Family Structure and Stability Effects on Child Cognitive Performance

Terry-Ann Craigie*
Center for Research on Child Wellbeing
Office of Population Research
Princeton University

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Abstract

The study exploits rich data from the Fragile Families and Child Wellbeing Study (FFCWS) to distinguish between contemporaneous and dynamic family structure effects on child cognitive performance. Using race-specific sex-ratios to instrument for endogenous family structure, the model illustrates that the child does benefit from living with two-parents. However, this method does not take into account how changes in family structure over time affect cognitive ability. The OLS regression model with extensive covariates allows for a more dynamic analysis of family structure, showing that cognitive outcomes are statistically similar for children in stable single-parent and stable two-parent households. In addition, unstable families, characterized by divorce or remarriage, are shown to have adverse effects on cognitive performance relative to the stable single-parent family. The profound implication of these findings is that when it comes to producing positive child cognitive outcomes, stability of the family structure may be more important than the family structure type.

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* Address all correspondence to Terry-Ann L. Craigie, 286 Wallace Hall, Center for Research on Child Wellbeing, Princeton, NJ 08544 and email to tcraigie@princeton.edu. The author gratefully acknowledges the guidance of Jeff Biddle, Sara McLanahan, Stephen Woodbury and Thomas Jeitschko in this research and also thanks Charles Becker, Todd Elder, Thomas Luster, Gary Solon and participants of the Fragile Families Worshop Series and the First National Research Conference on Child and Family Programs and Policy for their helpful comments and suggestions regarding this paper. Special thanks to Kristen Harknett for her data assistance. The author takes sole responsibility of the content and views expressed in this paper and all errors are her own.

I. Introduction

Non-traditional and single-parent family structures are a growing phenomenon in the United States. According to the U.S. Census Bureau Current Population Reports, in 1996, 25.4% of all children under eighteen had only one parent in the household. This figure rose to 27.3% in 2002; during this period, over 80% of single-parent family households were headed by single mothers. The issue therefore remains as to how children are being affected by the growing trend of family structures, in which the father is seldom in residence.

The study seeks to determine how the child's contemporaneous family structure and dynamic changes in family structure affect cognitive ability. The fundamental identification problem in answering this question, however, is that unobserved characteristics such as parental values, preferences and innate ability are potentially correlated with both the family situation and child outcomes; this could severely bias the estimated family structure effects (Lang and Zagorsky, (2001); Painter and Levine, (2000)). The problem can be parsimoniously addressed by including numerous family background and individual covariates to attenuate omitted variable bias and subsequently make causal inferences (Antecol and Bedard, (2007); Lang and Zagorsky (2001); Painter and Levine (2000)). However, if a valid instrument can be found for endogenous family structure, an instrumental variables (IV) strategy can be employed as well. I employ both approaches to address the identification problem using data from The Fragile Families and Child Wellbeing Study (FFCWS). It provides very rich data on family structure as well as a plethora of family background, household and individual covariates.

Prior studies have focused on the outcomes of adolescent children and the outcomes of adults who grew up in single-parent households (Antecol and Bedard, (2007); Corak, (2001); Lang and Zagorsky, (2001); Painter and Levine, (2000); Sandefur and Wells, (1997)). However, there is still much to learn about the impact of family structure and stability on outcomes for young children, particularly pre-school aged children. Parental investments during early childhood years may significantly impact the brain development of the child, thus affecting cognitive skills and accordingly, human capital accumulation (Heckman (2000); Ruhm, (2004)). It is therefore imperative to investigate how the family setting affects early cognitive development due to the momentous impact this may potentially have on skills of the future labor force.

The outcome variable used to evaluate cognition is the revised version of the Peabody Picture Vocabulary Test (PPVT-R), as it conveniently serves as a measure of cognitive ability and academic readiness. IV estimation substantiates the *contemporaneous family structure effect* in that children currently residing in two-parent families have better cognitive outcomes than children in single-parent families. However, this technique does not account for stability of the family structure over time. The study therefore, goes on to find evidence of the *family stability* or *dynamic family structure effect* on child cognitive ability. Once numerous controls are included in the model to mitigate omitted variable bias, child cognitive performance within the stable two-parent family structure is shown to be statistically similar to performance within the stable single-parent family structure. Parental divorce or having a step-father in the household also tends to yield more negative outcomes for the child relative to the stable single-parent household. The main implication of these findings is that when it comes to the

cognitive development of pre-school aged children, the stability of the family structure may be more important than the family structure type.

The paper is organized as follows. Section II provides a brief review of past works that examine family structure effects on child wellbeing. Section III gives the data description and descriptive statistics of the variables used in the model. Sections IV and V describe the econometric issues and approaches of measuring contemporaneous and dynamic family structure effects respectively. Section VI discusses the OLS and IV regression results; Section VII concludes with a summary of the findings.

II. Literature Review

Child outcomes are not only shaped by the genetic endowments of parents, but also the allocation of resources within the household. Parents have genetic endowments such as health and intelligence that are considered heritable and thus, are passed on to children directly (Haveman and Wolfe, (1995); Scott-Jones, (1994)). Therefore, a child will inherit intellectual and health endowments from his/her parents regardless of the family structure.

However, parental genetic endowments also affect child outcomes by influencing the level and allocation of resources within the household. Family dissolution ultimately influences the resources devoted to child development. For instance, a highly intelligent and healthy custodial father could significantly increase household income and subsequently the investments of both time and goods devoted to the child as opposed to a non-custodial father (Haveman and Wolfe, (1995); Scott-Jones, (1994)).

