0.74	0.57	429
Intensive parenting	-0.61	0.47	499	0.56	0.44	384
Average cognitive achievement	-0.51	0.39	501	0.47	0.49	382
Child's externalizing behavior problems	-3.42	2.37	456	3.00	2.02	323
Child's internalizing behavior problems	-2.74	1.97	378	2.67	2.08	288

For some people change scores were positive (indicating increases from 2002 to 2007) and for others they were negative (indicating decreases from 2002 to 2007). Because positive and negative change scores can average out to means close to zero (masking mean positive and negative changes of greater magnitude), and because positive and negative change may follow different trends, I show descriptive statistics for positive and negative change scores separately in Table 3.3. For each variable, about one third to one half of the sample experienced decreases.

Table 3.4. Descriptive Information for Change Variables (with Multiple Imputation) for Families by Income Group

	Low Income (n = 370)		Middle Income (n = 318)		High Income (n = 189)	
	Change in Mean	Change in SD	Change in Mean	Change in SD	Change in Mean	Change in SD
Income (in thousands)	0.18	1.33	0.14	0.60	0.14	0.67
Log average income	3.44	16.89	9.38	33.51	15.96	108.21
Family material hardship	0.03	2.48	-0.02	2.19	-0.09	1.37
Parent distress	-0.03	1.02	0.03	0.82	0.09	0.75
Intensive parenting	-0.14	0.77	-0.06	0.71	-0.11	0.73
Average cognitive achievement	-0.13	0.66	-0.06	0.60	-0.07	0.73
Child's externalizing behavior problems	-0.60	3.97	-0.92	3.42	-0.39	3.31
Child's internalizing behavior problems	-0.33	3.03	-0.30	2.84	-0.25	2.85

I also compared descriptive statistics for the three income groups, shown in Table 3.4. These results suggest that in many cases the mean change in a given variable was about the same magnitude for each of the three subgroups but for other variables there were substantial differences. For example, patterns of change in child achievement and internalizing behavior

problems were similar across the groups, on average decreasing by a similar amount. In contrast, externalizing behavior decreased for all three subgroups, but the magnitude of decrease was greatest for moderate-income families.

Focusing specifically on change and volatility over time in family income, I examined average income changes during several time periods from 1996 to 2006 (Table 3.5). Mean positive income changes and mean negative income changes were similar across time periods, as were standard deviations of income change, with the exception of the period of 1996 to 1998, where changes were somewhat smaller.

Translating period-specific changes into proportions of the first year in the period (e.g., 1996 to 1998 change divided by 1996 level), produces separate scores, shown for positive income change in Table 3.6 and negative income change in Table 3.7. The mean and standard deviation of income change were roughly constant over time within income groups.

Table 3.5. Mean Change in Family Income over Time

	Positive Change (Increased Income)			Negative Change (Reduced Income)		
	Change in Mean	Change in SD	*n*	Change in Mean	Change in SD	*n*
Year						
1996 to 1998	18.42	22.89	1531	-15.60	19.95	703
1998 to 2002	24.63	26.97	1421	-24.48	31.16	802
2002 to 2004	22.88	28.88	1313	-22.63	27.78	883
2004 to 2006	24.09	29.36	1322	-27.70	34.37	877

However, low-income families experienced greater proportional income increases (on average) than moderate- or high-income families due to their lower initial income levels. Among families who experienced income decreases, the proportional magnitude of change was similar

across income groups. Taken together, these descriptive statistics suggest that income change volatility was low from the period of 1996 to 2006, so the results from this study are not strongly biased by period effects or by using single-year income change scores.

Table 3.6. Mean Positive Proportional Change in Family Income over Time (Y2-Y1)/Y1, by Income Group

	All Groups (*n*=1336-1524)		Low-Income (*n*=497-580)		Middle-Income (*n*=482-571)		High-Income (*n*=326-373)	
	Change in Mean	Change in SD	Change in Mean	Change in SD	Change in Mean	Change in SD	Change in Mean	Change in SD
Year								
1996 to 1998	0.93	1.79	1.31	2.19	0.73	1.40	0.64	1.49
1998 to 2002	0.99	1.69	1.26	1.94	0.78	1.22	0.92	1.87
2002 to 2004	0.91	1.67	1.13	1.91	0.75	1.41	0.80	1.59
2004 to 2006	0.88	1.66	1.17	2.02	0.65	1.19	0.75	1.55

Table 3.7. Mean Negative Proportional Change in Family Income over Time (Y2-Y1)/Y1, by Income Group

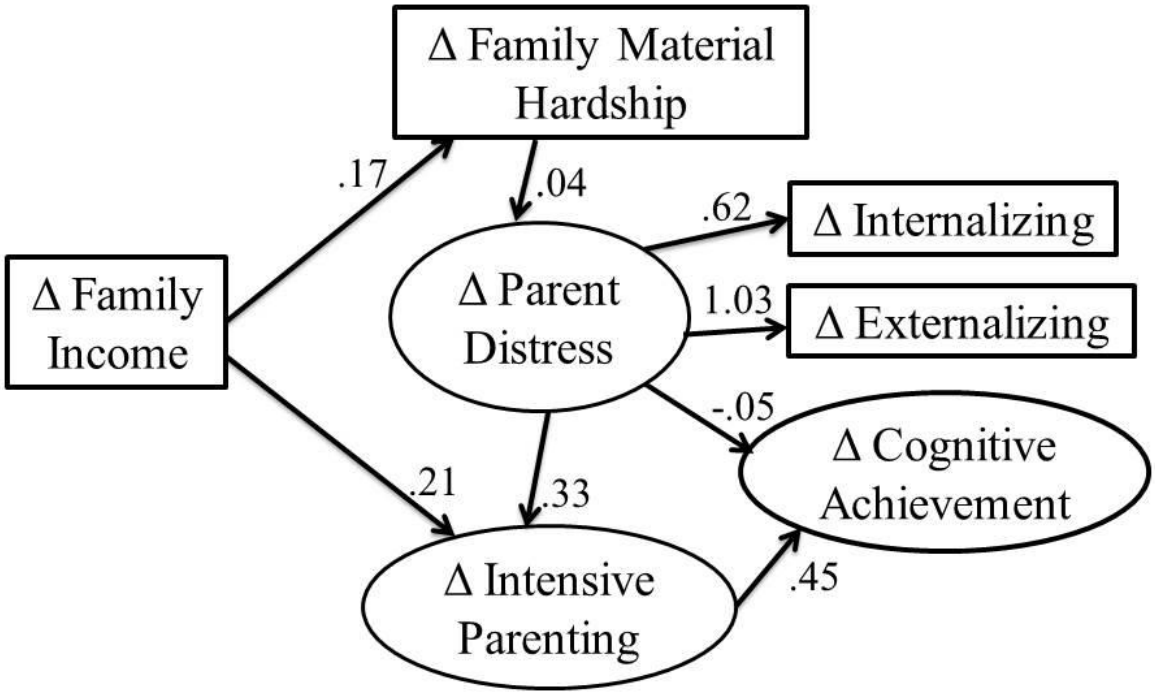
	All Groups (*n*=647-848)		Low-Income (*n*=311-380)		Middle-Income (*n*=213-319)		High-Income (*n*=122-165)	
	Change in Mean	Change in SD	Change in Mean	Change in SD	Change in Mean	Change in SD	Change in Mean	Change in SD
Year								
1996 to 1998	-0.32	0.25	-0.37	0.28	-0.27	0.23	-0.27	0.21
1998 to 2002	-0.38	0.27	-0.43	0.27	-0.33	0.24	-0.35	0.26
2002 to 2004	-0.35	0.26	-0.38	0.26	-0.31	0.25	-0.33	0.26
2004 to 2006	-0.38	0.28	-0.42	0.28	-0.34	0.27	-0.39	0.29

3.4.2 Results of Fixed-Effects Regression Analysis

Results for fixed-effects regression analyses using a "simple change model" (Votruba-Drzal 2006) are listed for all of the sample, showing main effects of variables in a path diagram of

results (Figure 3.2) testing the first four hypotheses. The last hypothesis predicts interaction effects of family income with change in family income; results separating the term for income into three terms (one each for low-, moderate-, and high-income subgroups) are shown in Figure 3.3. Tables providing full regression results are provided in Appendix 3.

Figure 3.2. Results of Change from 2002 to 2007
(Significant Unstandardized Regression Coefficients)



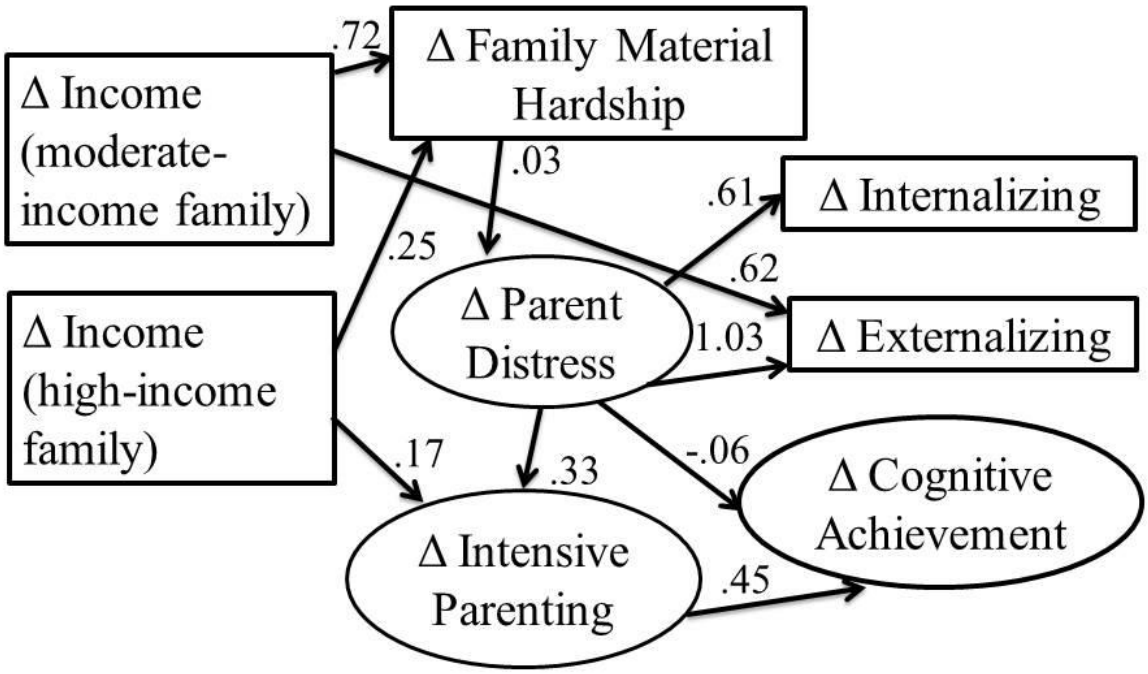
Increased family income was significantly associated with reduced family hardship (H1a) and increased intensive parenting (H1c) but not reduced parent distress (H1b). Reduced family material hardship was associated (H2a) with reduced parent distress but not with reduced behavior problems (H2b). Reduced parent distress was associated with reduced behavior problems (H3a), both externalizing and internalizing, as well as with increased intensive parenting (H3b). Increased intensive parenting was not significantly associated with change in

behavior problems (H4a), either externalizing or internalizing, but was associated with increased cognitive achievement (H4b). I did not predict any relationship between reduced parent distress and increased cognitive achievement but the findings suggested an inverse relationship.

