Maximum Impact Intergenerational Associations

APPENDIX*

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Contents

A Data

This appendix presents the data sources of the study and describes different analysis samples used in this paper.

A.1 Data Sources

Danish Administrative Registers. For the empirical analysis in this paper, we use Danish data.[1] The register data include unique individual identifiers allowing us to link individuals across years from 1980 to 2019 (the lastest year of data availability). In addition, the data also include unique individual identifiers of spouses and parents allowing us to link families across generations.

In addition to information on income measures of children and their parents, we also add information on completed education, household structure and demographic characteristics, and crime. Using the individual identifiers, we link data from registers containing educational attainment (UDDA register), income, assets, transfers, marital status, and fertility (BEF register) for each individual and his or her spouse and parents. We also include information on 9th grade national leaving exams (UDFK), and criminal convictions from the sentencing register (KRAF) and incarceration spells from the incarceration register (KRIN).
Danish Longitudinal Survey of Children (DALSC): We also make use of the Danish Longitudinal Survey of Children born in 1995 (DALSC), which includes a representative group of over 6,000 children among all children born in Denmark in 1995 (around 70,000).[2] These children and their parents were interviewed during five waves, from 1996 (6 months), 1999 (3 years), 2003 (7 years), 2007 (11 years) and 2011 (15 years), and 2014 (18 years old). We use information on children's cognitive tests completed in different waves of the survey.[3] From the survey, we obtain a measure of language development at age 11. We link the survey data

[1] For details, see http://www.dst.dk/en.
[2] The children in the survey were born between September 15 and October 31, 1995.
[3] For details, see
https://www.vive.dk/da/projektforloeb/aargang-95-forloebsundersoegelsen-af-boern-foedt-i-1995.

to the administrative register information using individuals' unique identifier.

A.2 Analysis Samples

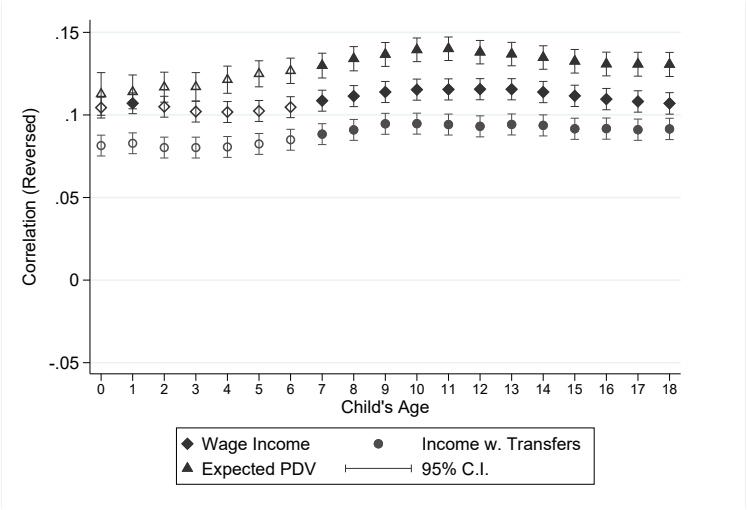
1981–1982 Cohort. We base our analysis on the sample of children born in 1981 and 1982 for whomwe can establish a link to parents, whose parents did not migrate, and who did not themselves migrate. We observe the birth cohorts of 1981 and 1982 from birth to age 38 and 37, respectively (in 2019). We have information on their parents in all years between 1980 and 2019, which covers the years between the arrival of the children in our sample all through age 38 (37) for the birth cohort 1981 (1982). For our IGE analysis, we use these sample of 1981–1982 birth cohorts and measure children's resources at ages 30—35. For the IGE analysis in the paper, our log-log specification excludes individuals with zero or negative average income for the age range over which we measure their income and individuals with average income more than four standard deviations above or below the mean. We start with a sample of 105,953 individuals who did not migrate and whose parents did not migrate for whom we can establish links with their parents. This reduces to 100,344 when dropping negative values and zeroes, and this reduces further down to 98,686 when we drop those children with fewer than three observations.

1995–1997 Cohort. We use the population of individuals born between 1995 and 1997 in Denmark. We use this sample when we study the 9th-grade national leaving exam as our measure of child human capital. We observe the birth cohorts of 1995–1997 from birth to age 22–24 in 2019. It follows that we observe their parental resources during the whole childhood period and beyond (from age 0 to 22 for the 1997 cohort and from age 0 to 24 for the 1995 cohort).

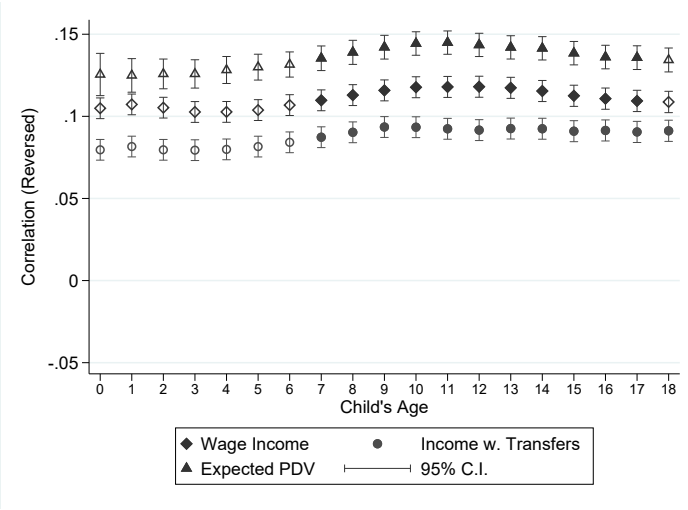
B Robustness of Results to the Child's Age when Measuring Criminality

Panel (d) of Figure 1 shows the correlation between the child's incarceration by age 35 and their parental resources. Figure B.1 shows the robustness of our results to the child's age we use to measure their criminality status. Figures B.2-B.4 present the results for different crime types, separately when we define criminality by age 20, 25, and 30, respectively.

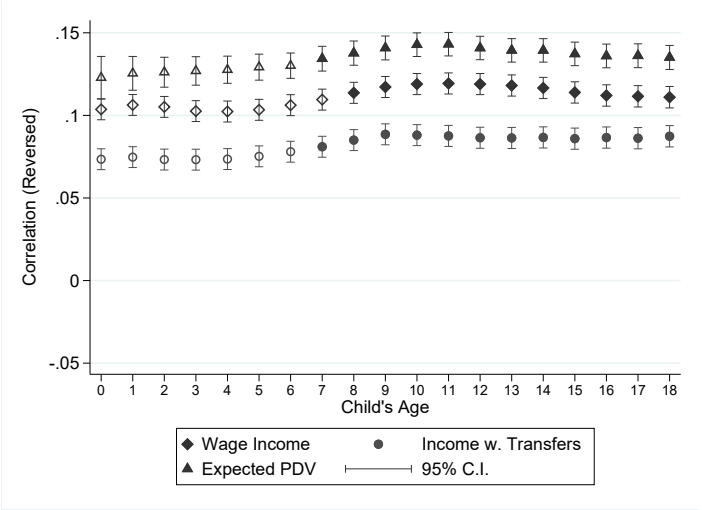
Figure B.1: Correlations between Parental Measures of Resources and Child's Incarceration- by Child's Age



(a) Ever Been Incarcerated by age 25



(b) Ever Been Incarcerated by age 30



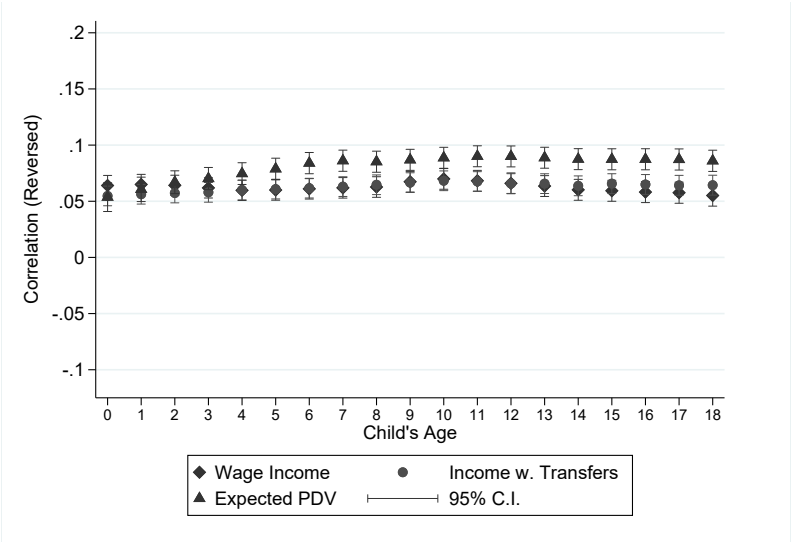
(c) Ever Been Incarcerated by age 35

Notes: Panels (a), (b), and (c) plot the correlations between the different parental income measures measured at the different child ages and the child's criminality defined by whether the child has ever been incarcerated by age 25, 30, and 35, respectively. All figures plot the inverted correlation between the child's receiving a prison sentence by the corresponding age (25, 30, or 35) and their parental resources. For each measure of resources, we use a t-test to evaluate whether the correlation at each age is significantly different from the maximum correlation (at the 5% level). We depict the estimate with solid (filled) symbols if it is not significantly different from the maximum value.