These arguments suggest that family disruption has deleterious effects on the cognitive performance of the child. Furthermore, the timing of disruption may also have

varying effects (Haveman and Wolfe, (1995); Seltzer, (1994)). Disruption occurring during early childhood may have larger negative effects on academic achievement compared to family disruption occurring later (Antecol and Bedard, (2007); Ermisch and Francesconi, (2001); Fronstin et al., (2001); Kreine and Beller, (1988)). In addition, sibling comparisons studies have shown that children exposed to a single-mother family setting for a longer period of time experience more pronounced negative effects (Ermisch and Francesconi, (2001); Sandefur and Wells, (1997); Sutton-Smith et al., (1968)). However, the assumption must be made that siblings respond to family dissolution in the same way and that parents treat all children equally. There is also the selection problem associated with using sibling comparisons – it limits the analysis sample to families with multiple children (Sigle-Rushton and McLanahan, 2002).

Other studies examine and exploit the reasons for paternal absence and subsequently the single-mother family type. Divorce for instance, as a cause of paternal absence, is much more endogenous than paternal loss through death (Corak, 2001; Lang and Zagorsky, 2001). Divorce or separation may be caused by pre-existing factors and consequently, father absence would be an endogenous occurrence. Paternal absence through death, on the other hand, is arguably less endogenous since it is not expected to be correlated with pre-existing factors[1]. Lang and Zagorsky (2001) exploit the exogenous variation provided by paternal death and concluded that this event decreased the probability of a son being married.

It is traditionally believed that paternal presence in the household (and thus the two-parent family) yields positive repercussions for child wellbeing. However, it has

[1] If father's death is due to risky lifestyle choices such as dangerous occupations, criminal activities, unhealthy eating or drinking, death is arguably no longer an exogenous event.

been shown that father presence alone may not be as important as previously thought (Corak, (2001); Lang and Zagorsky, (2001)). Lang and Zagorsky (2001) found that when family background and individual characteristics were controlled for, there was not much evidence of the positive impact on outcomes that one would expect (with the exception of father's death lowering the chances of the son being married). In particular, paternal absence had only modest effects on child cognitive ability as measured by the Armed Forces Qualification Test (AFQT).

Using a similar methodology however, Antecol and Bedard (2007) buttressed the traditional hypothesis on the importance of father presence, concluding that children were indeed "better off" the longer they live in a two-parent household. They found that an additional 5 years living with a biological father reduced the probability of outcomes such as smoking, drinking, convictions, marijuana use and pre-marital sexual activity.

Recently, however, there have emerged works that examine the stability of the family structure. Cavanagh and Huston (2006) showed that family instability was strongly associated with teacher and observer reports of child behavioral problems. Fomby and Cherlin (2007) bolstered these findings, noting that multiple family transitions produced more negative developmental outcomes than stable two-parent and even stable single-parent family structures. Similarly, Osborne and McLanahan (2007) concluded that partnership instability moderately increased behavioral problems in young children up to three years old.

From past works, it is clear that while family structure significantly affects child outcomes, it is especially important to distinguish between the current state of the family and the stability of the family over time. Cavanagh and Huston (2006) hinted at the

importance of unraveling family structure as a dynamic process rather than observing it in its discrete form. Child wellbeing is not only influenced by the current family structure that he or she lives in, but also past changes in family structure that may have occurred. As a consequence, I will use a more dynamic approach to the study of family structure and child wellbeing by accounting for family structure changes over time.

V. Data Description

The data I use for this empirical study come from the Fragile Families and Child Wellbeing Study (FFCWS). It supplies rich and detailed information on family structure, child and parental characteristics. It follows a sample of approximately 5,000 focal children born between 1998 and 2000. Follow-up interviews of both parents were conducted at one, three and five years thereafter. For this analysis, I will exploit data from all interview waves.

I restricted the analysis sample to those children who live with their mothers all (or most of) the time[2]. This ensures that any family disruption the child experiences, will come directly from a father's movement into or out of the household. It is important to note however that this restriction may introduce bias from endogenous sample selection because there are idiosyncratic differences between mothers who are primary caregivers and mothers who are not. Nevertheless, the vast majority of mothers in the sample are primary caregivers to the focal child and so we can argue that any selection bias caused by this restriction would be inconsequential. The restriction reduces the analysis sample to 2,104 children.

[2] Ideally, I would like to restrict the analysis sample to children living with their mothers all the time. However, in the third-year and fifth-year follow-up interview, the mother is asked if the focal child lives with her "all or most of the time." As a result, all primary caregivers are grouped together despite the implications for instability.

i) The Measure of Cognitive Performance

The dependent outcome that will be examined in this study is the Peabody Picture Vocabulary Test-Revised (PPVT-R) score of the focal child. The PPVT-R has two aims: (1) to test the respondent's receptive vocabulary capabilities for standard English and (2) to test the respondent's verbal ability[3]. The PPVT-R is also often used as a measure of academic readiness for pre-school aged children and hence is salient to examine.

Even though the PPVT-R is useful in measuring English Language proficiency and can even be useful to test respondents with mental and language impediments, one caveat is that it only serves as a reliable indicator of verbal ability for those living in an environment where English is principally spoken. For instance, the PPVT-R scores of Hispanic and Latin-American children in the sample may not be reliable indicators of their cognitive skills. Consequently, the language chiefly spoken in the household must be controlled for (in some form) if the PPVT-R is to reliably measure the verbal ability of these children[4].