In order to examine possible interaction effects between income level and change in income, I added interaction terms to the regression analysis. Families were classified in three categories of average income level: low-income families (less than $40,000, the reference group); moderate-income families, ($40,000 - $80,000); and high-income families (greater than $80,000). Because income level categories were time-invariant between the two waves the main effects of income level category canceled out of the equation; only the main effect of log income change and the interaction terms (offsets for the log income change coefficient for each income level category from the low-income category) remained. Supplemental tests are shown in the Appendix for this chapter (Tables A3.13 - A3.17) and show no significant differences in the magnitude of most of these coefficients for positive versus negative income change.

The findings were similar for all subgroups, with two important exceptions (Figure 3.3). Increased income was significantly associated with reduced family material hardship only for moderate- and high-income families. Further, increased income was significantly associated with increased intensive parenting and reduced externalizing behavior only for moderate-income families. This suggests that positive income change may not have much effect for parents who have low average income but could influence parents with moderate baseline income, supporting H5. For this subgroup, increased income was most strongly related to those variables predicted to mediate its effect on child outcomes, suggesting that increased income has little effect for low-income families (where a much larger increase would be necessary to change living conditions).

Figure 3.3. Results of Change by Income Category from 2002 to 2007 (Significant Unstandardized Regression Coefficients)



3.5 Discussion

The goal of this study was to examine how income changes between the tween years (age 10) and the teen years (age 15) are related to changes in children's cognitive achievement and behavior problems over the same period. This is an important developmental period in which to investigate the effects of family income change on change in parenting practices, parent distress, and child outcomes, for at least three reasons, to which I alluded briefly at the outset of this chapter. My findings support the notion that past inattention to this age group may have reduced the generalizability of earlier studies, which were based largely on younger children.

Yet no previous research seems to have utilized fixed effects regression analysis to

investigate the effects of change in family income between the tween and teen years (Duncan, Magnuson and Votruba-Drzal 2015). In their review, Duncan et al. (2015) stressed that examination of change processes is important for elucidating the nature of relationships among variables. Specifically, the effects of income on child outcomes cannot be assessed solely on the basis of analyses of the relationship between the level of family income and child outcomes, because such analyses are based on results compared across individuals and are subject to bias due to "omitted variables" (i.e., variables that were omitted from the analysis but actually have an effect on one or both variables, such as mother's IQ). In contrast, analysis of the relationship between change in family income and change in child outcomes allows assessment of variables across time for the same individuals, which is much less likely to suffer from omitted variables bias.

3.5.1 Effects of Change in Family Income

Initial results from this study suggested that income change was directly and significantly associated with change in material hardship and intensive parenting. Closer inspection of income subgroups, however, showed that these effects of income change were moderated by "permanent" income level, such that the associations were strongest for children in families with moderate income. Further, for children in families with moderate income, the effects of increased income on parenting practices, behavior problems, and cognitive achievement were mediated by family material hardship and parent distress. Thus, for moderate income families, there were some direct effects of increased income and some indirect effects, mediated by other variables. These findings did not extend to low-income families, where the income change may be insufficiently large to change their normal situation—an argument initially put forward by Mayer

(1997) several years ago. Similarly, increasing income had less impact on material hardship for parents with high average income than it did for moderate-income parents because they had fewer hardships to alleviate.

This finding contrasts with the results produced by Votruba-Drzal (2003), whose subgroup analysis of younger children showed that increased income was more strongly related to changed parenting practices (specifically, increased cognitive stimulation of children by parents) for parents in the lowest one percent of income ($6,295 annually) than parents with median income ($43,554 annually). Perhaps relevant educational goods and activities for younger children are cheaper, so that a small increase in income buys more goods for younger children (e.g., more books) than for adolescents (e.g., a new computer), or perhaps this result is due to a more stringent definition of low income. In any case, for the adolescents studied here, increased income was related to change in family material hardship, parent distress, and intensive parenting among moderate- income families, not in lower income families. This finding was comparable to results obtained by Mayer (1997), who found that income change was related to outcome variables only among middle-income families in her analysis of population-level data. As Mayer noted, because these families already had a cushion of moderate and stable income, perhaps this additional income was used for educational spending or reduced stress family dynamics. In contrast, lower-income families may have had to use the funds to pay off bills, and higherincome families probably already had sufficient money that any additional increase would make less difference in spending or stress.

Put in practical terms, the results here suggest that providing small amounts of income assistance to families may not reliably result in change in parenting practices or children's outcomes. Very few families in this sample experienced large income changes, however, so

possible heterogeneity of influence across various magnitudes of change could not be examined. Although the current study did not address the question of what happens when income changes are substantial or long-term, the results found here for family material hardship have important implications. Specifically, they suggest that net of income changes, decreasing family material hardship was associated with reduced parent distress (which in turn reduced behavior problems and increased intensive parenting) and had a direct impact on child externalizing behavior (e.g., aggression). This finding supports the argument of Gershoff et al. (2007) that the family's sense of material hardship may be more important than actual income change in influencing parenting practices and child outcomes.

3.5.2 Effects of Change in Parent Variables

In this study, I examined the effects of change in two parenting variables, parent distress and intensive parenting practices. Results showed that reductions in parent distress were associated with increased intensive parenting, suggesting that parents who experience less distress may increase their warmth, cognitive stimulation, investment in the child, and educational expectations for the child.

Reductions in parent distress were also related to decreased behavior problems in children, both externalizing (e.g., aggression) and internalizing (e.g., depression), consistent with past research on associations among levels of these variables. In conjunction with the finding that reductions in parent distress are associated with increases in intensive parenting, this suggests that changes in parent distress can affect child outcomes through multiple paths.

Finally, increased intensive parenting was associated with increased cognitive achievement as adolescents. At a time when parents may begin to participate less actively in their

teens' lives, it appears that those who increase involvement, warmth, cognitive stimulation and educational aspiration may in fact encourage increased cognitive achievement among teens. Even at this relatively late stage of child development, changes in parents seem to be related to changes in important child outcomes. As noted above, earlier research has shown that levels of parenting practices are related to levels of child outcomes and several qualitative studies of parenting practices have suggested that changing parent practices may have the effect of changing child outcomes (e.g., Lareau, 2011). The findings obtained here from quantitative analyses supported the argument that changing parenting practices may produce changes in child achievement scores.

3.5.3 Limitations

The measures of family financial conditions used in this study were limited to family income and family material hardship; the conclusion that income change is unrelated to change in parent-related variables for most families might be different if some economic measure other than income were used (i.e., wealth). However, most studies in this area have used average income measures, rather than measures of long-term wealth, because income measures may be more reliable and allow more concrete and direct comparison of family economic situations (Duncan, Magnuson and Votruba-Drzal 2015). Change in income over a period of five years provides an easily interpretable metric for understanding the effects of change related to the family's financial situation.

Second, this study focused on short-term change from the tween to teen years, a developmental period less studied than earlier childhood, but it was not possible to examine change between early childhood and adolescence. Most of the children who were old enough to

receive cognitive achievement assessments in the earliest waves were moved into the Transition to Adulthood sample by the 2007 wave, which did not collect the same measures. For the same reason it was also not possible to examine change scores for adolescents up through young adulthood. Other data sets might provide long-term data with consistent measures from early childhood to young adulthood.

Third, the sample was quite small. For reasons discussed in Chapter 2, it appeared to be fairly representative of the US population, at least in terms of income and the child outcome measures. Finally, income change was measured at the same time as changes in other variables, so the direction of causality among related variables could not be assessed. For example, theory suggests that income change influences parent distress but it is also possible that parent distress reduces income. Additional research is needed to evaluate explicitly their temporal ordering.

3.5.4 Conclusions

Analyses presented here examined whether income change is associated with changes in parent variables, which in turn could be related to changes in child cognitive achievement and behavior measures as adolescents. The findings concerning income change were very clear—increased income were largely unrelated to changes in parenting-related variables except for middle income families. Yet changes in family material hardship experienced by parents were significantly related to changes in child outcomes over that same time period, suggesting that changes in some measures of SES have an impact on teenagers. Further, reductions in levels of parent distress and increases in intensive parenting practices were associated with improved child outcomes, including both cognitive achievement scores and behavior problems. Thus, in contrast with the results of the study in Chapter 2, which found that income levels were associated with

levels of later child outcomes through material hardship and parent variables, short-term changes in income do not appear to substantially alter child outcomes except among moderate-income families. Instead, only more proximate economic (material hardship) and parent variables (parenting practices) that are associated with income appear to have change relationships with child outcomes. If income change does not affect change in material hardship or parent variables for low-income families then it is important to consider what variables do influence change in these variables and the types of interventions that might be helpful. I return to this question in Chapter 5 in a broader discussion of implications of the findings from all three studies taken together.

Appendix 3: Fixed-effects Regression Analysis Tables

Table A3.1. Fixed-effects Analysis of Family Material Hardship (with Multiple Imputation)

	Regression Coefficients
Log income	-0.17*
Single biological parent in home	-0.20
Number of siblings	0.02
Child's age	0.00
Constant	3.57***

N = 877 individuals.
***$p < .001$; **$p < .01$; *$p < .05$.

Table A3.2. Fixed-effects Analysis of Parent Distress (with Multiple Imputation)

	Regression Coefficients	
	Model 1	Model 2
Log income	0.03	0.04
Single biological parent in home	-0.32*	-0.32*
Number of siblings	-0.06	-0.07
Child's age	0.01	0.01
Family material hardship		0.04*
Constant	-0.19	-0.32

N = 877 individuals.
***$p < .001$; **$p < .01$; *$p < .05$.

Table A3.3. Fixed-effects Analysis of Intensive Parenting (with Multiple Imputation)

	Regression Coefficients		
	Model 1	Model 2	Model 3
Log income	0.02	0.02	0.03
Single biological parent in home	-0.08	-0.08	-0.18
Number of siblings	0.01	0.01	-0.01
Child's age	-0.02***	-0.02***	-0.02***
Family material hardship		0.01	0.02
Parent distress			-0.33***
Constant	0.17	0.14*	0.04

N = 877 individuals.
***$p < .001$; **$p < .01$; *$p < .05$.

Table A3.4. Fixed-effects Analysis of Child's Cognitive Achievement (with Multiple Imputation)

	Regression Coefficients			
	Model 1	Model 2	Model 3	Model 4
Log income	-0.02	-0.02	-0.01	-0.02
Single biological parent in home	-0.18	-0.18	-0.21	-0.10
Number of siblings	-0.08	-0.08	-0.08	-0.06
Family material hardship		0.00		0.00
Parent distress			0.01	0.05*
Intensive parenting			-0.09***	0.45***
Constant	0.42*	0.40	0.37	0.36

N = 877 individuals.
***$p < .001$; **$p < .01$; *$p < .05$.