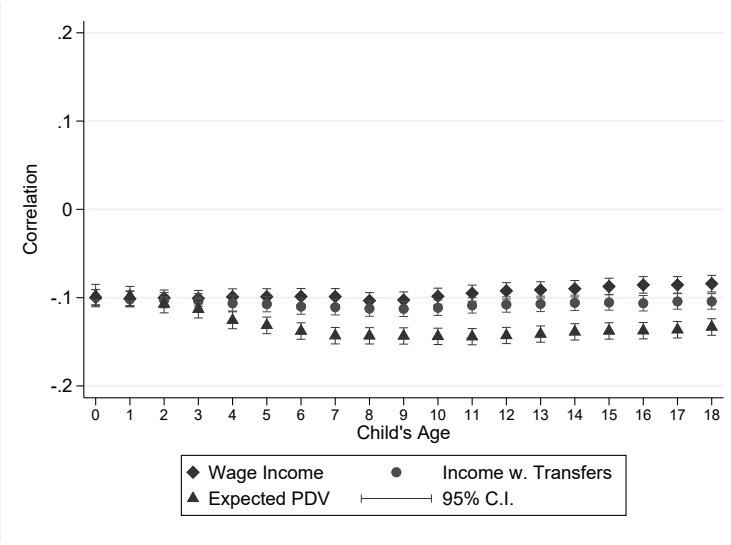
B.1 By Crime Types

This section presents the results for different crime types, separately when we define criminality by age 20, 25, and 30 (instead of age 35).

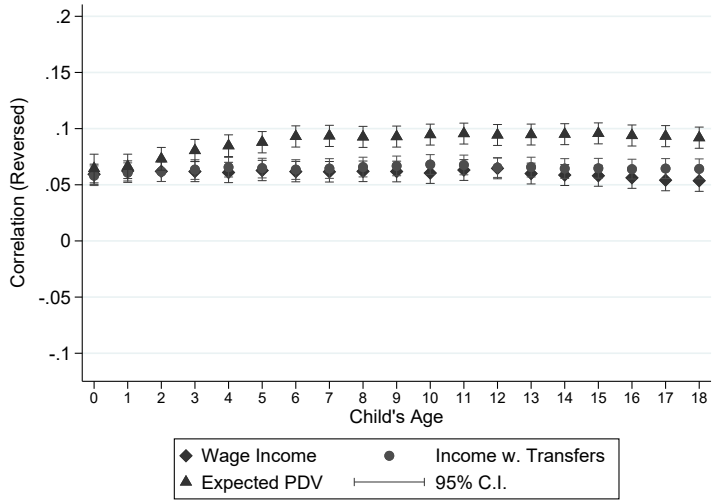
Figure B.2: Paternal Resources and Child's Criminality By Age 20 for Different Crime Types- Sample of Male Children



(a) Violent Crimes



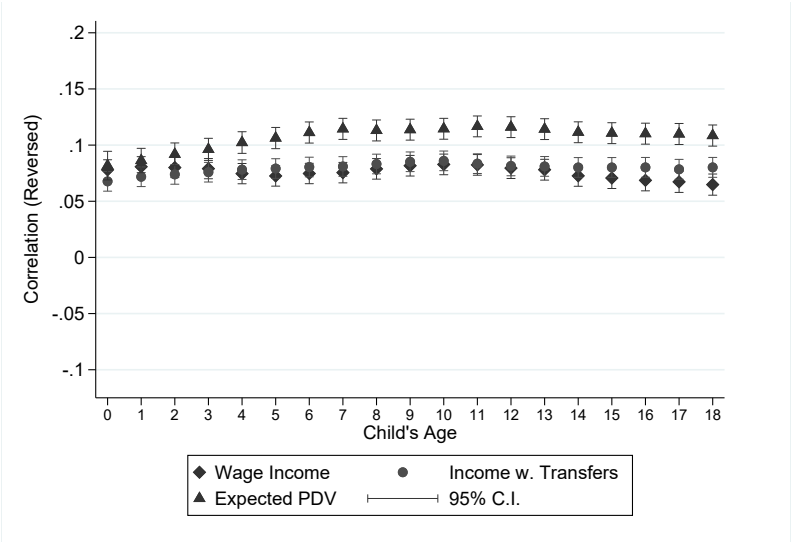
(b) Property Crimes



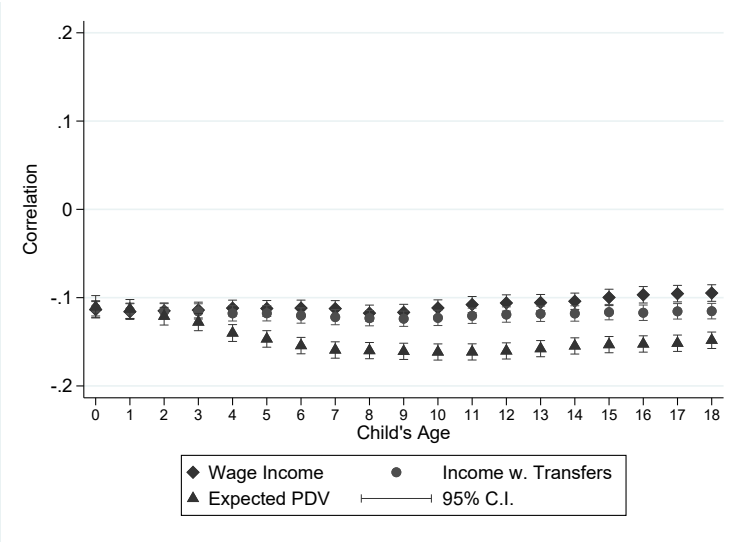
(c) Other Crimes

Notes: This figure plots the correlations between the different parental income measures measured at the different child ages and the child's participation in violent crimes (Panel (a)), property crimes, (Panel (b)), and all other types of crime (Panel (c)). We invert correlations in all figures.

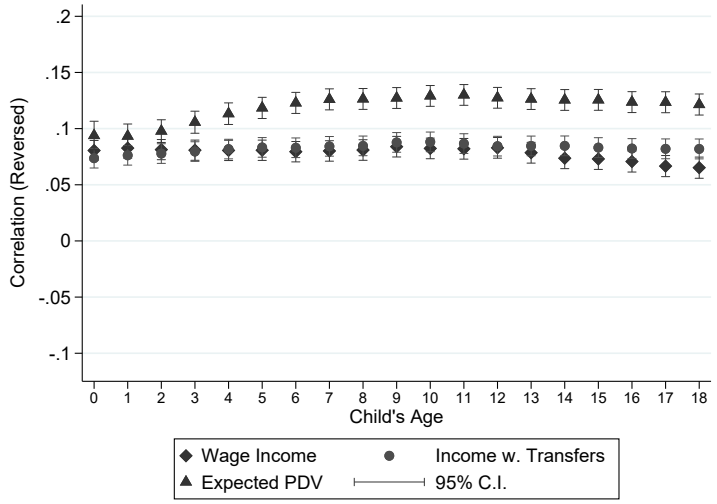
Figure B.3: Paternal Resources and Child's Criminality By Age 25 for Different Crime Types- Sample of Male Children



(a) Violent Crimes



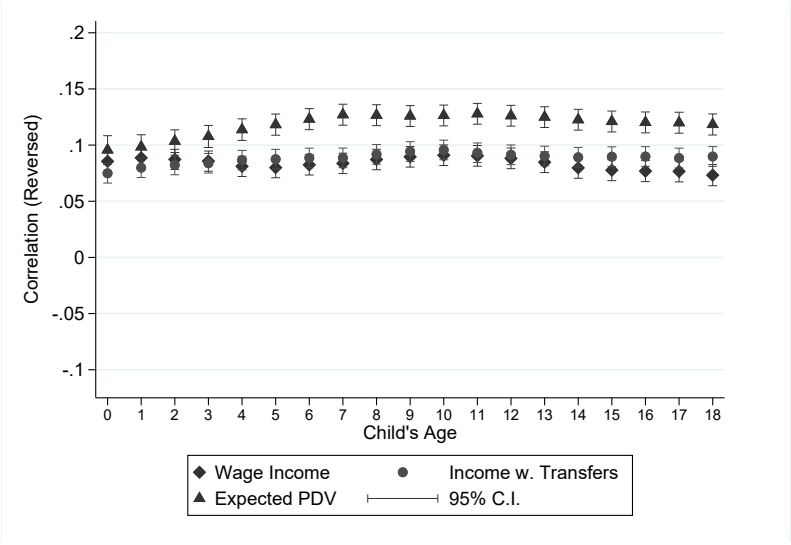
(b) Property Crimes



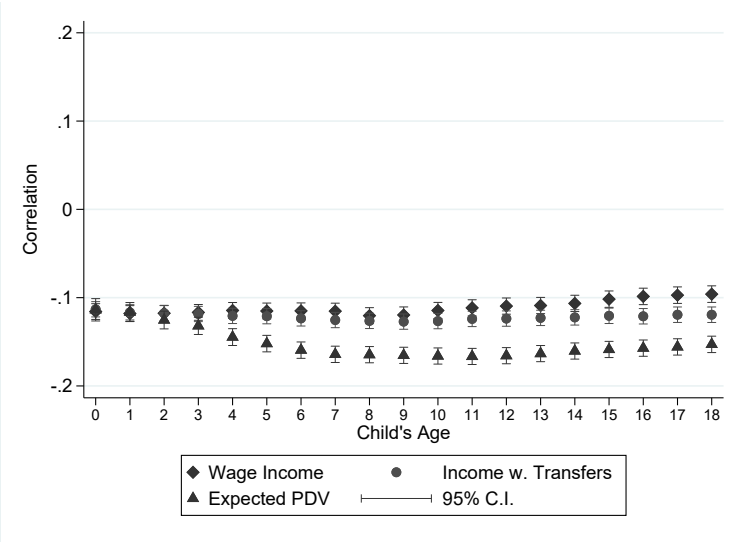
(c) Other Crimes

Notes: This figure plots the correlations between the different parental income measures measured at the different child ages and the child's participation in violent crimes (Panel (a)), property crimes, (Panel (b)), and all other types of crime (Panel (c)). We invert correlations in all figures.