For the test, the child has to identify the picture that best describes the noun or the verb spoken by the examiner (Jeruchimowicz et al., (1971)). The PPVT-R is generally administered to individuals over the age of 2.5 years. The data on the PPVT-R are

[3] The PPVT-R is administered by the examiner, selecting a 'picture plate' which shows four different black and white images. The examinee must choose the image that best describes the stimulus word spoken by the examiner. American Guidance Service, Inc.
http://www.state.tn.us/education/ci/cistandards2001/la/cik3assesmentfolder/cik3rapeabodypicture.htm

[4] I include variables indicating whether the mother was interviewed in Spanish as well as parents' region of birth as proxy variables for chief language spoken in the child's household.

provided in the 60-month In-Home Longitudinal Study of Pre-School Aged Children (a module of the FFCWS) and are only available for 2,345 children[5].

ii) Measures of Contemporaneous Family Structure

Contemporaneous family structure, in essence, describes the current living arrangements of the child with direct emphasis on parental presence. The model focuses on four such parental residential relationships at the fifth-year follow-up interview:

a. both biological parents married to each other (Married)

b. both biological parents are living together but not married (Coresiding)

c. the biological mother is living with a new partner (Living with a social father)

d. the biological mother is not coresiding with a partner (Single or no father present)

There is the possibility that either biological parent could be dating someone else living outside the household and I acknowledge that this may even influence child wellbeing. However, I do not consider this in the model – the analysis is restricted to residential parental relationships only.

iii) Measures of Dynamic Family Structure

The model focuses on the dynamic family situation in that it observes the baseline family structure of the child and the subsequent family transitions that may occur. As such, the model is not only able to distinguish among contemporaneous family structures, but the stability of these family structures as well. In the FFCWS, parents are asked at the baseline interview if they are married to each other, coresiding or single. Therefore, residential relationships for the mother at the time of the child's birth are limited to

[5] Since the analysis sample is restricted to children living with their mothers all or most of the time, this brings the final analysis sample to 2104 children.

married, cohabiting or non-coresiding single. However, it is important to note that if the mother is coresiding or married to a different partner than the biological father at the child's birth, this incidence would be erroneously classified as non-coresiding single. Mothers married or coresiding with new partners are a very small percentage of the sample, with less than 5% of mothers living with a new partner by the first-year follow-up interview. Hence, I maintain that the number of mothers who have a new partner at the time of the child's birth would be negligible.

Of the three residential relationship classifications at the baseline, it can then be determined whether the child experienced subsequent family transitions. The vector of dynamic family structures becomes:

1) Biological parents are married at the time of the focal child's birth, no family transitions (Stable Marriage)
2) Biological parents are married at the time of the focal child's birth but later divorced (Married at Birth – Unstable)
3) Biological parents were coresiding at the time of the focal child's birth, no family transitions (Stable Cohabitation)
4) Biological parents were coresiding at the time of the focal child's birth but later dissolved (Coresiding at Birth – Unstable)
5) Biological parents were coresiding at the time of the focal child's birth but subsequently married (Pre-Marital Cohabitition – Stable)
6) The biological mother was single (not coresiding) at the time of the focal child's birth, no family transitions (Stable Single-Mother) [**Reference Category**]

7) The biological mother was single (not coresiding) at the time of the focal child's birth but later re-partnered (Single at Birth – Unstable)
8) Biological Mother is married or coresiding with a new partner by year five (Living with Social Father – Unstable)

These binary measures are mutually exclusive and are categorized as stable or unstable. A stable family structure indicates that there has been no change or no new family transition from the child's family structure at birth[6]. An unstable family structure indicates that the child has experienced one or more family transitions that differ from the family structure at birth. The stable single-mother family is the reference category.

iv) Descriptive Statistics

Due to oversampling of blacks and Hispanics by the FFCWS, the generality of the findings may be affected. Therefore, weighted means of all the variables used in the OLS regression model are presented in Table 1. The sample is relatively evenly split among whites, blacks and Hispanics with over 35% of all parents being white. In addition, about 60% of parents have only a high school diploma or less. The average age of mothers and fathers at the fifth-year interview is about 32 years and 34 years old respectively.

Standardized PPVT-R scores range from 40 to 139 points and the average is about 96 points. Parents who have been married since the focal child's birth comprise 38% of the sample while mothers who have not engaged in a residential relationship (i.e. stably single) comprise only 7% of the sample. Parents who engaged in pre-marital cohabitation or are stably cohabiting in general make up 6% of the weighted analysis sample. Unstable family types, characterized by one or more family transitions since the focal child's birth

[6] An exception here is pre-marital cohabitation, where parents transition from cohabitation to marriage. I argue that this is a stable family since both parents have been living together since the child's birth.

comprise 44% of the sample. Biological parents married at the baseline who later divorced are approximately one-third of all unstable families; having a social father or step-father living with the biological mother by the fifth-year follow-up interview comprises almost 30% of all unstable families.

With such extremes in the stability of families in the FFCWS, it is imperative to examine the family background and experiences of the parents themselves. While about 30% of children had no parents who lived in intact families by age 15, only half of these had a father-figure growing up. Over 25% of maternal grandparents were professionally treated for depression and/or anxiety and almost 20% of paternal grandparents were similarly treated. Over 70% of maternal grandparents had a high school diploma or less. These statistics suggest that predominantly, parents from fragile families were themselves from fragile families and disadvantaged backgrounds.

To exploit the richness of the FFCWS data, the model also controls for covariates that are typically unobserved. On average, parents knew each other about 7 years before the mother became pregnant with the focal child. In addition, the FFCWS provides information on dysfunctional impulsivity of the parents. Dysfunctional impulsivity characterizes the lack of forethought in decision-making when this process is especially important (Dickman, (1990))[7]. On a scale of 1 to 4, with 1 being the most impulsive, parents on average score about 3 points implying that parents in the FFCWS are not dysfunctional impulsives in general.