Table A3.5. Fixed-effects Analysis of Child's Externalizing Behavior Problems (with Multiple Imputation)

	Regression Coefficients			
	Model 1	Model 2	Model 3	Model 4
Log income	-0.24	-0.23	-0.27	-0.27
Single biological parent in home	-0.45	-0.43	-0.11	-0.09
Number of siblings	-0.15	-0.15	-0.08	-0.08
Child's age	-0.12***	-0.12***	-0.13***	-0.13***
Family material hardship		0.09	0.06	0.05
Parent distress			1.01***	1.03***
Intensive parenting				0.09
Constant	10.06***	9.74***	10.06***	10.05***

N = 877 individuals.
***p < .001; **p < .01; *p < .05.

Table A3.6. Fixed-effects Analysis of Child's Internalizing Behavior Problems (with Multiple Imputation)

	Regression Coefficients			
	Model 1	Model 2	Model 3	Model 4
Log income	-0.15	-0.15	-0.17	-0.17
Single biological parent in home	0.32	0.32	0.50	0.52
Number of siblings	-0.07	-0.07	-0.03	-0.03
Child's age	-0.05*	-0.05*	-0.06*	-0.05*
Family material hardship		-0.01	-0.03	-0.03
Parent distress scale			0.57***	0.62***
Intensive parenting				0.13
Constant	5.27***	5.29***	5.47***	5.47***

N = 877 individuals.
***p < .001; **p < .01; *p < .05.

Table A3.7. Fixed-effects Analysis of Family Material Hardship by Income Category (with Multiple Imputation)

	Regression Coefficients	
	Model 1	Model 2
Log income (low income category)	-0.17*	-0.05
Log income (moderate income category)	-0.17*	-0.72**
Log income (high income category)	-0.17*	-0.25*
Single biological parent in home	-0.20	-0.23
Number of siblings	0.02	0.00
Child's age	0.00	0.01
Constant	3.57***	5.42**

N = 877 individuals.
****p* < .001; ***p* < .01; **p* < .05.

Table A3.8. Fixed-effects Analysis of Parent Distress Scale by Income Category (with Multiple Imputation)

	Regression Coefficients		
	Model 1	Model 2	Model 3
Log income (low income category)	0.03	0.05	0.05
Log income (moderate income category)	0.03	-0.11	-0.08
Log income (high income category)	0.03	0.09	0.10
Single biological parent in home	-0.32*	-0.32*	-0.32*
Number of siblings	-0.06	-0.07	-0.07
Child's age	0.01	0.01	0.01
Family material hardship			0.03*
Constant	-0.19	0.14	-0.05

N = 877 individuals.
***p < .001; **p < .01; *p < .05.

Table A3.9. Fixed-effects Analysis of Intensive Parenting by Income Category (with Multiple Imputation)

	Regression Coefficients			
	Model 1	Model 2	Model 3	Model 4
Log income (low income category)	0.02	-0.02	-0.02	0.00
Log income (moderate income category)	0.02	0.19**	0.20**	0.17**
Log income (high income category)	0.02	0.02	0.03	0.06
Single biological parent in home	-0.08	-0.07	-0.07	-0.17
Number of siblings	0.01	0.01	0.01	-0.01
Child's age	-0.02***	-0.02***	-0.02**	-0.02***
Family material hardship			0.01	0.02
Parent distress				-0.33***
Constant	0.17	-0.38	-0.44	-0.46

N = 877 individuals.
[a]Low income category is the reference category for this analysis.
***p < .001; **p < .01; *p < .05.

Table A3.10. Fixed-effects Analysis of Child's Average Cognitive Achievement by Income Category (with Multiple Imputation)

	Regression Coefficients				
	Model 1	Model 2	Model 3	Model 4	Model 5
Log income (low income category)	-0.02	-0.03	-0.03	-0.02	-0.02
Log income (moderate income category)	-0.02	0.10	0.11	0.10	0.04
Log income (high income category)	-0.02	-0.11	-0.11	-0.10	-0.11
Single biological parent in home	-0.18	-0.19	-0.18	-0.21	-0.11
Number of siblings	-0.08	-0.07	-0.07	-0.08	-0.06
Family material hardship					0.00
Parent distress			0.01	0.01	0.06*
Intensive parenting				-0.09***	0.45***
Constant	0.42	0.22	0.19	0.18	0.35

N = 877 individuals.
[a]Low income category is the reference category for this analysis.
***p < .001; **p < .01; *p < .05.

Table A3.11. Fixed-effects Analysis of Child's Externalizing Behavior Problems (with Multiple Imputation)

	Regression Coefficients				
	Model 1	Model 2	Model 3	Model 4	Model 5
Log income (low income category)	-0.24	-0.17	-0.16	-0.22	-0.22
Log income (moderate income category)	-0.24	-0.75*	-0.69*	-0.60*	-0.62*
Log income (high income category)	-0.24	-0.08	-0.06	-0.16	-0.16
Single biological parent in home	-0.45	-0.45	-0.43	-0.12	-0.10
Number of siblings	-0.15	-0.16	-0.16	-0.09	-0.09
Child's age	-0.12***	-0.12***	-0.12***	-0.12***	-0.12***
Family material hardship			0.08	0.05	0.05
Parent distress				1.00***	1.03***
Intensive parenting					0.10
Constant	10.06***	11.32***	10.86***	10.91***	10.96***

N = 877 individuals.
***p < .001; **p < .01; *p < .05.

Table A3.12. Fixed-effects Analysis of Child's Internalizing Behavior Problems (with Multiple Imputation)

	Regression Coefficients				
	Model 1	Model 2	Model 3	Model 4	Model 5
Log income (low income category)	-0.15	-0.19	-0.19	-0.22	-0.22
Log income (moderate income category)	-0.15	-0.26	-0.26	-0.22	-0.24
Log income (high income category)	-0.15	0.26	0.26	0.20	0.20
Single biological parent in home	0.32	0.36	0.36	0.54	0.56
Number of siblings	-0.07	-0.07	-0.07	-0.03	-0.03
Child's age	-0.05*	-0.05*	-0.05	-0.06**	-0.06**
Family material hardship			-0.01	-0.03	-0.03
Parent distress				0.57***	0.61***
Intensive parenting					0.12
Constant	5.27***	4.84***	4.88***	4.90***	4.96***

N = 887 individuals.
***p < .001; **p < .01; *p < .05.

Table A3.13. Results of Fixed-Effects Analysis of Family Material Hardship and Material Distress on Positive and Negative Income Change

	Family Material Hardship		Parent Distress		
	Model 1	Model 2	Model 1	Model 2	Model 3
Log income (positive change)	-0.12	-0.04	0.07	0.09	0.09
Log income (negative change)	-0.25	-0.05	-0.03	0.00	0.00
Middle-income offset (positive change)		-0.38		-0.11	-0.10
High-income offset (positive change)		-0.03		0.05	0.05
Middle-income offset (negative change)		-1.15*		-0.24	-0.20
High-income offset (negative change)		-0.41		0.04	0.05
Single parent	-0.20	-0.25	-0.33*	-0.33*	-0.32*
Siblings	0.01	0.00	-0.07	-0.07	-0.07
Age	0.00	-0.01	0.00	0.00	0.00
Family material hardship					0.03*
Constant	3.55***	5.28***	-0.20	0.10	-0.07
F Scores (*df* = 1, 881)					
Log income main effect		0.00		0.78	0.84
Middle-income offset (positive change)		1.83		0.44	0.30
High-income offset (positive change)		1.20		0.01	0.00

Note. Cases where income increased are coded "0" for negative change; cases where income decreased are coded "0" for positive change. F-tests assess whether effects of income change are significantly different from zero.
n = 877 individuals; *$p < .05$; **$p < .01$; ***$p < .001$.

Table A3.14. Results of Fixed-Effects Analysis of Intensive Parenting on Positive and Negative Income Change

	Model 1	Model 2	Model 3	Model 4
Log income (positive change)	0.03	-0.01	-0.01	0.02
Log income (negative change)	0.00	-0.03	-0.03	-0.02
Middle-income interaction (positive change)		0.23*	0.24**	0.21*
High-income interaction (positive change)		0.12	0.12	0.14
Middle-income interaction (negative change)		0.18	0.19	0.12
High-income interaction (negative change)		-0.06	-0.06	-0.04
Single parent	-0.08	-0.07	-0.07	-0.17
Siblings	0.01	0.02	0.02	-0.01
Age	-0.02***	-0.03***	-0.03***	-0.03***
Family material hardship			0.01	0.02
Parent distress				-0.33***
Constant	0.17	-0.44	-0.49	-0.52
F Scores for difference of magnitude of positive vs. negative change coefficients (*df* = 1, 881)				
Log income main effect		0.04	0.04	0.47
Middle-income interaction		0.11	0.08	0.26
High-income interaction		1.24	1.18	1.29

Note. Cases where income increased are coded "0" for negative change; cases where income decreased are coded "0" for positive change. Interaction terms are the additional coefficient of income in that income level category relative to the low-income subgroup. F-tests assess whether magnitude of income coefficients for an income-level subgroup differ between increasing income and decreasing income.
n = 877 individuals; *$p < .05$; **$p < .01$; ***$p < .001$.

Table A3.15. Results of Fixed-Effects Analysis of Cognitive Achievement on Positive and Negative Income Change

	Model 1	Model 2	Model 3	Model 4	Model 5
Log income (positive change)	-0.04	-0.06	-0.06	-0.05	-0.03
Log income (negative change)	0.03	0.02	0.02	0.02	0.01
Middle-income interaction (positive change)		0.15	0.15	0.14	0.09
High-income interaction (positive change)		-0.08	-0.08	-0.07	-0.10
Middle-income interaction (negative change)		0.10	0.11	0.09	0.00
High-income interaction (negative change)		-0.08	-0.08	-0.08	-0.08
Single parent	-0.17	-0.17	-0.17	-0.20	-0.11
Siblings	-0.07	-0.07	-0.07	-0.07	-0.06
Family material hardship			0.01	0.01	0.00
Parent distress				-0.09***	0.06*
Intensive parenting					0.45***
Constant	0.43	0.23	0.19	0.19	0.36
F Scores for difference of magnitude of positive vs. negative change coefficients (df = 1, 881)					
Log income main effect		2.40	2.40	1.87	0.62
Middle-income interaction		0.09	0.07	0.11	0.47
High-income interaction		0.00	0.00	0.00	0.02

Note. Cases where income increased are coded "0" for negative change; cases where income decreased are coded "0" for positive change. Interaction terms are the additional coefficient of income in that income level category relative to the low-income subgroup. F-tests assess whether magnitude of income coefficients for an income-level subgroup differ between increasing income and decreasing income.
n = 877 individuals; *p < .05; **p < .01; ***p < .001.