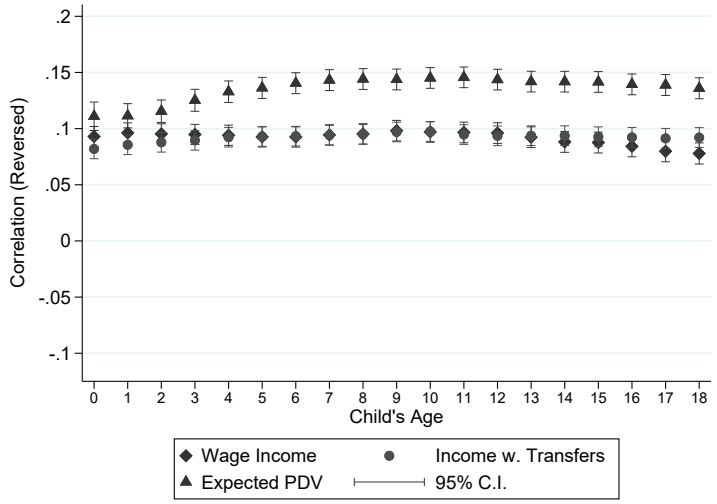
Figure B.4: Paternal Resources and Child's Criminality By Age 30 for Different Crime Types- Sample of Male Children



(a) Violent Crimes



(b) Property Crimes



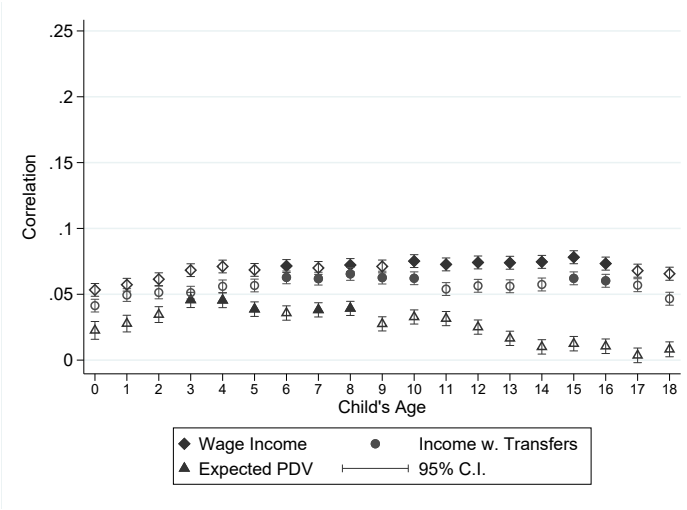
(c) Other Crimes

Notes: This figure plots the correlations between the different parental income measures measured at the different child ages and the child's participation in violent crimes (Panel (a)), property crimes, (Panel (b)), and all other types of crime (Panel (c)). We invert correlations in all figures.

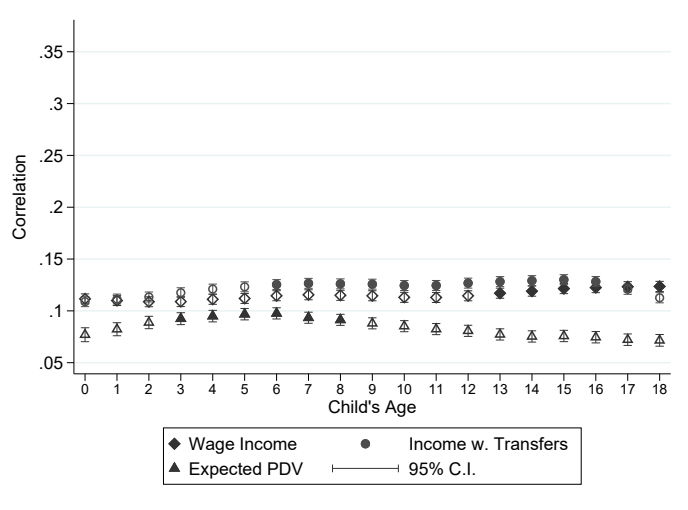
C Robustness of Intergenerational Correlation Estimates

Section 3 presents the relationship between parental resources at different ages during childhood and children's outcome measures. This Section presents the robustness of the patterns in Section 3 if we control for parental education and family structure. To this aim, we repeat our analysis in Section 3, but we use residualized measures where we non-parametrically residualize our measures of income and children's outcomes by parental level of education (college vs non-college) and marital status at birth of the child (married vs non-married). Figure C.1 presents the results.

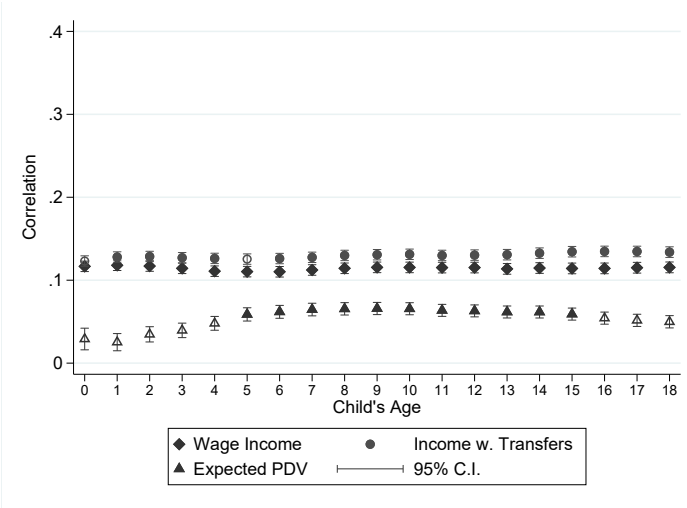
Figure C.1: Correlations between Parental Measures of Resources and Child Human Capital Outcomes- Residualized Measures



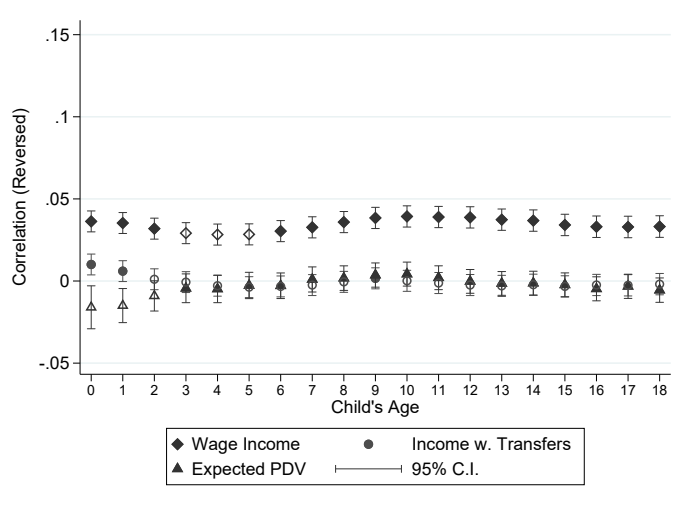
(a) Child's Language Test Score at age 11



(b) Math. National Leaving Exam Grade at age 16-17



(c) Years of Education by age 30



(d) Criminality (Ever Been Incarcerated) by age 35

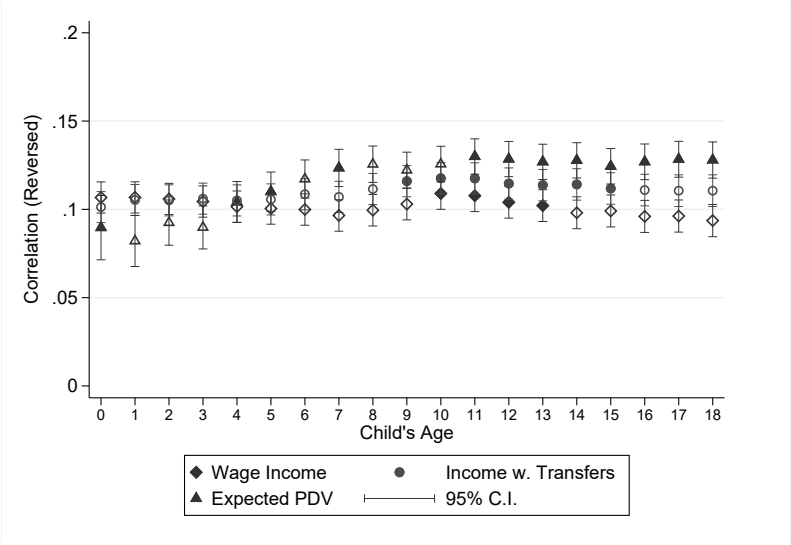
Notes: Panels (a), (b), and (c) plot the correlations between the different parental income measures measured at the different child ages and the child's language test score at age 11, the child's national math test score at age 15, and the child's years of completed schooling at age 35, respectively. Figure (d) plots the inverted correlation between the child's receiving a prison sentence by age 35 and their parental resources. We use residualized measures where we non-parametrically residualize measures of income and children's outcomes by parental level of education (college vs non-college) and marital status at birth of the child (married vs non-married).