Table 2 presents weighted means of the dependent outcome and demographic variables based on the main family types used in the dynamic model. The statistical significance of the difference of variable means for stable marriage, stable cohabitation,

[7] Excessive gambling is a prime example of dysfunctional impulsivity.

premarital-cohabitation and all unstable families from the variable means of the stable single-mother family (reference category) is also presented.

Children living in stably married households have the highest mean standardized PPVT-R scores at about 103 points. Similarly, children living with parents who engaged in pre-marital cohabitation score about 10 points better on the PPVT-R relative to those children living with stable single-mothers. By contrast, children living with parents who have been cohabiting since the child's birth, score significantly worse on average than children in stable single-mother households.

White parents are most likely to characterize stable marriages and pre-marital cohabitation relative to being stably single. Hispanic parents are most likely to typify the stable cohabiting family structure while black parents overwhelmingly exemplify the stable single-mother and unstable families.

The stable single-mother family tends to have the youngest parents relative to the other family types. Further, they are more likely to have high school diplomas or less compared to parents in stable marital unions but less likely to have college degrees compared to parents in stable marital unions or even unstable unions.

In summary, these mean comparisons suggest that children living in stable-single mother families are disadvantaged in terms of their test scores, parents' age and education relative to children in stable marital unions.

IV. Measuring Contemporaneous Family Structure Effects

To measure how the child's current family structure affects cognitive scores, **Y**, the model can be expressed as follows:

$$\mathbf{Y_i = F_i \kappa_1 + X_i \kappa_2 + \varsigma_i} \qquad \mathbf{(1)}$$

where **F** denotes the current family structure in which the child resides and **X** are time-invariant exogenous variables that influence child cognitive ability. There are unobserved characteristics in the error term, ς, that explain both the dependent child outcome and contemporaneous family structure, rendering $\boldsymbol{\kappa_1}$ biased. To address this omitted variable or selection bias, I propose the use of an instrumental variable (IV) estimation strategy. A valid instrument should explain current family structure and should not explain child cognitive performance other than through family structure contemporaneously. The instrument I propose is the race-specific sex ratio for white, black and Hispanic racially endogamous parents.

Recent and early works have explored how male to female population ratios influence the potential for marriage of heterosexual individuals. Empirical findings show that where there is a shortage of potential partners, this will directly impact the probability of marriage. Fewer men than women in a given region will inevitably lower marriage rates and even increase marital instability (Harknett and McLanahan, (2004)). Since there are more females to choose from, there is less incentive for men to marry or stay married. This becomes especially apparent when race-specific sex ratios are observed.

Black women tend to be highly affected by imbalanced sex ratios where there is a shortage of marriageable black men relative to marriageable black women (Cox, (1940)). Black men in the United States have the highest incarceration and mortality rates compared to any other racial-ethnic cohort and subsequently, marriage rates and family structure among blacks are directly influenced. The theory posits that with a lower supply

of marriageable men in each distinct racial-ethnic cohort, there should also be lower race-specific marriage rates (Harknett and McLanahan, (2004)).

For the twenty cities sampled by the FFCWS, race-specific sex ratios for 20 to 34 year olds were retrieved from the 2000 Census (Harknett and McLanahan, (2004)). Table A shows the mean sex-ratios of the three main racial-ethnic cohorts for these cities. The white and Hispanic populations in all cities have sex ratios greater than 1 on average, suggesting than males in these race-ethnic cohorts are not in shortage. By contrast, the black sex ratio is less than 1 on average, indicating that there is black male shortage in urban cities. As such, if sex ratios directly affect contemporaneous marriage and the stability of a marriage, the data should show lower marriage rates for black women in the FFCWS sample. Table 2 underscores this hypothesis: black mothers in the FFCWS are more likely to be in unstable family situations or be stable single-parents compared to white and Hispanic mothers.

To utilize race-specific sex-ratios as a single instrument for contemporaneous family structure, I assign each race-specific sex ratio to racially endogamous couples i.e. to those couples who describe themselves to be of the same racial-ethnic cohort. Therefore, the black sex-ratio is only assigned to black biological parents, the white sex-ratio is only assigned to white biological parents and the Hispanic sex-ratio is only assigned to Hispanic biological parents.

$$\mathbf{F_i = SR_i\,\theta_1 + X_i\,\theta_2 + \upsilon_i} \qquad \mathbf{(2)}$$

The first-stage regression (2) is the reduced-form equation explaining family structure and it includes the race-specific sex-ratio indicator, **SR**, as well as exogenous variables, **X**. **SR** is assumed to be uncorrelated with υ and ς.

V. Measuring Dynamic Family Structure (Family Stability) Effects

The OLS regression model estimating the family stability effects on child cognition is given below:

$$\mathbf{Y_i} = \sum_{j=1}^{8} \boldsymbol{\delta_j}\, \mathbf{T_{ji}} + \mathbf{P_i}\, \boldsymbol{\beta_1} + \mathbf{C_i}\, \boldsymbol{\beta_2} + \boldsymbol{\varepsilon_i} \qquad \textbf{(3)}$$

where **Y** denotes the child's PPVT-R score and **T** is a set of *8* dynamic family structure types (shown in section III) accounting for possible family transitions over the course of the child's life. Binary indicators are used for each family measure with the stable single-mother family as the reference category; **δ** shows the effect of these dynamic family structures on cognitive performance. **P** is a vector parental characteristics and **C** is a vector of child characteristics (see Table 1 for a full list of these variables).