Table A3.16. Results of Fixed-Effects Analysis of Externalizing Behavior Problems on Positive and Negative Income Change

	Model 1	Model 2	Model 3	Model 4	Model 5
Log income (positive change)	-0.22	-0.12	-0.12	-0.21	-0.21
Log income (negative change)	-0.28	-0.25	-0.25	-0.25	-0.25
Middle-income interaction (positive change)		-1.02	-0.99	-0.89	-0.91
High-income interaction (positive change)		0.21	0.22	0.16	0.15
Middle-income interaction (negative change)		0.20	0.30	0.50	0.48
High-income interaction (negative change)		-0.11	-0.07	-0.12	-0.12
Single parent	-0.45	-0.42	-0.40	-0.07	-0.06
Siblings	-0.15	-0.14	-0.14	-0.07	-0.07
Age	-0.12***	-0.11***	-0.11**	-0.11***	-0.11**
Family material hardship			0.09	0.05	0.05
Parent distress				1.00***	1.04***
Intensive parenting					0.11
Constant	10.06***	11.25***	10.79***	10.86***	10.92***
F Scores for difference of magnitude of positive vs. negative change coefficients (*df* = 1, 881)					
Log income main effect		0.12	0.12	0.01	0.01
Middle-income interaction		2.85	3.22	3.92*	3.95*
High-income interaction		0.27	0.21	0.21	0.18

Note. Cases where income increased are coded "0" for negative change; cases where income decreased are coded "0" for positive change. Interaction terms are the additional coefficient of income in that income level category relative to the low-income subgroup. F-tests assess whether magnitude of income coefficients for an income-level subgroup differ between increasing income and decreasing income.
n = 877 individuals; *$p < .05$; **$p < .01$; ***$p < .001$.

Table A3.17. Results of Fixed-Effects Analysis of Internalizing Behavior Problems on Positive and Negative Income Change

	Model 1	Model 2	Model 3	Model 4	Model 5
Log income (positive change)	-0.07	-0.10	-0.11	-0.15	-0.16
Log income (negative change)	-0.25	-0.31	-0.31	-0.31	-0.31
Middle-income interaction (positive change)		-0.13	-0.13	-0.08	-0.10
High-income interaction (positive change)		0.48	0.48	0.45	0.43
Middle-income interaction (negative change)		0.05	0.04	0.16	0.14
High-income interaction (negative change)		0.43	0.43	0.40	0.40
Single parent	0.31	0.36	0.36	0.54	0.56
Siblings	-0.07	-0.07	-0.07	-0.03	-0.03
Age	-0.06*	-0.06*	-0.06*	-0.06*	-0.06*
Family material hardship			-0.01	-0.03	-0.03
Parent distress				0.57***	0.61***
Intensive parenting					0.12
Constant	5.25***	4.78**	4.81***	4.85***	4.92***
F Scores for difference of magnitude of positive vs. negative change coefficients (df = 1, 881)					
Log income main effect		0.35	0.35	0.21	0.20
Middle-income interaction		0.07	0.06	0.12	0.13
High-income interaction		0.01	0.01	0.01	0.00

Note. Cases where income increased are coded "0" for negative change; cases where income decreased are coded "0" for positive change. Interaction terms are the additional coefficient of income in that income level category relative to the low-income subgroup. F-tests assess whether magnitude of income coefficients for an income-level subgroup differ between increasing income and decreasing income.
n = 877 individuals; *p < .05; **p < .01; ***p < .001.

CHAPTER IV

Effects of Early Childhood Care Type on Cognitive Achievement and Behavior Problems

4.1 Introduction

There has been a longstanding interest, marked by debates both in social science and in policy, in the relationship between non-parental early child care and children's wellbeing (Belsky and Steinberg 1978, Vandell 2004). Because many children spend a substantial amount of time in the care of people other than their parents, it has the potential to affect child cognitive and non-cognitive skill development greatly. However, there is an added urgency to these studies because the choices made by parents among various types of professional care for young children may play a role in shaping patterns of social stratification and intergenerational mobility in today's world. With the increasing prevalence of dual-earner and single-parent households in the last few decades, formal, long-term pre-school care arrangements are now essential to most parents. In fact, 50% of infants and toddlers and 75% of preschoolers now receive nonparental care (Burchinal et al. 2015). Professional child care is also more widely available across social strata, as government-funded programs like Head Start and preschool vouchers have made access less dependent on wealth. Quality of care is more consistent because of professionalization of staff resulting from care-giver training certification and new government regulations.

In principle, these developments suggest that early child care could become a social equalizer much like public schooling, providing quality care that disadvantaged parents may lack the training, time, or resources to provide themselves. Alternatively, access to higher-quality care

that fosters child skill development may remain exclusive to wealthy parents, limiting early child care's aggregate effect on social mobility. To assess these two possibilities will require a better understanding of the links between family background and patterns of child care use, as well as between the characteristics of different care types and their effects on child development and outcomes. These are the two goals of this study.

Two major aspects of early childhood care make it a mechanism linking family background to child outcomes. First, in a context like the U.S. where pre-kindergarten child care is still predominantly paid for by the parent, socioeconomic status and family characteristics affect access to particular types of care (Burchinal et al. 2015). Parents who work longer hours or single parents may experience time constraints that influence their choice of care providers. Less wealthy parents, especially those who have long work hours and no partner, may not be able or willing to take their children to private day care and preschool centers. For some of them, free or low-cost Head Start programs may be a viable alternative; for wealthier parents, Head Start is not an option due to income eligibility restrictions. Other parents may prefer to use care only from well-known friends or relatives, or to arrange their work schedules so that they can handle care themselves (e.g., when two parents work different shifts in order to share child-care responsibilities).

Second, care arrangements may differ in how well they foster child development based on a variety of factors (Burchinal et al. 2015). Care providers' training, familiarity with their charges, level of attention, and care or curriculum style could influence child skill development. Care setting characteristics, such as the availability of stimulating toys and educational materials and the ratio of children to caregivers, also play a role. These characteristics vary greatly by care arrangement, but are more similar within types of center care (e.g., Head Start or pre-

kindergarten) due to requirements such as care provider certification and provider-child ratios.

In this study I examine patterns of care selection by socioeconomic status and use this information to evaluate the long-term impact of child care type in observational data. Past studies were constrained by the different limitations that are particular to either *observational* studies of average child-care impact based on its characteristics or *experimental* studies of the effects of a particular care regime on the children who participated. Two features of the present study lessen the impact of some issues typical to observational data while at the same time allowing analysis of the net effects of care selection that would not be possible with experimental data.

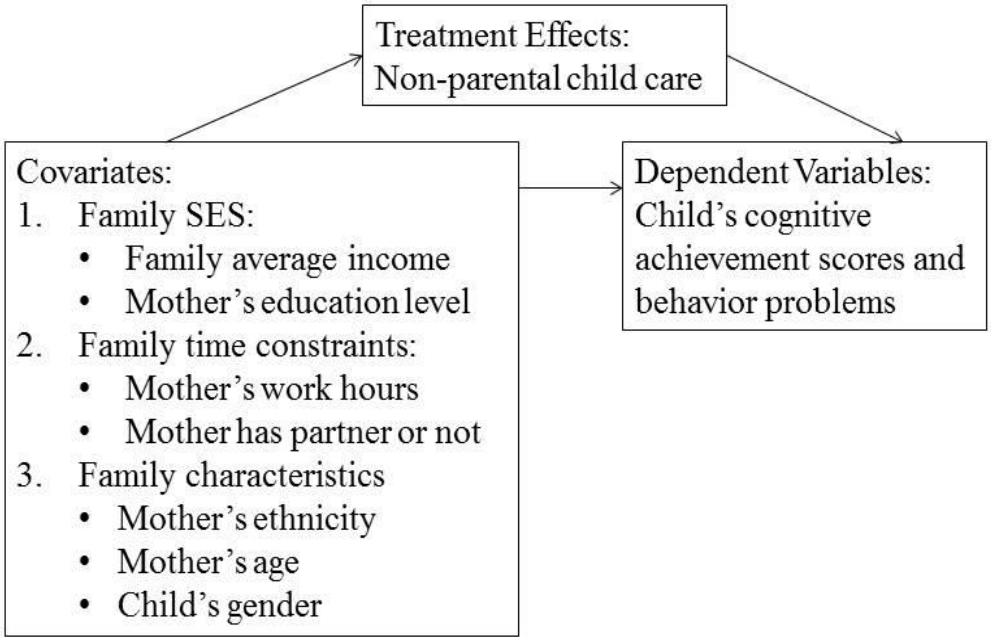
First, I use a longitudinal observational data set for a birth cohort with repeated measures of early child care and later cognitive and non-cognitive skills, which allows examination of the persistence of child care effects on continuing child development. To my knowledge, no previous observational studies have used longitudinal data of duration sufficient to investigate whether these effects fade over time; only studies of experimental data have been able to do so.

Second, my model takes into account patterns of selection of particular types of child care (i.e., treatment status) and covariates that may influence the selection process as well as outcomes for the child, including cognitive achievement scores and behavior problems. To ignore this selection process, as often occurs in studies of observational data, introduces selection bias in estimation of care type effects. Experimental studies avoid this issue by using random assignment of care, but in so doing, provide no information on the care selection process and the indirect effect it has on child outcomes. By using multiple-treatment propensity score methods, I can explicitly adjust for selection bias in care type use.

4.2 Background

As shown in Figure 4.1, the treatment status is represented by type of child care selected. Covariates include three sets of family variables: family socioeconomic status, family time constraints, and family demographic characteristics. I predict that family socioeconomic status is associated with selection of care type because of the differential expense associated with different types of care. Further, I expect that family time constraints due to the mother's work hours and the availability of a partner to transport the child to child care also influence the choice of care type. For example, pre-K and Head Start normally are offered only during daytime hours but non-program care may be offered at night as well and provide an option for single parents who work nights. Other family characteristics (e.g., age and ethnicity of parent and child) may also influence the type of care selected or child outcomes.

Figure 4-1. Proposed Model of Treatment Effects and Covariates In Relationship to Child's Achievement and Behavior Problems Scores



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4.2.1 Experimental Studies of Child Care

Child care effects have been extensively studied using early-childhood experimental intervention programs (Burchinal et al. 2015), which provide estimates of "ideal" child care effects free from care selection bias. Experimental intervention studies targeting disadvantaged children (e.g., the Perry Preschool program, Abecedarian project, and Infant Health and Development studies) have demonstrated persistent effects of quality early child care on skills and outcomes (Barnett 1995). Improvements in cognitive skills often fade soon after the intervention ends but long-term adulthood outcomes such as educational achievement, health behaviors, employment, and involvement in crime have been shown to be improved by such programs, due partly to lasting improvements in non-cognitive behaviors such as self-control (Heckman, Pinto and Savelyev 2013). Unfortunately, these seminal studies drew their samples from limited geographic areas and included socioeconomic eligibility restrictions, so they were not representative of the national population of American children (Burchinal et al. 2015). Furthermore, the high quality of the care provided in these experimental settings may have been atypical of the care most children actually receive.