D Heterogeneity Analyses by Crime Types

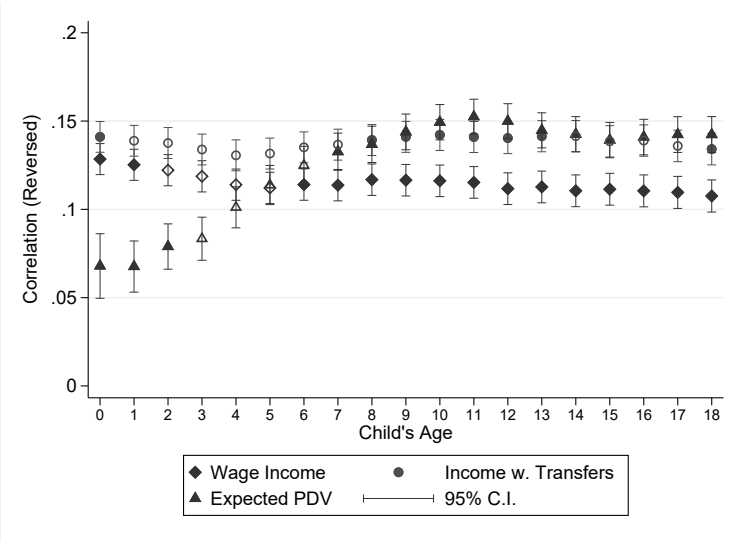
Figure D.1 presents the correlations between measures of parental resources (the sum of father's and mother's) at different children's ages from zero to 18 and the child's participation in various types of crime, i.e., violent crimes (Panel (a)), property crimes (Panel (b)), and other crimes[4] (Panel (c)) for the sample of male children. Figure D.2 depicts the same relationship for the sample of female children. Finally, Figure D.3 shows the relationship between the paternal resources and the child's participation in various crimes for the sample of female children.

[4] "Other crimes" include all crimes other than violent crimes, property crimes, and traffic crimes. It includes, for example, drug crimes, sex crimes, and all other types of crimes from practicing as doctor without license to treason.

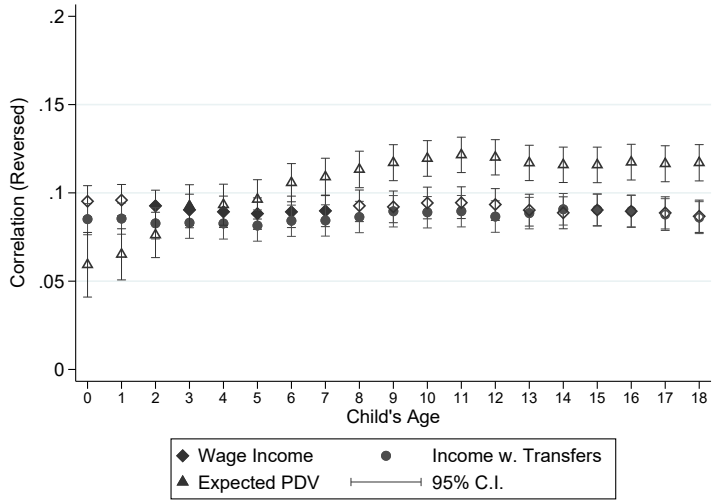
Figure D.1: Father's and Mother's Resources and Child's Criminality By Age 35 for Different Crime Types- Male Children



(a) Violent Crimes



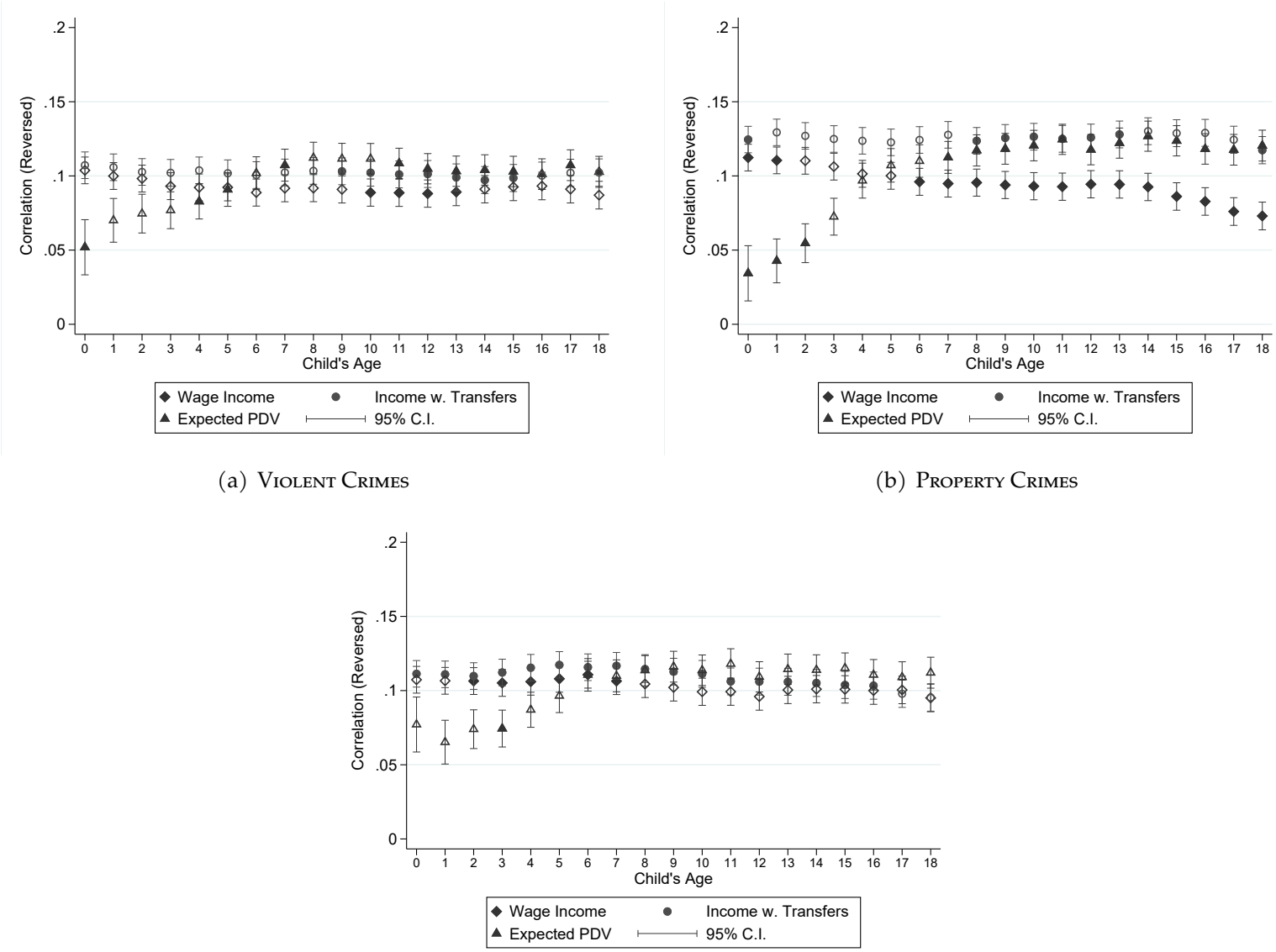
(b) Property Crimes



(c) Other Crimes

Notes: This figure plots the correlations between the different parental income measures measured at the different child ages and the child's participation in violent crimes (Panel (a)), property crimes (Panel (b)), and all other types of crime (Panel (c)). We invert correlations in all figures.