If the main observed and unobserved characteristics are directly controlled for in this model, then arguably the "true" impact of family stability on child cognitive performance can be isolated. The FFCWS aptly offers a wealth of data in which once unobserved characteristics can now be directly controlled for in the model. Even though this econometric method is not as elaborate as those employed in previous studies, omitted variable bias will be effectively attenuated without introducing other sources of bias.

Fragile Families dataset includes the Wechsler Adult Intelligence Scale – Revised (WAIS-R[8]) scores for both parents and I argue that these scores can be used as proxy variables for parents' innate ability. In addition, the dataset supplies several proxy

[8] The questions are acquired from the Similarities subtest expected to measure verbal concept formation and reasoning abilities (Wechsler, (1981)).

variables for family background, parental values and preferences (see Table 1 for the complete list of proxy variables, **Z**).

The reduced-form model becomes:

$$\mathbf{Y_i} = \sum_{j=1}^{8} \boldsymbol{\psi_j}\, \mathbf{T_{ji}} + \mathbf{P_i}\, \boldsymbol{\alpha_1} + \mathbf{C_i}\, \boldsymbol{\alpha_2} + \mathbf{Z_i}\, \boldsymbol{\alpha_3} + \boldsymbol{\nu_i} \qquad \textbf{(3)}$$

where **Z** represents the proxy variables for innate ability, parental values and preferences, the source of omitted variable or selection bias in the model.

If these variables are valid proxies for unobserved characteristics, the OLS estimator, $\boldsymbol{\psi}$, will be unbiased: $\boldsymbol{\psi}$ is expected to be upwardly biased if unobserved heterogeneity is not effectively addressed. Put simply, once **Z** is incorporated into the model, **T** and **Z** should not be correlated with $\boldsymbol{\nu}$. Even though the IV strategy can be used to explain dynamic family structure types individually (i.e. there is only one instrument for one endogenous variable, required for the model to be identified), it does not allow us to analyze them simultaneously. Moreover, controlling for numerous covariates in the OLS regression model allows us to capture dynamic family structure effects while addressing omitted variable bias or selection in a parsimonious way.

VI. Empirical Findings

Table 3 presents the OLS and IV estimates of the contemporaneous family structure effect on child PPVT-R scores. Columns (1) and (2) indicate the effect on child test scores of living with married biological parents at the time of the test. Column (1) suggests that the stable marriage of biological parents improves test scores by about 8 points. However, once selection is addressed by using the IV estimation strategy in Column (2), the estimate is about 1 point less, indicating only a 6.5 point improvement;

this is statistically significant at the 10% level. This result buttresses the initial prior of the direction of the bias – unobserved characteristics correlated with both family structure and child cognition should upward bias OLS estimates. Similarly, children living with two married biological parents or step-parent family have a 6.6 point advantage relative to children living in other family structures; this estimate is also statistically significant at the 10% level. By contrast, a child living in a single mother household at year five experiences approximately an 8 point drop in scores relative to children living in other family situations; this is statistically significant at the 10% level. Therefore, an analysis investigating contemporaneous family structure effects on child cognitive performance suggests that living with two parents will significantly improve test scores whereas living in a single parent family will significantly lower test scores.

It is imperative not to overlook the strength of the instrument being used to address bias in the model. A weak instrument (i.e. an instrument that weakly explains family structure) may exacerbate the bias of OLS instead of mitigating it. The first-stage F-statistics in Table 3 easily surpass the Stock and Watson rule of thumb of 10 and thus, the IV findings are robust to weak instrument bias. In addition, if the race-specific sex-ratios are correlated with child cognitive ability other that through family structure, this could exacerbate the bias of OLS as well. If higher mortality and incarceration rates of males in a city (which directly influence the supply of marriageable men) detracts from the resources that can be allocated to childhood education, this may also render the instrument invalid – sex ratio would explain child cognitive ability other than through family structure.

For the race-ethnic subsamples in Table 4, only the black and Hispanic subsample in column (8) meets the requirements of a strong instrument. For blacks and Hispanics, living in a married two-parent family yields a 10 to 11 point improvement in PPVT-R scores and these estimates are statistically significant at the 10% level.

Since IV estimation does not allow for the analysis of family stabilty over time, it is imperative to examine the dynamic model with an extensive set of covariates. Table 5 displays OLS estimates of the effect of each dynamic family structure on child cognitive performance. Without additional controls, the estimates in Column (1) are simple mean differentials of PPVT-R scores of each dynamic family structure from the stable single-mother family. Stable marriage of the biological parents significantly increases child cognitive scores by about 10 points relative to the stable single-mother family; similarly, children whose parents engage in pre-marital cohabitation have a 3 point advantage over children from stable single-mother homes. Stable cohabitation and unstable families are not shown to be statistically different than the stable single-mother family.

However, by including in the model child and demographic characteristics, the distinct advantange given to the stable marital union becomes markedly smaller. Column (2) illustrates that children living in stable married unions score on average 2 points higher than children growing up in stable single-mother homes. Further, the advantage assigned to pre-marital cohabitation when there were no control variables in the model is now not statistically different from zero.

To address omitted variable bias plaguing the model, I also include in the model family background and typically unobserved characteristics, **Z** (listed in Table 1). Column (3) illustrates that the advantage of stable two-parent families, particularly stable

marital and pre-marital cohabiting unions dissipates once this bias is addressed. It is especially striking that the coefficients on stable marriage and pre-marital cohabitation are small in magnitude and statistically insignificant. This finding suggests that stable-two parent families are not statistically different from stable single-mother households as it pertains to child cognitive performance.