4.2.2 Observational Studies of Child Care

There have been few long-term, large-scale observational studies of child care effects (Burchinal et al. 2015). In contrast to experimental studies, observational study samples are often representative of a wider range of children and care arrangements, allowing them to show how effects vary based on timing, duration, type, and quality of child care as well as child characteristics (Vandell 2004). Generally, higher quality child care is associated with better educated caregivers, lower caregiver-child ratios in group care, and center-based care (which

usually has more cognitively stimulating materials and better educated caregivers than home-based care). In turn, high-quality child care is associated with higher cognitive and social skills and fewer behavior problems (Burchinal et al. 2015, Li et al. 2013, Ruzek et al. 2014, Vandell 2004); as a result, center-based care generally produces better child outcomes than other types of early child care (Putnam 2015, Waldfogel 2006), particularly for low-income children, relative to parent-only care (Burchinal et al. 2015).

That said, because of the wide variety arrangements that are possible and the variation in their quality, observational studies have shown there are many complexities to the effects of child care (Burchinal et al. 2015). Some threshold level of quality may need to be reached before early childhood education affects outcomes for children, and there are individual differences in how children respond to care, such that some benefit more than others from such programs; for instance, some studies find differences in effects by gender. Quantity of early childhood education used also varies greatly, resulting in potentially heterogeneous results. Burchinal et al. (2015) conclude that number of hours spent in care is *not* related to attachment to the mother or to behavior problems; instead, there is some indication that number of hours may actually help academic achievement, although two years of early childhood education did not necessarily produce higher academic achievement than one year. On the negative side, center-based care is also associated with greater behavior problems and worse learning behaviors in early childhood if used for an extended period of time (Coley et al. 2013), if used by children with lower initial social skills (Vandell 2004), if caregivers are switched often (Pilarz and Hill 2014), or if care is used heavily before the child is one year old (Putnam 2015, Waldfogel 2006).

These studies lacked the long-term longitudinal data to assess whether short-term detrimental effects persisted into pre-teen or teen years; if results from experimental studies are

generalizable, the negative effects found in observational studies may fade or even reverse with time (Barnett 1995). Further, children were not randomly assigned to treatment groups in observational studies, introducing the possibility of care type selection bias—that is, that apparent effects of child care on child outcomes are the spurious result of family characteristics that affect both selection of care and child outcomes. This problem may be somewhat resolved with propensity score analysis (Winship and Morgan 1999).

In their recent review of quantitative and qualitative research concerning types of childcare and its effects, Burchinal et al. (2015) pointed out that there are three basic types of care: care by relatives (received by 48% of US children aged 0 – 4); home-based care by unrelated adults (i.e., day care home or in child's home by nanny, received by eight percent of all US preschool children); center-based care, a more formal type of care, often used by older children who have previously received care by relatives or home-based care (received by 50% of all US children aged 3 years and 75% of US children aged 4 years). Most commonly, center-based care is provided by private childcare and preschool centers, whereas Head Start and Pre-K programs are funded by the government. Center-based care is most likely to be selected by certain kinds of parents (Burchinal et al. 2015). In particular, parents who value educational benefits tend to select center-based care, compared to other parents. Parents with logistics problems due to transportation needs or non-standard work shifts that occur at times other than the usual "9 to 5" jobs (especially for low income parents) are also likely to choose center care. Latino/a children and children of immigrants are less likely to attend center-based care than are non-immigrant children who are white or African-American. These findings suggest that some of the family socioeconomic status and demographic characteristics that are associated with child outcomes through the parenting variables identified in chapters 2 and 3 of this dissertation are

likely also associated with parental choice of care arrangements for young children, which would result in selection bias in estimates of child care type effects on child outcomes.

4.2.3 Research Questions

Thus, while experimental studies have demonstrated what high-quality child care *can* achieve, many questions remain about the long-term effects associated with the child care most children *actually* receive. The goal of the present study is to investigate these questions—in particular, the effects of family variables on parent choice of particular types of child care and how this care affects child cognitive and non-cognitive skills in later childhood. The research questions addressed in this study focus on the relationships of family SES and parent time constraints on parent selection of child care type, as well as the associations of family SES, parent time constraints and child care type to child outcomes, including cognitive achievement and behavior problems.

4.3 Data and Methods

I use data from the Fragile Families and Child Wellbeing study, a longitudinal study of mothers (with a deliberate oversample of unmarried mothers) and their children. The initial wave sampled 4700 mothers when they gave birth at 75 hospitals in 20 large cities (population 200,000 or more) in the US from 1998 to 200. Follow-up waves interviewed the child's mother, the father (if possible), and teachers/care providers when the child was 1, 3, 5, and 9 years of age. The data set is well-suited for studying patterns of child care usage in urban areas (where many options are available) and long-term associations with child outcomes, especially in single-parent families for whom quality care may play an especially important role in child rearing.

Due to attrition, the sample size is reduced to 3000 children who lived with the respondent at ages 5 and 9 and had data in both these waves. Of these, about 300 respondents did not complete either the in-home child cognitive assessment or the self-administered questionnaires that included the questions on child behavior. An additional 108 children were in the "2 cities" subsample and coded as using kindergarten for their primary child care, making them not comparable to the rest of the sample (for whom the survey asked only about child care prior to kindergarten). After listwise deletion of all these cases as well as 38 cases with missing data on other variables, the analytic sample is 2578 children. Based on pairwise correlations and logit models predicting missingness, all data appeared to be missing at random with respect to the variables used in the analyses, so imputation was not used.

4.3.1 Covariate: Family Socioeconomic Status

I used two measures of family socioeconomic status that may be related to selection of child care type and to child outcomes. I used the log of the average of annual household income in the first four waves (at child's age 0, 1, 3, and 5) as a proxy measure for permanent income. Mother's education at child's birth was categorized as less than high school degree, high school degree (treated as the reference category), associate's degree, bachelor's degree, or advanced degree.

4.3.2 Covariate: Family Time Constraints

Family time constraints may affect choice of child care, especially if some types of child care are located at farther distances from home (thereby requiring transport of the child to child care) or if child care providers are not open during night or holiday hours when single mothers may need care, depending on their work constraints. I used number of mother's work hours as the first

measure of time constraint. Mothers who are married or cohabiting with a partner (who presumably could help with child care or transport to child care) may feel lower time constraint so I measured whether mother was single or living with a partner.

4.3.3. Covariates: Family Demographic Variables

Family demographic variables may be related to child outcomes and perhaps also to choice of child care. I measured three variables at the time of the child's birth (age 0): mother's race/ethnicity, mother's age, and child's gender. Mother's race/ethnicity was classified as white (the reference category), Black, Hispanic, Asian/Pacific Islander, or other. The mother's age was measured in number of years. Child's gender was coded with a reference category of male.

4.3.4 Treatment Variable: Primary Childcare Type

The treatment variable of interest is the primary type (i.e., type used for the most hours per week) of non-parental child care used at the age 5 interview prior to entering kindergarten. Interviewers first asked if the child was currently in kindergarten or on summer break from kindergarten. Parents whose children were in kindergarten or on break were asked about their child care in the semester before the child entered kindergarten, and parents whose children had not yet entered kindergarten were asked about current child care. They were first asked about non-kindergarten center care and then, if the child had not been in some type of center care for at least eight hours a week, about non-program care by relatives or non-relatives used for at least eight hours a week. I constructed five categories of primary child care type from these measures: day care (day care center, nursery school, or preschool), used by 37% of the sample; pre-kindergarten (including junior kindergarten), used by 27%; Head Start, at 14% of the sample; home care (no center-based care and at least 8 hours a week of care by a relative or non-relative), used by 8%; and parental

care only (no center care and less than 8 hours a week of non-center care), used by 15% of the sample and treated as the reference category in analyses.

4.3.5 Dependent Variables

The primary dependent variables are measures of child cognitive achievement and behavior problems. Four standard measures of the *child's cognitive achievement* were included in the age 9 interview: the Woodcock-Johnson standardized applied problems (i.e., math skills) and passage comprehension scores (i.e., reading skills); the Peabody Picture Vocabulary Test (PPVT-III) standardized score; and the Wechsler Intelligence Scale for Children (WISC-IV) Digit Span (memory) subtest.

Child behavior problems were measured at child's age 9 using four subscales from the Child Behavior Checklist CBCL/4-18: attention problems, social problems, externalizing behavior, and internalizing behavior (listed in Table A4.1 in Appendix 4). Each subscale was constructed as the average of several ordinal items about how often the child exhibited specific behaviors or issues ranging from 0 ("never" or "not true") to 2 ("very often" or "very much true"), with a higher subscale value representing greater behavior problems. "Attention problems" ($\alpha = .82$) included 11 items on the child's attention management, engagement with school work, and self-control skills (e.g., "Child can't concentrate"; "Child can't sit still"; "Child has poor school work"; and "Child is impulsive or acts without thinking"). "Social problems" ($\alpha = .64$) was composed of eight items indicating difficulties the child has with social interaction (e.g., "Child acts too young for his/her age," "Child clings to adults or is too dependent," and "Child does not get along with other kids"). "Externalizing behavior" ($\alpha = .91$) comprised 30 items on aggressive, bullying, and destructive behavior by the child (e.g., "Child argues a lot,"

"Child destroys things belonging to his/her family or others," "Child physically attacks others," and "Child lies or cheats"). Finally, "internalizing behavior" ($\alpha = .86$) included 22 items on whether the child seems depressed, socially anxious, or lonely (e.g., "Child would rather be alone than with others," "Child is unhappy, sad, or depressed," and "Child worries").

4.3.6 Analytic Approach

Three steps of data analysis were used to assess long-term effects. I first predicted children's likelihoods of using each type of child care (parental care, non-program care, day care center, Head Start, or pre-kindergarten) using a multinomial logit regression, which showed how type of child care used was patterned by family variables.

Second, I estimated OLS regressions of the treatment effects of each type of child care on child cognitive achievement and behavior problems at age 9 to provide conventional estimates of child care type effects for comparison with the IPW models (described below). I estimated two OLS models: a reduced-form bivariate model of care effects (Model 1) and a multivariate model including the family variables (Model 2).

Finally, I estimated average treatment effects (ATEs) and average treatment effects on the treated (ATETs) of care type on cognitive achievement and behavior problems at age 9, adjusting for child care type selection using the predictions from the first step in inverse propensity weights (IPWs). This process, accomplished using Stata's "teffects ipw" command, is described below.

The first step in an IPW model is to estimate a propensity score model for likelihood of treatment (Guo and Fraser 2014). In this study, because there are multiple treatment categories for care type, I used a multinomial logit model of age 5 care type on family variables (covariates)

at child's age 5. This included log average income in the first four waves and other family variables, namely mother's level of education at child's birth, mother's work hours and relationship status when the child was age 5, and mother's race/ethnicity, mother's age at child's birth, and child's gender.

Using this model I predicted five propensity scores—one for each care type—for each child, which represented estimates of the probability that the particular type of care was the child's primary source of care, conditional on family variables. However, because each child received only one type of care as his or her "primary" child care, weights were constructed from only one propensity score. Thus, for each case, I used only the propensity score for the type of care the child actually received in order to calculate an inverse probability of treatment weight (IPTW).