Figure D.2: Father's and Mother's Resources and Child's Criminality By Age 35 for Different Crime Types- Female Children



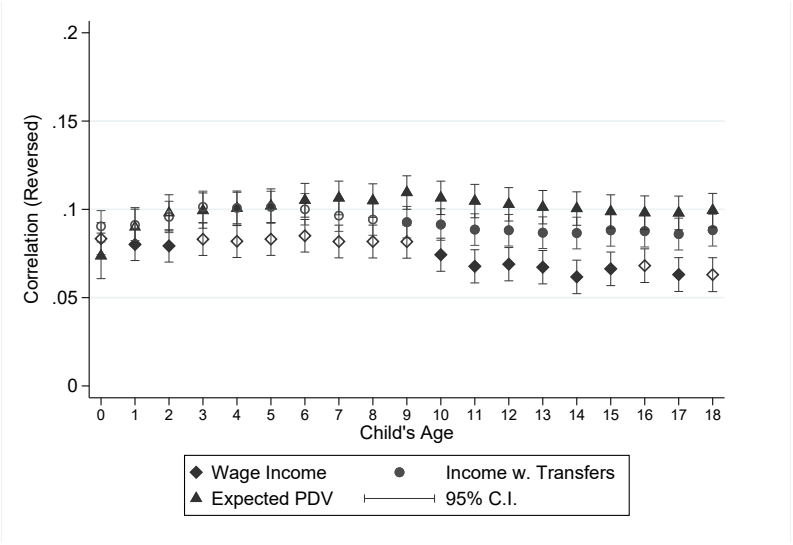
(a) Violent Crimes

(b) Property Crimes

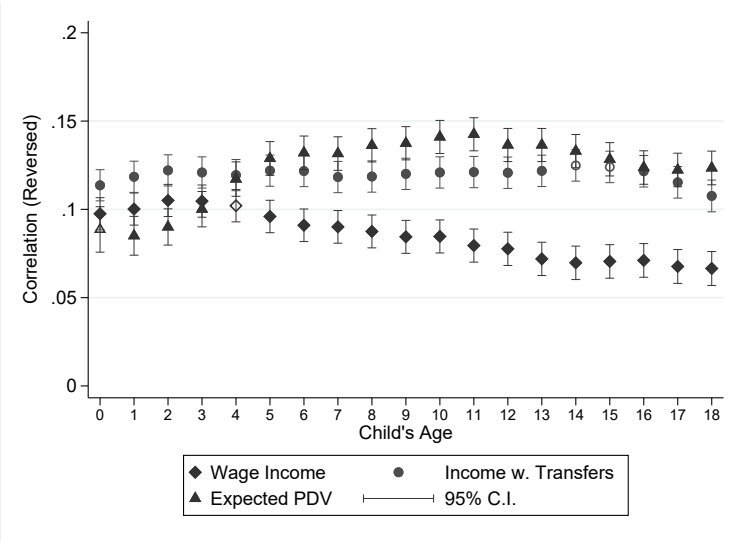
(c) Other Crimes

Notes: This figure plots the correlations between the different parental income measures measured at the different child ages and the child's participation in violent crimes (Panel (a)), property crimes (Panel (b)), and all other types of crime (Panel (c)). We invert correlations in all figures.

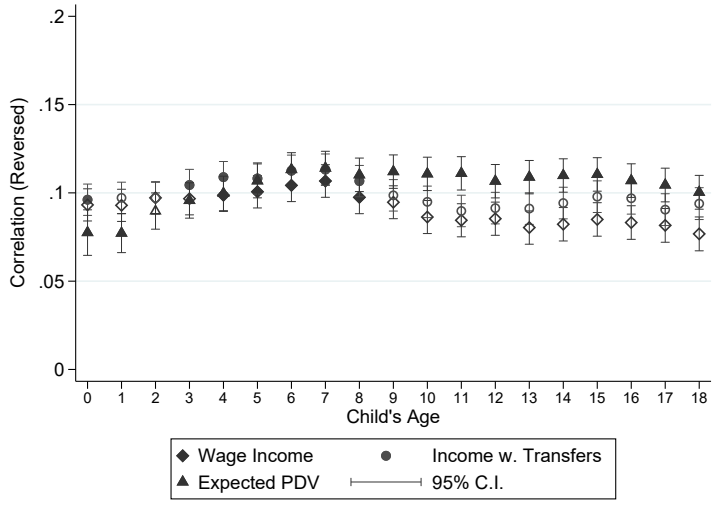
Figure D.3: Father's Resources and Child's Criminality By Age 35 for Different Crime Types- Female Children



(a) Violent Crimes



(b) Property Crimes



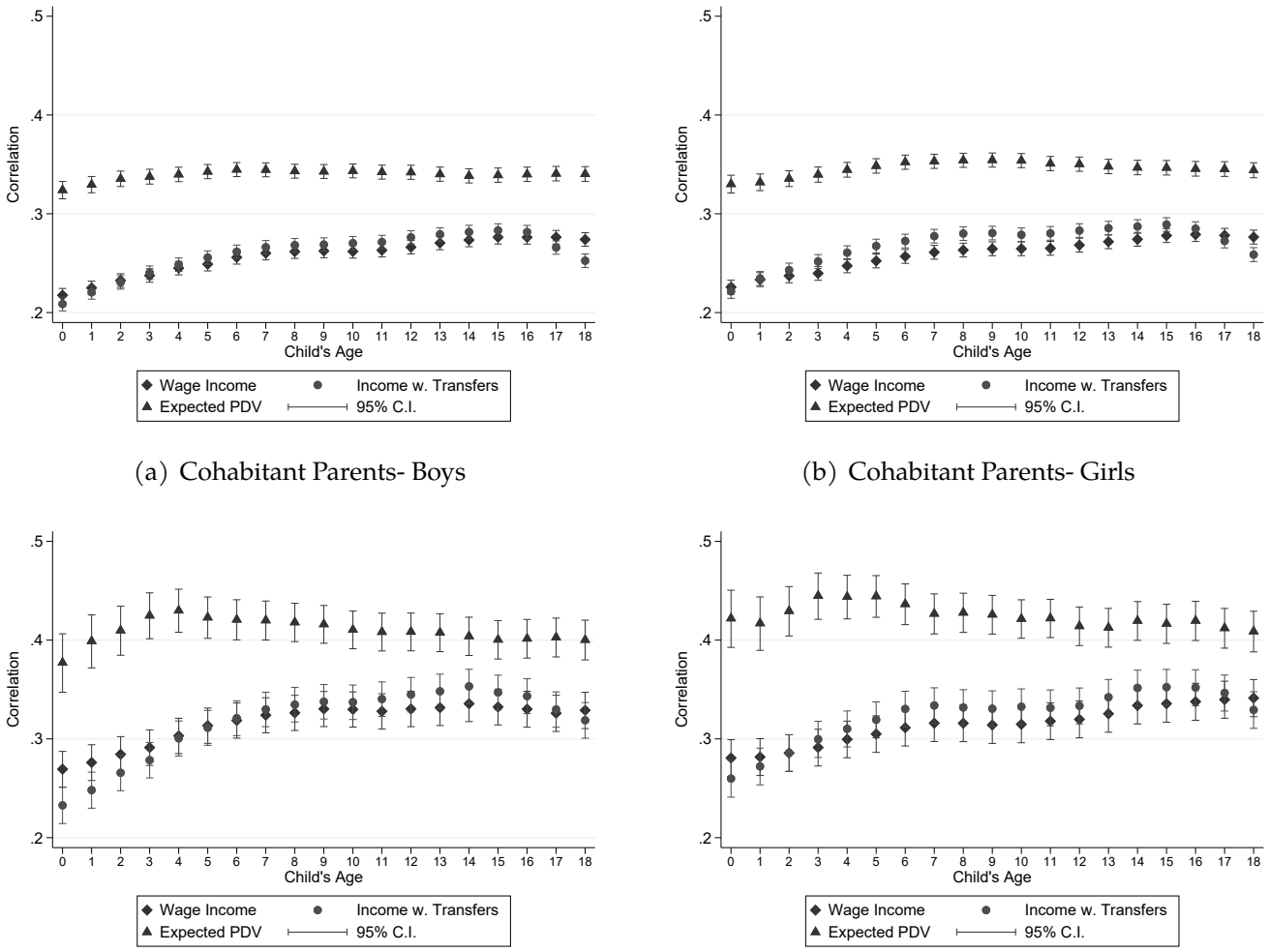
(c) Other Crimes

Notes: This figure plots the correlations between the different parental income measures measured at the different child ages and the child's participation in violent crimes (Panel (a)), property crimes (Panel (b)), and all other types of crime (Panel (c)). We invert correlations in all figures.

E Heterogeneity Analyses by Family Background

Figure E.1 plots the correlation between the child's mathematics test scores at age 16 and parental income variables measured at the household level at different child's ages, separately for cohabitant and non-cohabitant parents and by gender of the child. Panels (a) and (b) present the results for boys and girls growing up in cohabitant families, respectively. Panel (c) and (d) present the results for boys and girls growing up in non-cohabitant families, respectively. For each child, we consider the family as cohabitant if the mother and the father were cohabitants at the time of the arrival of the child. Figure E.2 plots the correlation between the child's years of formal schooling by age 35 and parental income variables measured at the household level at different child's ages, separately for the four different groups of families as described above. Figure E.3 plots the correlation between the child's participation in crime (defined as the absence of any incarceration) by age 35 and parental income variables measured at the household level at different child's ages, separately for the four different groups of families.