By including in the OLS model these additional controls, it becomes evident that instability may have adverse effects on cognitive performance – a finding that was not apparent from the contemporaneous approach or just controlling for child and demographic characteristics. Column (3) indicates that for those children living with parents married at the time of the child's birth but later divorced, they score 4 points or about ¼ of a standard deviation lower than children of stable single-mother households. Similarly, children living with a social or step-father by year five score about 2 points or 1/8 of a standard deviation lower than children in stable single-mother homes.

Table 4 splits the analysis sample by mother's racial-ethnic cohort to show heterogeneous effects of dynamic family structure on child cognitive scores. Column (1) indicates that children of white mothers in stable cohabiting unions score approximately 6 points worse relative to white children in stable single mother households. Living with a social father or step-father by year five also produces adverse effects for white children in the FFCWS. For the black and black and Hispanic sub-samples shown in columns (2) and (4), living with parents who were married at the time of the child's birth but who later divorced, lowers child test scores by 6 and 7 points respectively compared to the stable single-mother family. This constitutes about 40% of the standard deviation of the PPVT-R scores.

Therefore, for minority children in urban populations, living in stable two-parent families is not statistically different from living in stable single-mother families and experiencing divorce or remarriage significantly decreases scores relative to children in single-mother households who never experienced family instability.

VII. Summary

This paper utilizes rich, policy-relevant data to examine early child cognitive performance. The study adds to the literature by distinguishing between contemporaneous and dynamic family structure effects. While IV estimation results indicate that two-parent family structures increase test scores for children, a dynamic analysis of family structure yields different results.

The OLS regression model, after addressing omitted variable bias with an exhaustive set of covariates, indicates no statistical difference between the stable single-parent household and the stable two-parent household when it comes to child cognitive development. Children living with biological parents who were married but later divorced score ¼ of a standard deviation lower on the PPVT-R relative to children of stable single-parent households. Similarly, children who are currently living with social fathers score about 2 points or 1/8 of a standard deviation less than children in stable single-parent homes. The findings of Cavanagh and Huston (2006), Osborne and McLanahan (2007) and Fomby and Cherlin (2007) are endorsed by this study since these results suggest that instability in the home stunts cognitive development.

To the extent that including a comprehensive set of covariates in the OLS model sufficiently attenuates unobserved heterogeneity, the adverse effect of family instability on child cognitive performance can be interpreted as causative. The stress hypothesis

postulated by Sandefur and Wells (1997), Wu (1996) and McLanahan (1985) gives us some insight as to why this might be the case: unstable families produce negative child outcomes due to the stress and anxiety that typically accompany each transition.

The study was not able to determine whether more family transitions yielded more adverse effects on early cognitive development. In addition, it is important to note that I cannot predict how the child would adjust to family transitions over the course of his/her life. Since, the subjects of study are pre-school aged children, it cannot be determined whether the negative effects of early family instability are short-lived or are improved over time. The child may be able to adjust to his/her family structure as time progresses but this clearly goes beyond the scope of this paper. Further, the findings of this study may not extend to other child outcomes such as behavioral problems or substance abuse. Future research would do well to examine this in more rigorous detail.

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Table A. Race-Specific Sex Ratios

GENERAL	
Black Sex-Ratio	0.86
Hispanic Sex Ratio	1.28
White Sex-Ratio	1.06
Race-Specific Indicator (Instrument)[9]	0.92
Mean of the Instrument by City	
Oakland	1.03
Austin	1.17
Baltimore	0.86
Detroit	0.85
Newark	0.95
Philadelphia	0.82
Richmond	0.82
Corpus Christi	0.96
Indianapolis	0.93
Milwaukee	0.84
New York	0.92
San Jose	1.21
Boston	0.85
Nashville	0.91
Chicago	0.87
Jacksonville	0.90
Toledo	0.92
San Antonio	0.96
Pittsburgh	1.00
Norfolk	1.20

Source: 2000 Census

[9] Each race-specific sex ratio is assigned to racially endogamous couples i.e. to those couples who describe themselves as being of the same racial-ethnic group. Therefore, the black sex-ratio is only assigned to black biological parents, the white sex-ratio is only assigned to white biological parents and the Hispanic sex-ratio is only assigned to Hispanic biological parents.

Table 1. Summary Statistics

	Mean	SD	Min	Max
Variables of Interest (Y and T)				
PPVT-R Standardized Scores	96.05	15.71	40	139
Stable Marriage	0.38	0.38	0	1
Stable Cohabiting	0.06	0.27	0	1
Stable Single	0.07	0.35	0	1
Pre-Marital Cohabitation	0.06	0.26	0	1
Married to Biological Father at Birth - Unstable	0.15	0.19	0	1
Cohabiting with Biological Father at Birth - Unstable	0.08	0.37	0	1
Single at Birth - Unstable	0.09	0.39	0	1
Living with Social Father by Year Five	0.12	0.36	0	1
Child Characteristics (C)				
Child is Male	0.55	0.50	0	1
Low Birth Weight	0.06	0.29	0	1
Parental Characteristics (P)				
Mother White	0.37	0.40	0	1
Mother Black	0.27	0.50	0	1
Mother Hispanic	0.29	0.42	0	1
Other	0.06	0.16	0	1
Father White	0.35	0.38	0	1
Father Black	0.32	0.50	0	1
Father Hispanic	0.29	0.42	0	1
Other	0.04	0.18	0	1
Mother has Some HS	0.33	0.48	0	1
Mother has HS Diploma	0.27	0.45	0	1