Both multivariate OLS regressions and IPTW regressions are capable of adjusting for treatment selection on observed covariates, but they each have their own limitations. Inherent in the OLS estimator is the assumption that treatment effects are homogenous across cases—that the potential outcome for all cases, had they been given a particular treatment, equals the average observed outcome for cases that did receive that treatment. Covariates (control variables) may help to disentangle these treatment effects from outcome associations with other observed variables, but they cannot prevent biased estimates if there is selection on variables that are not observed or if treatment effects truly are heterogeneous based on some covariates. In contrast, IPTW regressions allow individuals' potential treatment effects to vary with observed covariates (summarized in a single propensity score), because they calculate potential outcomes and average treatment effects using observed outcomes weighted by individuals' probability of receiving that treatment. In practical terms, this can reduce estimate bias from sample

composition relative to unweighted OLS estimation (since the distribution of observed covariates is taken into account), and can even be used to examine patterns of treatment effect heterogeneity by covariates (Xie, Brand and Jann 2012). On the other hand, if the conditional-independence assumption is violated (any unobserved variables affect both treatment selection and potential outcomes), IPTW estimation can increase random error relative to unweighted OLS estimation (Guo and Fraser 2014). Thus, by using both sets of analyses, I was able to cross-examine their results.

4.4 Results

I provide descriptive statistics in Table 4.1. The relationship of family variables to child care type is shown in Table 4.2 and Figure 4.2. Associations of family variables and child care type to child outcomes are listed in Table 4.3. Tables 4.5 and 4.6 show results of inverse propensity treatment weighted regression results for care type at age 5 on child outcomes.

4.4.1 Descriptive Statistics

Descriptive statistics for outcomes are shown in Table 4.1. Mean household 5-year average income was $35,000 (SD = $34,000). At age 5, 64% of the children were in day care or pre-kindergarten; a majority of mothers were Black, had a high school education or less, and were not living with the child's father.

Table 4.1. Descriptive Statistics (N = 2578)

Variable	Mean/%	SD	Minimum	Maximum
Covariates				
Average household income in $1000s (age 0-5[a])	34.97	33.59	1.85	350.75
Log average household income (age 0-5)	10.12	0.84	7.52	12.77
Mother's education at baseline				
Less than High School degree	31.34			
High School degree (reference)	31.61			
Technical/Associate's degree	25.64			
Bachelor's degree	7.99			
Advanced degree	3.41			
Mother's weekly work hours (age 5)	37.64	14.92	0.00	120.00
Single mother (age 5)	0.53	0.50	0.00	1.00
Mother's race/ethnicity				
White (reference)	21.1			
Black	50.89			
Hispanic	24.59			
Asian/Pacific Islander	1.94			
Other	1.47			
Mother's age at child age 0 (in years)	25.13	6.04	15.00	43.00
Child's gender (female = 1, male = 0)	0.48	0.50	0.00	1.00
Child's age (in years at age 5 wave)	5.11	0.21	4.75	6.00
Treatment Effects: Primary care type (age 5)				
Parent only (reference)	14.58			
Non-program (home) care by non-parents	7.68			
Day care	37.08			
Head Start	13.77			
Pre-kindergarten	26.88			
Cognitive Achievement and Behavior Problems				
Applied problems score (age 9)	98.77	15.47	1.00	152.00
Passage comprehension score (age 9)	93.40	13.73	1.00	136.00
Peabody picture vocabulary score (age 9)	93.20	14.92	44.00	159.00
WISC-IV digit span (age 9)	9.40	2.75	1.00	19.00
Attention problems (age 9)	0.27	0.29	0.00	2.00
Social skills problems (age 9)	0.23	0.25	0.00	2.00
Externalizing behavior (age 9)	0.24	0.24	0.00	2.00
Internalizing behavior (age 9)	0.17	0.21	0.00	2.00

[a]Age refers to the approximate child age at the data collection wave.

4.4.2 Family Variables and Child Care Type

Figure 4.2 provides a graphic portrayal of the association between average income and the probabilities of using different types of care. From this simple analysis it is clear that income is associated with choice of care type.

Figure 4.2. Relationship of Average Household Income to Predicted Probabilities of Care Type Use at Age 5

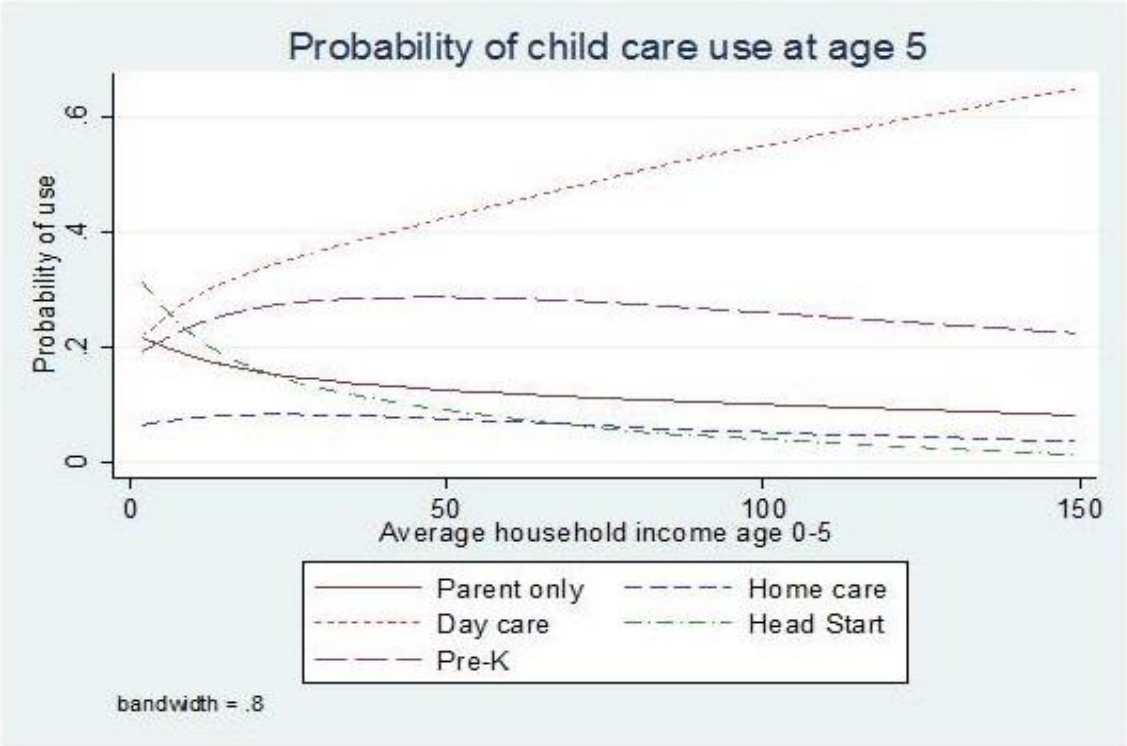

Table 4.2 shows estimates from a multinomial logit regression for the likelihood of using types of primary non-parental child care at age 5 (versus the reference category of parental care only) on family variables in the same wave. These suggest two main patterns for care type selection.

Table 4.2. Multinomial Logit Estimates for Likelihood of Using Type of Child Care at Age 5 on Age 5 Covariates

	Non-program	Day Care	Head Start	Pre-K
Log average income (age 0-5)	0.46**	0.49***	-0.17	0.41***
Mother's education at age 0				
Less than High School degree	-0.28	-0.20	-0.29	-0.43***
Technical/Associate's degree	-0.23	0.42*	0.22	0.42*
Bachelor's degree	0.18	1.24***	0.25	1.02**
Advanced degree	-0.67	1.22**	0.64	0.72
Mother's work hours (at child age 5)	0.02***	0.01*	0.02***	0.01**
Single mother (at child age 5)	1.10***	0.57***	0.50**	0.56***
Mother's race				
Black	0.07	0.68***	1.02***	0.91***
Hispanic	0.19	0.36*	0.70**	0.84***
Asian	-0.90	-0.18	-0.21	-0.47
Other	-0.59	-0.69	0.12	0.04
Mother's age (at child age 0)	-0.02	-0.01	-0.04**	-0.03*
Child's gender (reference male)	-0.10	0.21	0.26	0.04
Constant	-5.83***	-4.99***	0.88	-4.24***
AIC	7359.60			
BIC	7687.47			

***$p < .001$; ** $p < .01$;* $p < .05$. $N = 2578$.

The first pattern seen in the results is that higher SES was associated with use of certain types of care (particularly center-based care). Income was associated with a greater probability of using non-program, day care center, or pre-kindergarten care rather than parental care only. Mother's level of education was also related to selection of care type. Having less than a high school education was associated with use of parental care only; having a bachelor's degree or more was associated with use of day care or pre-kindergarten care.

The second pattern is that greater family time constraints were associated with use of any non-parental care. Marital or cohabitation status was associated with selection of child care type (likely due to single parents facing greater time constraints than partnered parents): being single was associated with use of some type of non-parental care, particularly non-program care. Similarly, number of mother's work hours was positively related to use of non-program, Head

Start, or pre-kindergarten care. Thus, there is clearly selection of child care type based on family SES and time constraints that could bias estimates of child care type effects. Other than these patterns, being Black or Hispanic (relative to the reference category of being white) was associated with a greater probability of using a day care center, Head Start or pre-kindergarten care rather than parental care only, and mother's age was inversely related to use of Head Start or pre-kindergarten care.

Examinations of covariate balancing across treatment groups, shown in Tables A4.2 – A4.5 in Appendix 4, confirm that child care type is selective with respect to observed family variables, and that the inverse propensity weights are effective in accounting for this selection. Many of these covariates have significant associations with child care type, but these associations are no longer significant once I weight them by inverse propensity scores.