Figure E.1: Correlations with Child's Mathematics Test Scores by Parental Cohabitant Status and Gender



(a) Cohabitant Parents- Boys

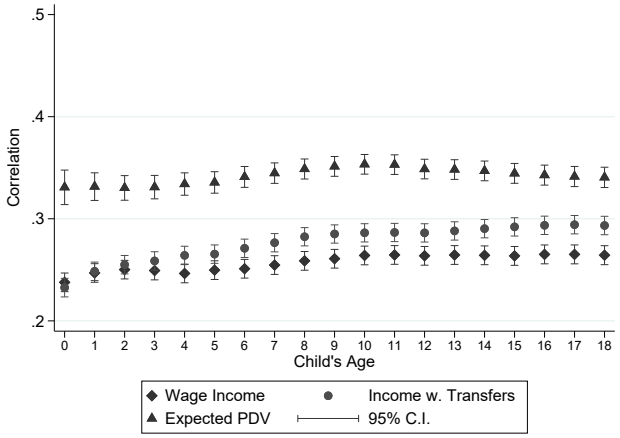
(b) Cohabitant Parents- Girls

(c) Non-Cohabitant Parents- Boys

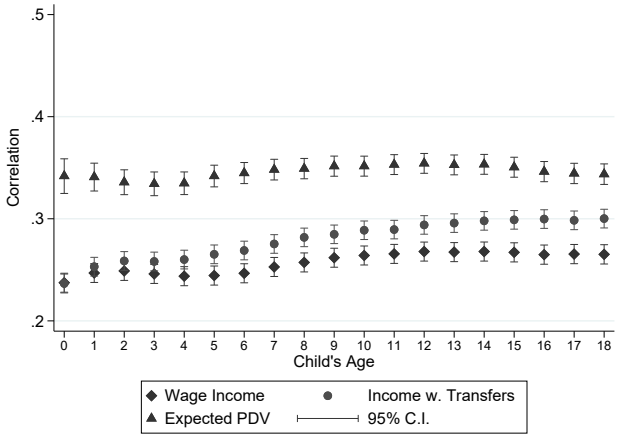
(d) Non-Cohabitant Parents- Girls

Notes: This figure plots the correlation between Mathematics test scores at age 16 measured and parental income variables measured at the household level at different child's ages. These test scores were measured as part of national leaving examinations for cohorts born in 1995-1997. Panels (a) and (b) present the results for boys and girls growing up in cohabitating families, respectively. Panel (c) and (d) present the results for boys and girls growing up in non-cohabitating families, respectively. For each child, we consider the family as cohabitant if the mother and the father were cohabitants at the arrival of the child.

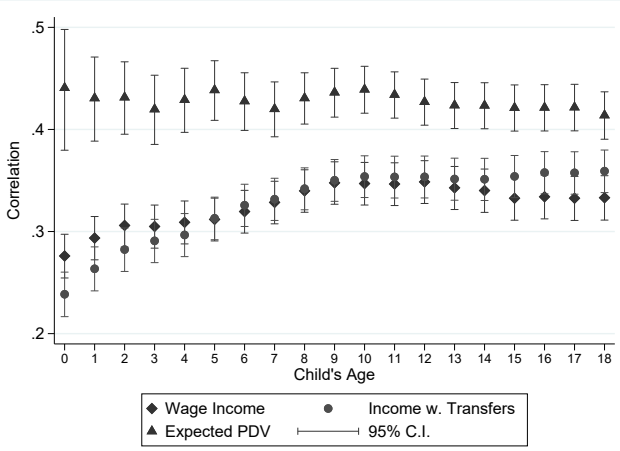
Figure E.2: Correlations with Child's Years of Education by Parental Cohabitant Status and Gender



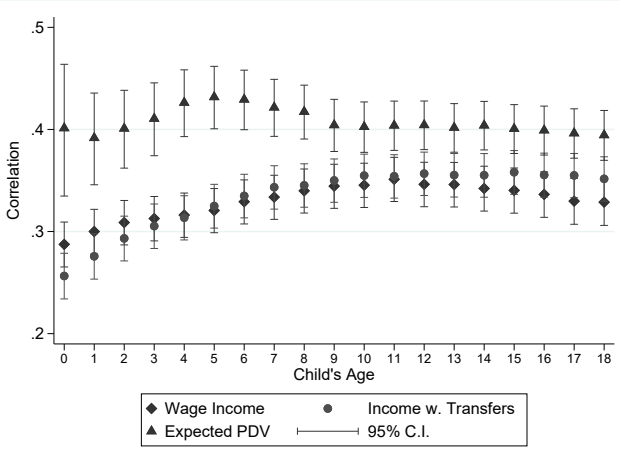
(a) Cohabitant Parents- Boys



(b) Cohabitant Parents- Girls



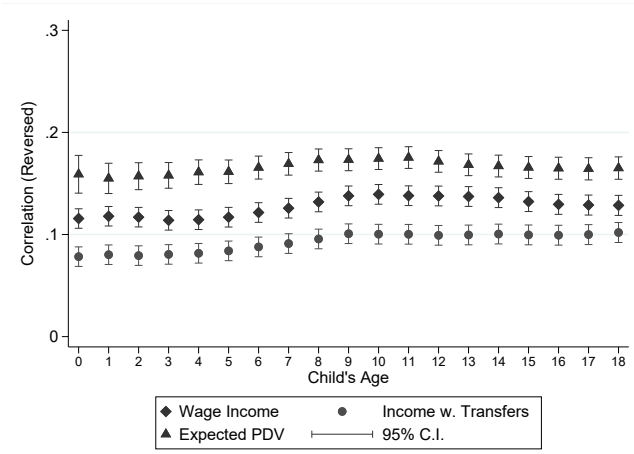
(c) Non-Cohabitant Parents- Boys



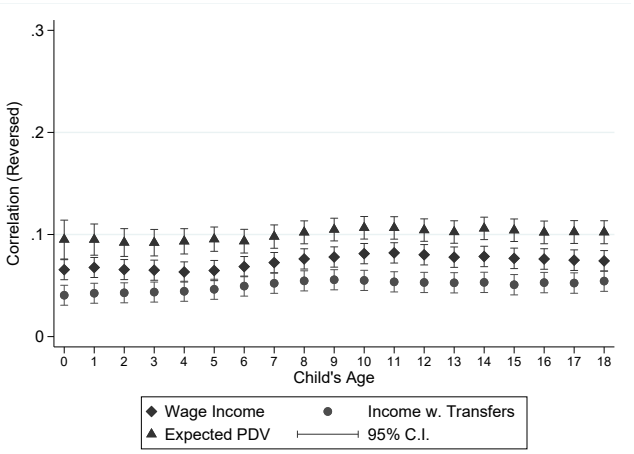
(d) Non-Cohabitant Parents- Girls

Notes: This figure plots the correlation between years of education and parental income variables measured at the household level at different child's ages. We include children from the 1981-1982 cohorts in these exercises. Panels (a) and (b) present the results for boys and girls growing up in cohabitant families, respectively. Panel (c) and (d) present the results for boys and girls growing up in non-cohabitant families, respectively. For each child, we consider the family as cohabitant if the mother and the father were cohabitants at the arrival of the child.

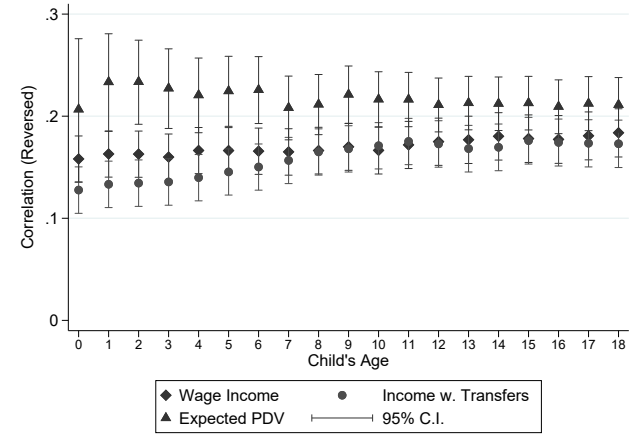
Figure E.3: Correlations with Child's Criminality (Never Been Incarcerated) by Parental Cohabitant Status and Gender



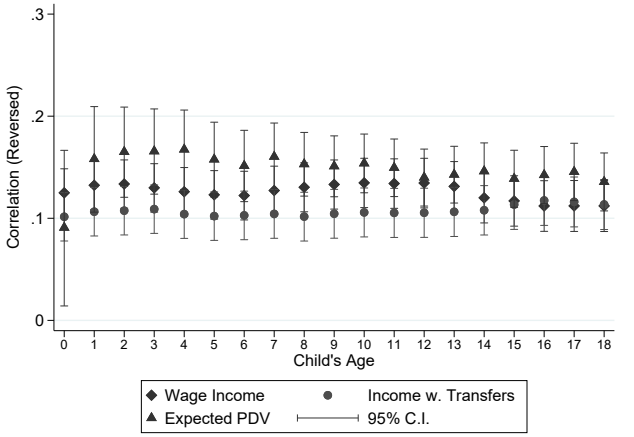
(a) Cohabitant Parents- Boys



(b) Cohabitant Parents- Girls



(c) Non-Cohabitant Parents- Boys



(d) Non-Cohabitant Parents- Girls

Notes: This figure plots the correlation between criminality and parental income variables measured at the household level at different child's ages. We rely on conviction information from criminal records for children from the 1981-1982 cohorts. Panels (a) and (b) present the results for boys and girls growing up in cohabitant families, respectively. Panel (c) and (d) present the results for boys and girls growing up in non-cohabitant families, respectively. For each child, we consider the family as cohabitant if the mother and the father were cohabitants at the arrival of the child.