Mother has Some College	0.19	0.43	0	1
Mother has College Degree	0.21	0.30	0	1
Father has Some HS	0.27	0.47	0	1
Father has HS Diploma	0.30	0.48	0	1
Father has Some College	0.28	0.41	0	1
Father has College Degree	0.14	0.28	0	1
Mother's Age	31.80	5.96	19	53
Father's Age	34.32	7.00	20	72
Interviewed in Spanish	0.13	0.27	0	1
Family Background Characteristics (Z)				
Maternal Grandmother has Some HS	0.24	0.40	0	1
Maternal Grandmother has HS Diploma	0.46	0.50	0	1
Maternal Grandmother has Some College	0.16	0.34	0	1
Maternal Grandmother has College Degree	0.14	0.31	0	1
Maternal Grandfather has Some HS	0.22	0.40	0	1
Maternal Grandfather has HS Diploma	0.50	0.50	0	1
Maternal Grandfather has Some College	0.12	0.32	0	1
Maternal Grandfather has College Degree	0.17	0.34	0	1
Maternal Grandparents treated for Depression and/or Anxiety	0.26	0.45	0	1
Paternal Grandparents treated for Depression and/or Anxiety	0.18	0.41	0	1
Parents had Father-Figure growing up	0.15	0.39	0	1
Parents lived in Intact Family at age 15	0.71	0.49	0	1
Typically Unobserved Characteristics (Z)				
Length of time Parents knew each other before Pregnancy (Yrs.)	6.96	4.73	0	31
Father suggested Abortion	0.09	0.30	0	1
Mother thought about Abortion	0.17	0.45	0	1

Father visited mother in the hospital at the time of birth	0.90	0.38	0	1
Mother's Wechsler Adult Intelligence Scale-Revised (WAIS-R) Scores	6.91	2.60	0	14
Father's Wechsler Adult Intelligence Scale-Revised (WAIS-R) Scores	6.30	2.71	0	15
Mother's Dickman's Dysfunctional Impulsivity (DDI) Scores	2.94	0.60	1	4
Father's Dickman's Dysfunctional Impulsivity (DDI) Scores	3.00	0.72	1	4

Source: FFCW

The table presents weighted means using baseline national weights from the FFCWS (N=1514); the standard deviations, minimum and maximum values of all variables are from the un-weighted sample (N=2104).

Table 2. Weighted Means by Family Structure Types

	Stable Married		Stable Cohabiting		Pre-Marital Cohabitation		Unstable		Stable Single
	Mean		Mean		Mean		Mean		Mean
PPVT-R Scores	102.76	(+)***	85.81	(-)**	99.08	(+)***	92.23	(+)*	89.64
Mother White	0.54	(+)***	0.19	(-)	0.49	(+)***	0.26	(+)*	0.20
Mother Black	0.09	(-)***	0.21	(-)***	0.22	(-)***	0.41	(-)***	0.52
Mother Hispanic	0.30	(+)	0.53	(+)***	0.23	(-)	0.27	(-)	0.28
Other	0.08	(+)***	0.06	(+)***	0.05	(+)	0.06	(+)***	0.01
Father White	0.55	(+)***	0.15	(-)	0.32	(+)***	0.24	(+)*	0.18
Father Black	0.09	(-)***	0.29	(-)***	0.40	(-)*	0.47	(-)	0.50
Father Hispanic	0.31	(+)	0.51	(+)***	0.22	(-)	0.27	(+)	0.27
Other	0.05	(+)	0.05	(+)	0.06	(+)	0.02	(-)	0.05
Mother's Age	34.49	(+)***	29.85	(+)**	29.72	(+)**	30.57	(+)***	28.17
Father's Age	36.40	(+)***	33.49	(+)***	33.06	(+)***	33.51	(+)***	29.87
Mother has Some HS	0.16	(-)***	0.75	(+)***	0.39	(-)	0.40	(-)*	0.48
Mother has HS Diploma	0.19	(-)***	0.15	(-)***	0.33	(+)	0.35	(+)	0.32
Mother has Some College	0.23	(+)	0.10	(-)***	0.23	(+)	0.16	(+)	0.20
Mother has College Degree	0.43	(+)***	0.00	(-)	0.05	(+)**	0.09	(+)***	0.00
Father has Some HS	0.14	(+)***	0.53	(+)	0.32	(-)**	0.30	(-)**	0.46
Father has HS Diploma	0.11	(-)***	0.32	(-)	0.32	(-)	0.46	(+)**	0.32
Father has Some College	0.44	(+)***	0.15	(-)	0.28	(+)*	0.18	(+)	0.19
Father has College Degree	0.30	(+)***	0.00	(-)*	0.08	(+)*	0.05	(+)	0.03

Source: FFCWS

The table presents weighted means of demographic variables by the main family structure types and their statistical difference from the weighted means of the stable single-mother family (OLS reference category). [*** p<0.01, ** p<0.05, * p<0.1]

Table 3. OLS and IV Estimates of Family Structure Effects on Child PPVT-R Scores

	(1)	(2)	(3)	(4)	(5)	(6)
	Married to Bio. Dad at Year Five		Married to Bio./Social Dad at Year Five		No Father Present at Year Five	
	OLS	IV	OLS	IV	OLS	IV
Family Structure Effect	7.744***	6.476*	7.416***	6.570*	-3.035***	-7.759*
	(0.839)	(3.518)	(0.799)	(3.551)	(0.723)	(4.280)
1st-Stage Coefficient	0.690***		0.681***		-0.576***	
1st -Stage F-Statistic	134.27		119.42		69.01	
R-Squared	0.07	--	0.07	--	0.04	--
Observations	2004	2004	2004	2004	2004	2004

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: FFCWS
The table presents OLS and IV estimates of the effect of family structure types on child cognitive performance. The instrument used in the IV strategy is the sex ratio indicator, which only assigns the race-specific sex-ratio to respective racially endogamous couples. All regressions control for child gender, parents' age and interview-year indicators.