4.4.3 Family Variables, Child Care Type, and Child Outcomes

Table 4.3 shows OLS estimates for cognitive achievement scores at age 9 on care type at age 5, and Table 4.4 lists OLS estimates for behavior problem scores at age 9 on care type at age 5. For each variable, Model 1 estimates the average treatment effects of care types, and Model 2 adds terms for family variable covariates in an attempt to control for care type selection. In Model 1, day care is positively associated with all four cognitive achievement scores, and pre-kindergarten is positively associated with all cognitive achievement scores except the Weschler digit span. For most care types, inclusion of covariates substantially reduced coefficient sizes and significance, suggesting that family variables influenced child outcomes beyond the effect of care type. For the case of Head Start, inclusion of family variables increased coefficient sizes and significance, which suggests that much of the apparent difference between Head Start and other center care in

Table 4.3. OLS Regression Estimates (Unstandardized) of Age 9 Cognitive Achievement on Age 5 Child Care Type and Covariates

	Applied Problems		Passage Comprehension		Peabody Picture Vocabulary		Weschler 4-Digit	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Treatment Effects: Care Type (age 5)								
Non-program	1.63	1.22	1.60	1.29	1.25	0.66	0.06	-0.04
Day care	4.83***	2.49**	4.15***	1.78*	4.21***	1.31	0.41*	0.05
Head Start	1.00	2.59*	0.05	0.94	-0.94	1.33	0.06	0.09
Pre-K	3.47***	2.28*	2.54**	1.37	2.65**	1.32*	0.16	-0.07
Covariates								
Log average income (age 0-5)		3.05***		2.60***		3.87***		0.29**
Mother's education (age 0)								
Less than High School		-1.43		-1.25		-2.33**		-0.36**
Technical/Associate's		3.41***		2.42***		3.90***		0.23
Bachelor's degree		6.24***		6.52***		7.60***		1.01***
Advanced degree		7.85***		7.97***		8.99***		1.49***
Mother's work hours (age 5)		0.03		0.02		0.01		0.00
Single mother (age 5)		-0.29		-0.63		0.33		0.06
Mother's race								
Black		-4.24***		-2.73***		-7.94***		0.01
Hispanic		-2.36**		-3.92***		-6.40***		-0.25
Asian		2.61		0.15		-0.61		0.06
Other		-5.48*		-1.68		-2.63		-0.23
Mother's age (age 0)		-0.02		-0.06		0.00		0.01
Child's gender: female		0.43		2.95***		-0.73		0.15
Constant	95.79***	67.08***	91.05***	66.83***	90.96***	57.17***	9.19***	6.38***
R^2	.01	.15	.02	.15	.02	.27	.00	.05

Note. Model 1 includes only care type treatment effect; Model 2 adds covariates. ***$p < .001$; ** $p < .01$;* $p < .05$. $N = 2578$.

Table 4.4 OLS Regression Estimates (Standardized) of Age 9 Behavior Problems on Age 5 Child Care Type and Covariates

	Attention Problems		Social Problems		Externalizing		Internalizing	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Treatment Effect: Care Type (age 5)								
Non-program	.05	.04	.01	.01	.03	.02	.02	.03
Day care	-.01	.02	-.01	.00	.00	.02	-.01	.01
Head Start	.02	.03	.01	-.01	.02	.01	.02	.01
Pre-K	.00	.02	-.02	-.01	.01	.02	-.01	.00
Covariates								
Log average income (age 0-5)		-.03**		-.03***		-.04***		-.02***
Mother's education at age 0								
Less than High School		.00		.01		.00		.00
Technical/Associate's degree		-.01		-.02		-.01		-.01
Bachelor's degree		-.03		-.04*		-.02		.01
Advanced degree		-.01		-.05		.00		.04
Mother's work hours (age 5)		.00		.00		.00		.00
Single mother (age 5)		.04**		.03**		.02*		.01
Mother's race (reference white)								
Black		-.10***		-.02		-.06***		-.06***
Hispanic		-.08***		-.01		-.08***		-.02
Asian		-.08*		-.02		-.04		-.03
Other		.03		.08		.04		.06
Mother's age at age 0		.00*		.00*		.00**		.00
Child's gender: female		-.09***		.00		-.05***		-.01
Constant	.27***	.69***	.24	.45	.23***	.72***	.18	.44***
R^2	.00	.06	.00	.03	.00	.05	.00	.03

***$p < .001$; ** $p < .01$;* $p < .05$. $N = 2578$.

Note. Model 1 includes only care type treatment effect; Model 2 adds controls.

total effect was due to socioeconomic differences in the children using them. In Model 2, relative to parental care only, day care was associated with higher applied problems and passage comprehension scores, while pre-kindergarten and Head Start were associated only with higher applied problems scores. Care types were not associated with behavior problems scores.

Table 4.5. Inverse Propensity Weighted Regression Estimates for Age 5 Care Type Effect on Age 9 Cognitive Achievement

	Applied Problems	Passage Comprehension	Peabody Picture Vocabulary	Weschler 4-Digit
Average treatment effect				
Non-program	1.21	1.15	0.04	-0.01
Day care	2.70**	2.14*	0.94	0.11
Head Start	1.34	0.12	-0.39	0.02
Pre-K	2.47**	1.75	1.03	0.01
Average treatment effect on treated				
Non-program	2.01	2.63	1.06	0.00
Day care	3.54**	3.13**	1.46	0.04
Head Start	2.43	1.17	1.27	0.18
Pre-K	3.06*	2.91**	1.75	0.00

***$p < .001$; ** $p < .01$;* $p < .05$. $N = 2578$.

Table 4.6. Inverse Propensity Weighted Regression Estimates for Age 5 Care Type Effect on Age 9 Behavior Problems

	Attention Problems	Social Problems	Externalizing	Internalizing
Average treatment effect				
Non-program	0.02	-0.01	0.00	0.01
Day care	0.00	-0.01	0.01	0.00
Head Start	0.01	0.00	0.01	0.01
Pre-K	0.00	-0.02	0.01	-0.01
Average treatment effect on treated				
Non-program	0.01	0.00	0.00	0.01
Day care	-0.02	-0.01	-0.01	-0.01
Head Start	0.00	-0.01	0.00	0.00
Pre-K	-0.01	-0.02	0.00	-0.02

Note: There were no significant relationships in these analyses. $N = 2578$.

4.5 Discussion

Results from this study support two important ideas about early child care and its impact. The first is that family variables, specifically socioeconomic status and time constraints, greatly influence access to child care. Mothers with greater income and education are more likely to use non-parental child care, especially day care, preschool, and pre-kindergarten; the exception to this is Head Start, to which only lower-income children have access. Mothers with more time constraints—those who are single and/or work more hours—are more likely to use any type of non-parental care, particularly non-program care, which in some arrangements does not require shuttling children to and from care. These results are unsurprising, but show that substantial differences in access to particular types of child care could exacerbate existing inequalities.

Second, some types of care do appear to have cognitive benefits that last into later childhood. Specifically, day care centers and pre-kindergarten—the types most associated with socioeconomic advantage—are associated with higher cognitive skill scores, even after adjusting for care type selection. Results for non-program and Head Start care are less conclusive, likely because non-program care is so heterogeneous and Head Start is associated with economic disadvantage. It is possible that the methods used in this study did not succeed in fully removing selection bias, or that the benefits of Head Start are greater for more disadvantaged children.

Contrary to the findings from studies using experimental data, I do not find support for the notion that quality early child care provides lasting effects in terms of reducing behavior problems. Two differences of sample might account for this discrepancy. First, the child care programs administered in the experimental programs could have been different from the care received by most children in the Fragile Families sample. Many of the experimental programs had explicit, standardized curricula, care provider training requirements, and even home visits

with the parent to teach parenting skills. The care provided in the Fragile Families data set was likely less extensive and more heterogeneous, even within center care categories. Second, because the samples of many experimental programs included only disadvantaged children, their non-cognitive benefits may have been specific to disadvantaged children and may not have been so great for more advantaged children.

Regardless, these results suggest that early childhood care matters, that not all care is created equal (though some may be more equal than others as a result of regulations), and that child care access is not equal. If access to quality childcare remains so unequal, then existing social inequalities seem unlikely to improve—but there is the potential to increase social mobility if high quality public preschools are made widely available. This study provides clear indication that the quality of day care has long-term effects on child development, even taking into account the socioeconomic factors that often predict access to particular types of day care. Additional research is needed to provide more information about the mechanisms by which and the degree to which day care affects children—in particular, what sorts of programs are most effective for which children; how effective and accessible the programs are in practice; and how long their impact persists.

4.5.1 Limitations

The Fragile Families data set is not representative of the nation as a whole but instead oversamples from single mothers, the disadvantaged, and minority families. As a result, findings from this study may not generalize to the US population of families. On the other hand, this data set is well suited for examination of the effects of care type among relatively disadvantaged families, so it allows fuller understanding of the effects of care type under these conditions.

4.5.2 Conclusions

Previous research on the effects of care type on child outcomes has produced conflicting results due to differences in methods used. With the use of an innovative method for estimating effects of care type while controlling for income and other family variables that affect selection of care type I am able to provide a clearer assessments of the relative effects of care type on child outcomes. These indicate that care type prior to kindergarten can directly influence child cognitive achievement, and that family SES and time constraints indirectly affect cognitive achievement by structuring the accessibility of different types of care.

Appendix 4: Additional Information about Propensity Score Measures and Analysis

Table A4.1. List of Behavior Problems Subscale Items

Attention Problems (11 items, α = .82)
Child acts too young for age
Child can't concentrate
Child can't sit still
Child is confused or seems to be in a fog
Child daydreams or gets lost in his/her thoughts
Child is impulsive or acts without thinking
Child is nervous high strung, or tense
Child is nervous moment or twitching
Child has poor school work
Child is poorly coordinated or clumsy
Child stares blankly

Social Problems (8 items, α = .64)
Child acts too young for age
Child clings to adults or too dependent
Child does not get along with other kids
Child gets teased a lot
Child not liked by other kids
Child is overweight
Child is poorly coordinated or clumsy
Child prefers being with younger kids

Internalizing behavior (22 items, α = .86)
Child would rather be alone than with others
Child refuses to talk
Child is secretive, keeps things to self
Child is shy or timid
Child stares blankly
Child sulks a lot
Child is underactive, slow moving, lacks energy
Child is unhappy, sad, or depressed
Child is withdrawn, doesn't get involve w others
Child complains of loneliness
Child cries a lot
Child fears s/he might think/do something wrong
Child feels s/he has to be perfect
Child feels or complains no one loves him/her
Child feels others out to get him/her
Child feels worthless/inferior
Child is nervous, high strung, or tense
Child is too fearful or anxious
Child feels too guilty
Child is self-conscious or easily embarrassed
Child is suspicious
Child worries

Externalizing behavior (30 items, α = .91)
Child argues a lot
Child brags or boasts
Child is cruel, bullying, or mean to others
Child demands a lot of attention
Child destroys his/her own things
Child destroys things belong to his/her family or others
He/She is disobedient at home
He/She is disobedient in school
Child is easily jealous
He/She gets in many fights
Child physically attacks people
Child screams a lot
Child is showing off or clowning
Child is stubborn, sullen, or irritable
Child has sudden changes in mood of feelings
Child talks too much
Child teases a lot
Child has temper tantrums or hot temper
Child threatens people
Child is unusually loud
Child does not seems to feel guilty after misbehaving
Child hangs around with others who get in trouble
Child lies or cheats
Child prefers being with older kids
Child runs away from home
Child sets fires
Child steals at home
Child steals outside home
Child swears or uses obscene language
Child vandalizes

Table A4.2. Continuous Covariate Balancing by Treatment Group, Before and After Inverse Propensity Weighting

	Log Average Income		Mother's Age		Mother's Work Hours		Child's Age	
	Unweighted	Weighted	Unweighted	Weighted	Unweighted	Weighted	Unweighted	Weighted
Non-program	0.12	0.01	-0.90	-0.14	6.11***	0.08	0.00	-0.01
Day care	0.35***	0.01	0.72*	0.12	3.58***	0.08	0.02	0.02
Head Start	-0.22***	-0.09	-1.44**	-0.25	4.52***	0.30	0.03*	0.02
Pre-K	0.22***	0.03	-0.22	0.08	4.29***	0.26	0.03*	0.02
Constant	9.95***	10.10***	25.19***	25.00***	34.06***	37.53***	5.09***	5.10***

***$p < .001$; ** $p < .01$;* $p < .05$. $N = 2578$.

Note: "Unweighted" columns denote balancing without inverse propensity score weighting by care type; "weighted" columns denote balancing with inverse propensity score weighting by care type.