F Child Outcome Measures and Adult Earnings

Table F.1 presents the correlation between child outcome measures such as years of schooling and participation in crime with different measures of child resources in adulthood over ages 30–35. For this analysis, we only focus on education and participation in crime (and not the child's test score) due to data limitations. The cohorts of 1995-1997 whom we use for language test scores and Mathematics test scores are not observed at ages 30–35.

Table F.1: Correlation between Child Outcome Measures and Child Resources over Ages 30–35

Measure	**Years of Schooling**	**Not Incarcerated**
(1)	(2)	(3)
Wage Income	0.423	0.032
Income w. Transfers	0.268	0.012
Expected PDV	0.754	0.184

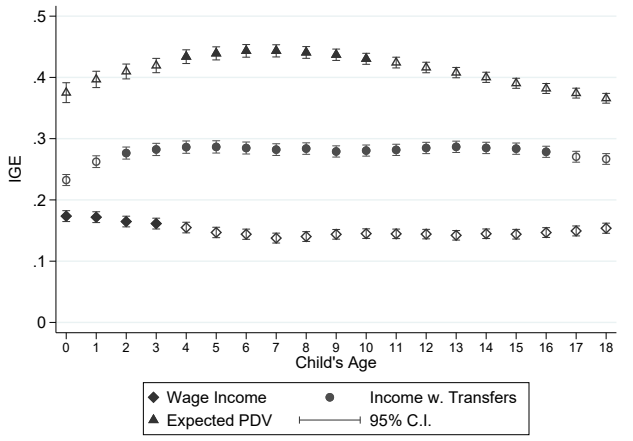
Notes: For each measure of resources for the child (Column 1), this table presents the correlation with the child's years of completed schooling at age 35 (Column 2), and never been incarcerated by age 35 (column 3). We measure the child's measures of resources (listed in the first column) over ages 30-35.

G Robustness of IGE Estimates

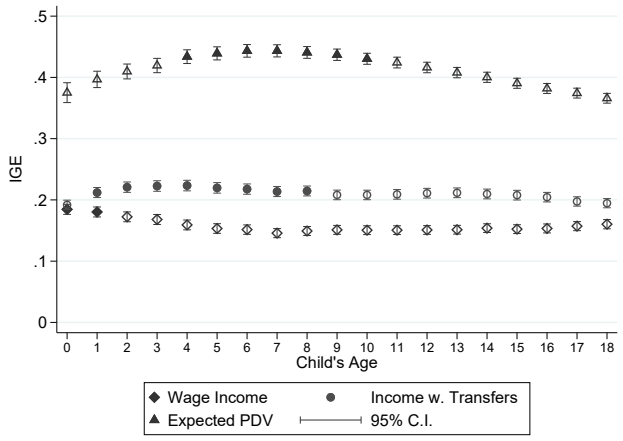
This section presents the sensitivity of our IGE estimates, presented in Section 4, to the age range we choose to measure the children's income. In addition to ages 30–35 used in Section 4, we also present the results when we use ages 25–30 and 25–37. Moreover, Section G.1 presents these results by parental education level. Section G.1.2 reports the results by intactness of families. Finally, Section G.1.3 shows the results by marital status of parents at the child's birth.

Figure G.1: IGE Estimates over Age of Child When Parental Resources Measured, by Age of Measurement of Child

(a) Children Measured over 25–30



(b) Children Measured over 30–35



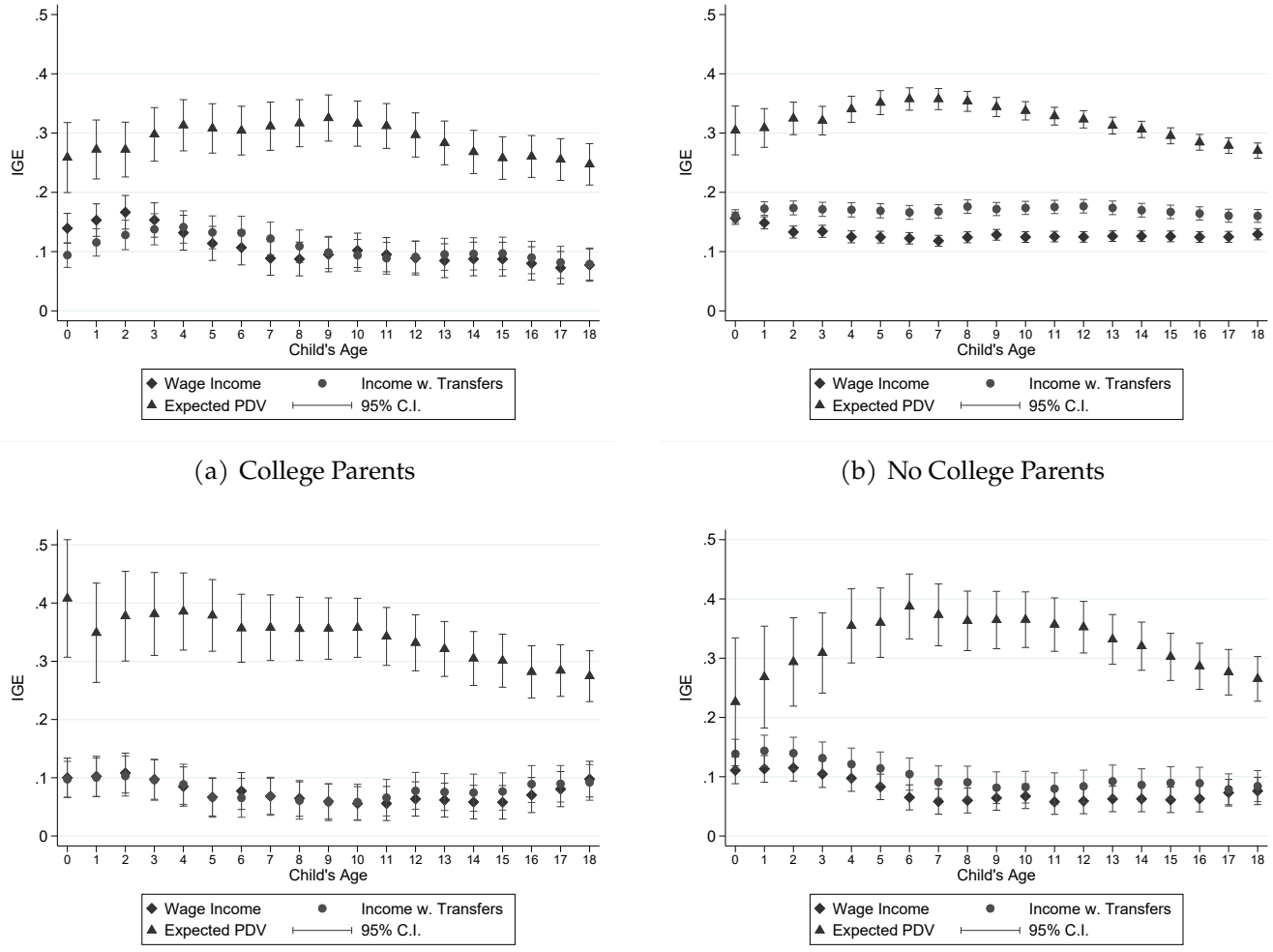
(c) Children Measured over 25–37

Notes: This figure plots the IGE for selected income variables. The child's income is measured at ages 30-35 and the parental income is measured at the household level at different child's ages. We include children from the 1981-1982 cohorts in Denmark and their parents. The vertical lines around the point estimates represent the 95% confidence intervals. Panel (a) shows the results where children are measured at ages 25–30. Panel (b) shows the results where children are measured at ages 30–35. Panel (c) shows the results where children are measured at ages 25–37. For each income measure, we use a t-test to evaluate whether the estimate at each age is significantly different from the maximum IGE estimate. We depict the estimate with solid (filled) symbol if it is not significantly different from the maximum IGE estimate.