Table 4. OLS and IV Estimates of Family Structure Effects on Child PPVT-R Scores by Race/Ethnicity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	White		Black		Hispanic		Black & Hispanic	
VARIABLES	OLS	IV	OLS	IV	OLS	IV	OLS	IV
PANEL A								
Married to Bio. Dad at Year Five	3.375**	-1,846.65	5.841***	18.308	5.023***	20.889	5.500***	10.012*
	(1.495)	(214,115)	(1.136)	(15.838)	(1.561)	(17.327)	(0.910)	(5.886)
1st-Stage F-Statistic		0.00		7.79		4.33		30.30
R-Squared		0.10		0.06		0.17		0.09
PANEL B								
Married to Bio./Social Dad at Year Five	2.791*	57.40	5.199***	21.341	5.155***	24.879	5.165***	10.971*
	(1.499)	(76.975)	(1.058)	(19.256)	(1.519)	(22.042)	(0.861)	(6.524)
1st-Stage F-Statistic		0.58		4.94		2.96		23.82
R-Squared		0.10		0.06		0.17		0.09
PANEL C								
No Father Present at Year Five	-1.091	135.533	-1.184	93.482	-3.627**	-112.932	-1.811**	-18.797
	(1.879)	(405.115)	(0.843)	(268.51)	(1.609)	(328.09)	(0.743)	(12.467)
1st-Stage F-Statistic		0.14		0.17		0.18		7.26
R-Squared		0.09		0.04		0.16		0.07
Observations	340	340	1194	1194	468	468	1663	1663

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: FFCWS
The table presents OLS and IV estimates of the effect of family structure types on child cognitive performance by racial-ethnic group. The instrument used in the IV strategy is the sex-ratio indicator, which only assigns the race-specific sex-ratio to respective racially endogamous couples. All regressions control for child gender, parents' age and interview-year indicators. Columns (5) and (8) also include Latin geographical region of birth and parents inteviewed in Spanish.

Table 5. OLS Estimates of the Effects of Family Stability on PPVT-R Scores

VARIABLES	(1) OLS	(2) OLS	(3) OLS
Stable Marriage	10.113***	2.411*	0.653
	(1.171)	(1.257)	(1.336)
Stable Cohabitation	-2.102	-1.112	-2.109
	(1.558)	(1.401)	(1.426)
Pre-Marital Cohabitation	2.828*	0.629	-0.717
	(1.620)	(1.504)	(1.533)
Married at Birth-Unstable	0.510	-2.861	-4.022**
	(2.207)	(1.913)	(1.940)
Cohabiting at Birth-Unstable	-0.393	-0.455	-1.248
	(1.155)	(1.079)	(1.120)
Single at Birth-Unstable	-0.202	0.540	0.025
	(1.134)	(1.046)	(1.026)
Living with Social Father by Year Five	-1.352	-1.607	-2.148*
	(1.200)	(1.123)	(1.129)
R-Squared	0.07	0.26	0.29
Observations	2104	2104	2104

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: FFCWS

The analysis sample is restricted to mothers living with the focal child all or most of the time. Stable single-mother family is the reference category. All family types above are mutually exclusive.

(1) Includes no additional control variables
(2) Adds child and demographic characteristics: child gender, low birth weight, parents' age, race, education and geographical region of birth as well as city, interview-year and interviewed in Spanish indicators.
(3) Adds family background and typically unobserved characteristics: parents' family intact at age 15, maternal grandparents' education, maternal and paternal grandparents treated for depression and/or anxiety, parents had a father figure growing up; parents' impulsivity scores, length of time parents knew each other before pregnancy, abortion preferences, biological father visited mother in the hospital at child's birth and parents' WAIS-R scores.

Table 6. OLS Estimates of the Effects of Family Stability on PPVT-R Scores by Race

	(1)	(2)	(3)	(4)
	White	Black	Hispanic	Black & Hispanic
VARIABLES	OLS	OLS	OLS	OLS
Stable Marriage	-4.006	3.008	3.058	2.438
	(3.099)	(2.001)	(3.385)	(1.638)
Stable Cohabitation	-5.678*	-1.777	-0.504	-1.781
	(3.429)	(2.019)	(3.112)	(1.651)
Pre-Marital Cohabitation	-4.694	-2.454	2.864	0.075
	(3.728)	(2.493)	(3.172)	(1.805)
Married at Birth-Unstable	-2.882	-5.942**	-6.175	-5.090**
	(4.065)	(2.793)	(4.307)	(2.341)
Cohabiting at Birth-Unstable	-4.347	-1.021	-0.224	-0.896
	(3.321)	(1.418)	(2.943)	(1.239)
Single at Birth-Unstable	-3.468	-0.118	3.024	0.542
	(3.269)	(1.245)	(2.728)	(1.110)
Living with Social Father by	-6.772**	-1.482	-1.433	-1.328
Year Five	(3.330)	(1.385)	(3.006)	(1.240)
R-Squared	0.33	0.18	0.34	0.19
Observations	431	1123	492	1615

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: FFCWS

The analysis sample is restricted to mothers living with the focal child all or most of the time. Stable single-mother family is the reference category. All family types above are mutually exclusive.

All regressions control for: {child gender, parents' age, race, education and geographical region of birth as well as city, interview-year and interviewed in Spanish indicators} *as well as* {family background and typically unobserved characteristics: parents' family intact at age 15, maternal grandparents' education, maternal and paternal grandparents treated for depression and/or anxiety, parents had a father figure growing up; parents' impulsivity scores, length of time parents knew each other before pregnancy, abortion preferences, biological father visited mother in the hospital at child's birth and parents' WAIS-R scores}