Table A4.3. Binary Covariate Balancing by Treatment Group, Before and After Inverse Propensity Weighting

	Single Mother		Child Female	
	Unweighted	Weighted	Unweighted	Weighted
Non-program	0.96***	-0.08	-0.11	0.07
Day care	0.28*	-0.05	0.20	0.02
Head Start	0.84***	0.08	0.23	0.09
Pre-K	0.44***	-0.07	0.04	-0.01
Constant	-0.27*	0.22	-0.19	-0.10

***$p < .001$; ** $p < .01$;* $p < .05$. $N = 2578$.

Note: “Unweighted” columns denote balancing without inverse propensity score weighting by care type; “weighted” columns denote balancing with inverse propensity score weighting by care type.

Table A4.4. Mother's Race/Ethnicity Balancing By Treatment Group, Before and After Inverse Propensity Weighting

	Black	Hispanic	Asian/Pacific Islander	Other
Unweighted				
Non-program	0.12	-0.09	-0.97	-0.56
Day care	0.17	-0.33	0.00	-1.06*
Head Start	1.26***	0.64**	-0.31	0.38
Pre-K	0.58***	0.28	-0.38	-0.27
Constant	0.51***	0.15	-2.23***	-2.23***
Weighted				
Non-program	-0.08	-0.03	-1.01	-0.24
Day care	-0.09	-0.12	-0.19	-0.19
Head Start	0.22	0.07	-0.39	-0.06
Pre-K	-0.11	-0.11	-0.25	-0.20
Constant	1.01***	0.29	-2.18***	-2.46***

***$p < .001$; ** $p < .01$;* $p < .05$. $N = 2578$.

Note: "Unweighted" rows denote balancing without inverse propensity score weighting by care type; "weighted" rows denote balancing with inverse propensity score weighting by care type.

Table A4.5. Mother's Education Balancing by Treatment Group, Before and After Inverse Propensity Weighting

	Less Than High School Degree	Tech/Associate's Degree	Bachelor's Degree	Advanced Degree
Unweighted				
Non-program	-0.38	-0.17	-0.03	-0.94
Day care	-0.35*	0.50**	1.18***	1.14**
Head Start	-0.17	0.01	-0.88	-0.74
Pre-K	-0.48**	0.44*	0.65*	0.19
Constant	0.29*	-0.51***	-2.01***	-2.71***
Weighted				
Non-program	-0.01	-0.05	0.19	0.07
Day care	-0.02	-0.07	-0.01	0.22
Head Start	-0.04	-0.14	-0.47	-0.06
Pre-K	-0.01	-0.05	0.00	0.25
	0.01	-0.14	-1.37***	-2.46***

***$p < .001$; ** $p < .01$;* $p < .05$. $N = 2578$.

Note: "Unweighted" rows denote balancing without inverse propensity score weighting by care type; "weighted" rows denote balancing with inverse propensity score weighting by care type.

CHAPTER V

Income and Child Outcomes

5.1 Summary

This chapter reviews the main conclusions and implications of Chapters 2 - 4 and discusses the implications for future research. Each of the empirical chapters describes a study that uses a longitudinal data set to examine of some of the mechanisms connecting family income to children's cognitive achievement and behavior problems, among them parent distress, parental investment, parenting practices, and preschool-age child care use. Chapter 2 constructs an integrated model of how the parent variables—parent distress, parental investment, and parenting practices—fit together with each other, are influenced by family income and material hardship, and mediate the association of income with children's outcomes five years later. Results suggest that several parenting behaviors coalesce in a single construct I term "intensive parenting" that is significantly associated with family income, material hardship, and parent distress. Further, parent distress and intensive parenting influence later levels of child cognitive achievement and behavior problems, with parent distress having a stronger link to behavior problems and intensive parenting being more strongly related to child cognitive achievement. These two mediating variables account for the vast majority of the relationship of family income to child outcomes.

Chapter 3 expands on this examination of parenting variables to explore whether changes in family income are associated with changes in parenting variables and, through them, child outcomes. Results indicate that the mediation model for *levels* of these variables does not

translate directly to relationships between *changes* in the variables. Improvements in parenting variables is associated with improved child cognitive achievement and behavior problems, but income changes are not associated with changes in the parenting variables or the outcomes for all children. Only among middle-income children do changes in income seem to be related to changes in parenting variables, but there appears to be a threshold effect for low-income families and high-income families. In low-income families, the increased income is probably used to pay down debt or deal with other financial problems, rather than reducing parent distress or changing parent behaviors. In high-income families, the increased income has little real impact on the already-munificent financial situation. In contrast, middle-income families may find that windfalls decrease parent distress and can be devoted to investment in child enrichment rather than mere survival.

Chapter 4 switches focus to the effects of early child care type, which we may view as "supplemental," often professional, parenting. Analyses show that the type of primary care used prior to kindergarten is substantially influenced by family income, education, and time constraints, with higher-SES families being more likely than lower-SES families to use center-based care and more time-constrained mothers being more likely to use some form of non-parental care. Even net of these selection effects that influence child outcomes, center-based and pre-kindergarten care seem to be beneficial to later child cognitive achievement, relative to parent-only care. Thus, center-based care prior to kindergarten, which is often of higher quality than other types of child care, is likely to be of use to all children, but lower-SES children are less likely to be able to access it.

5.2 Future Research on Parenting Variables and Child Outcomes

The question of relationships among socioeconomic status, parenting variables, and child outcomes has received considerable attention from multiple disciplines, each contributing at least one unique perspective on the issue. What has received less attention is how the different parenting variables may interact with one another and have cumulative effects. Results from Chapters 2 and 3 of this dissertation suggest that multiple parenting mechanisms and variables are important in different ways, are interrelated, and can change to affect child outcomes, though changing income itself has a limited impact on parenting variables. What this dissertation does not address is how and why these parenting variables are important in conjunction with one another.

This suggests many questions that should be addressed in the future. First, are these different parenting variables synergistic (multiplicative) in their effects, or can they be "substituted" for one another (additive effects)? Are all of these parenting behaviors—high levels of emotional warmth and support, cognitive stimulation, parent investment and involvement, and educational expectations or "habitus"—equally important, or do they merely tend to occur together in the American context? How much, and how easily, can each of these variables be altered to improve child outcomes? To what extent are the effects of particular parenting variables cumulative or tied to particular critical periods? And how could parenting interventions best be implemented? For example, results presented in Chapter 3 suggested that increased income was associated with increased intensive parenting and reduced material hardship among moderate-income families but not low-income families; such findings suggest that public policy interventions in this area would need careful consideration because of the complex interrelationships among variables.

Specific public policy research, especially intervention studies, is already addressing some of these questions. The difficulty is in integrating research and interventions on multiple mechanisms simultaneously, which requires substantial resources and very large sample sizes. New technologies for disseminating and implementing interventions, such as mass text messaging, online programs, and linking to other data sources (e.g., school and standardized test assessments of child cognitive and behavioral skills), will make such studies much more feasible. By greatly cutting costs and allowing interventions regardless of geographic location, these methods could give us the necessary statistical power and ability to compare different conditions (e.g., different programs, regions, or even countries) where there may be differences in the relative impact or even interrelationships among specific parenting variables.

Longer-term research on the effects of parenting variables on factors beyond child cognitive skills could also be informative; further, such research is now feasible thanks to the wealth of longitudinal studies currently being conducted. So-called non-cognitive skills—executive control, social, and motivational skills—that are not fully picked up by cognitive assessments could have substantial effects on success and circumstances in education, careers, and life, and the studies presented in this dissertation merely scratch the surface concerning the effects of these skills. Transitions and outcomes in early adulthood, such as college enrollment and completion, career choice and success, relationship formation, fertility, criminal activity, and mental health may be substantially affected by parenting variables even after the child has left home as a result of "non-cognitive" skills learned in childhood.

More comparative qualitative research on parenting variables would also contribute greatly to our understanding. Just as Lareau (2011) noticed class-based patterns in multiple parenting practices, additional qualitative research comparing different approaches to parenting

in different contexts could reveal important patterns in parenting variables and their interaction that quantitative analysis could not pick up. Comparison of parenting in different regions, kinds of families, social groups, or countries may help elucidate which practices are more "necessary" or effective than others in improving children's outcomes, how they affect one another, and the factors that shape their prevalence. Similarly, examination of "unusual cases," such as families or areas that have adopted more advantageous parenting practices or methods of alleviating or coping with parent distress despite adverse socioeconomic conditions, may shed light on how intensive parenting may arise (and could be encouraged) independent of income.

5.3 Future Research on Early Child Care

The study presented in Chapter 4 demonstrates that type of "typical" early child care—that is, non-experimental child care programs or arrangements—have long-term associations with child cognitive achievement, and that the type used varies systematically with family socioeconomic status. What it does not address is what the particular characteristics of these child care arrangements are that matter for child cognitive achievement, how heterogeneous they are both within and between the categories of child care examined, and how strongly family SES and other variables (particularly geographic location) are associated with these characteristics. The current version of the data also lacks the follow up time required to examine how lasting these associations are, whether child care may influence behavioral and social skills later in childhood and early adulthood, and whether any of these potential associations translate into a variety of early adult outcomes. Finally, the study also does not address the possible interaction between parenting variables and early child care use: both are associated with family SES, but there may be heterogeneous effects of child care use by SES and parenting variables, as child care may

either supplement or substitute for intensive parenting and emotional support. All of these questions are important, especially in an age of proliferating non-parental child care.

Many of the same opportunities noted with regard to research on parenting variables could be applied to research on early child care, particularly because it has become more widespread, developed, and institutionalized in the US in recent decades (although there are still shortages of facilities in many geographic areas). Intervention studies of particular child care characteristics and methods are hardly new but remain very relevant. It also seems possible that child care centers could begin collecting and distributing more administrative and assessment data, which would offer a new wealth of observational data that would be ideal for examining heterogeneity. International comparisons of early child care characteristics and effects may also become more possible and be fruitful. Finally, qualitative research would be particularly effective in elucidating how children interact with one another and with care providers based on characteristics of the care setting, methods, and other children, and how these dynamics affect child development—especially in societies where children are less likely to have siblings at home and therefore may engage in social interaction with other children only at day care..

5.4 Overall Conclusions

The studies detailed in Chapters 2 - 4 demonstrate the substantial links among family socioeconomic status, parenting variables, early child care, and child cognitive achievement and behavior problems. They do not show simple chains of association; there are multiple mechanisms at work in each, and income is far from a sole determinant of parenting variables and child care; nor does income have homogenous effects on parenting and child care. Not surprisingly, these studies produce more questions than answers, especially with regard to the

age-old overarching question posed about many institutions involved in child development and socialization and their potential consequences for intergenerational mobility.

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