G.1 By Parental Background

G.1.1 Parental Education

Figure G.2: Parents-Child IGE Estimates, Children Measured at Ages 25–30



(a) College Parents

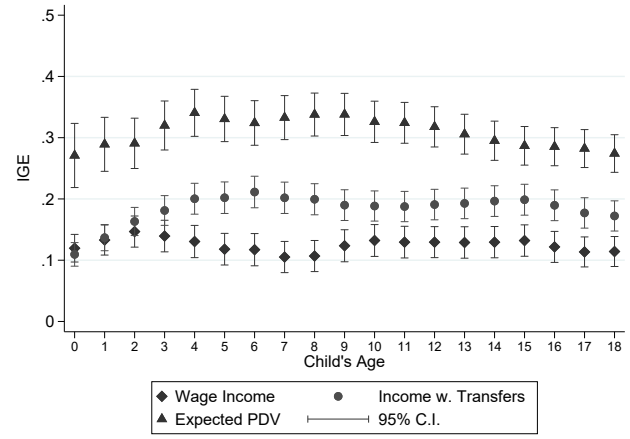
(b) No College Parents

(c) College Fathers

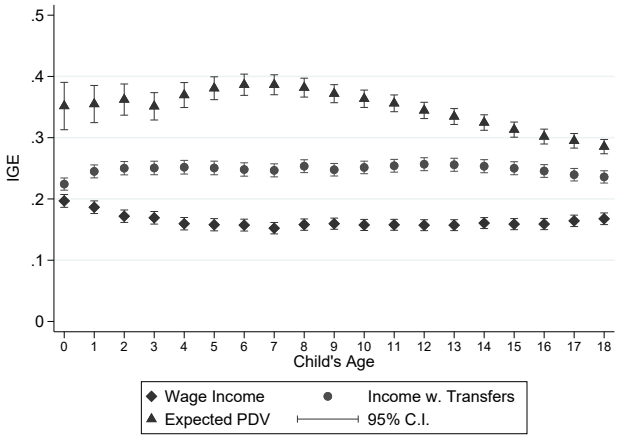
(d) College Mothers

Notes: This figure plots the IGE for selected income variables. The child's income is measured at ages 25-30 and the parental income is measured at the household level at different child's ages. We include children from the 1981-1982 cohorts in these exercises. Panel (a) presents by-age correlations for the sample of college parents where both parents are college (or university) graduates. Panel (b) presents correlations for the sample of parents where non of the parents are college (or university) graduates. Panel (c) restricts the sample to those families where only the father is a college (or university) graduate. Panel (d) restricts the sample to those families where only the mother is a college (or university) graduate.

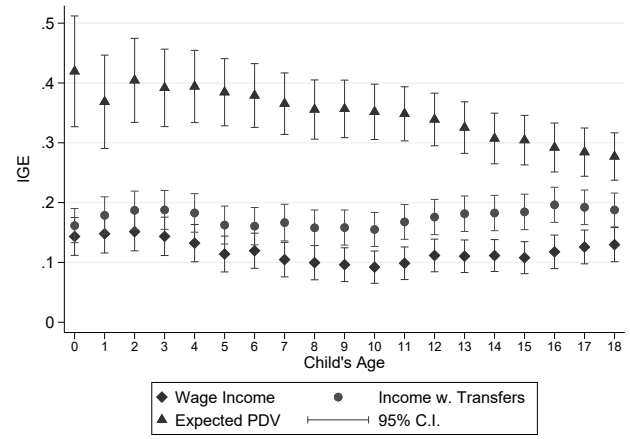
Figure G.3: Parents-Child IGE Estimates, Children Measured at Ages 25–37



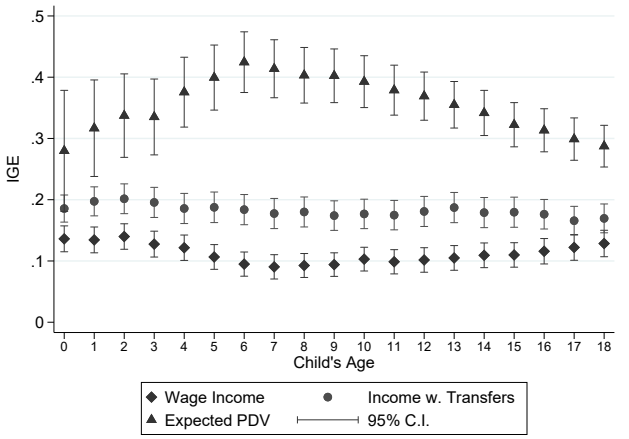
(a) College Parents



(b) No College Parents



(c) College Fathers

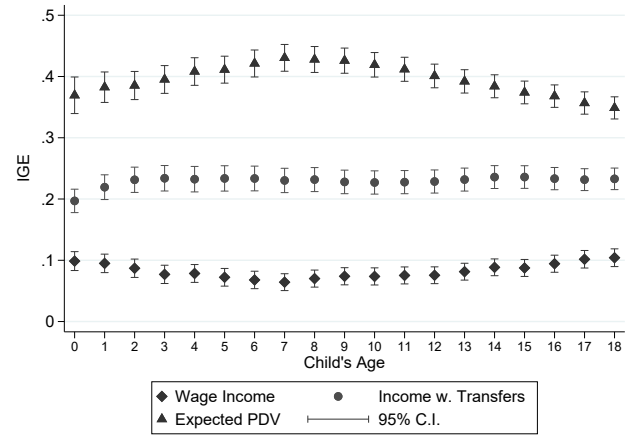


(d) College Mothers

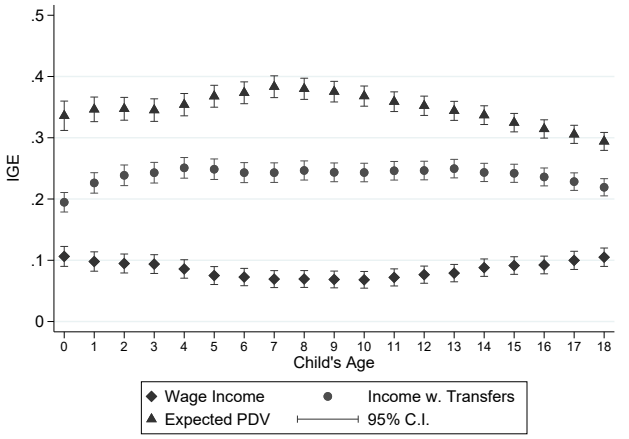
Notes: This figure plots the IGE for selected income variables. The child's income is measured at ages 25-37 and the parental income is measured at the household level at different child's ages. We include children from the 1981-1982 cohorts in these exercises. Panel (a) presents by-age correlations for the sample of college parents where both parents are college (or university) graduates. Panel (b) presents correlations for the sample of parents where non of the parents are college (or university) graduates. Panel (c) restricts the sample to those families where only the father is a college (or university) graduate. Panel (d) restricts the sample to those families where only the mother is a college (or university) graduate.

G.1.2 Intactness of Family

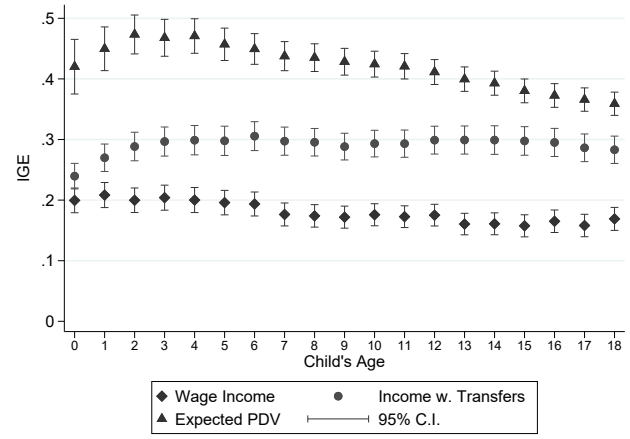
Figure G.4: Parents-Child IGE Estimates by Family Intactness, Children Measured at Ages 30–35



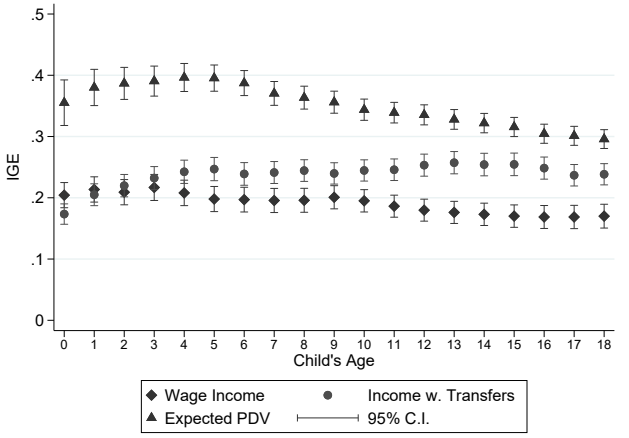
(a) Intact Family- Boys



(b) Intact Family- Girls



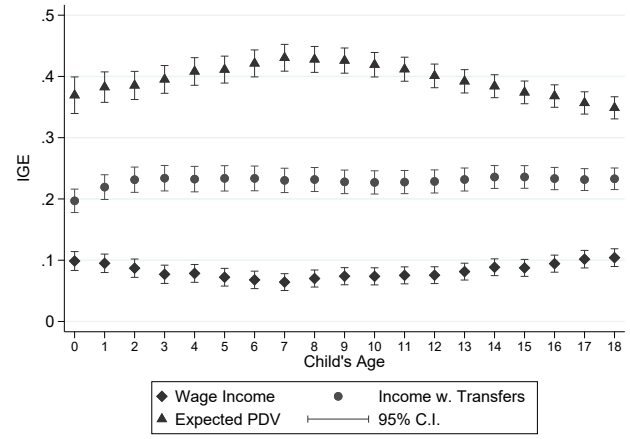
(c) Non-Intact Family- Boys



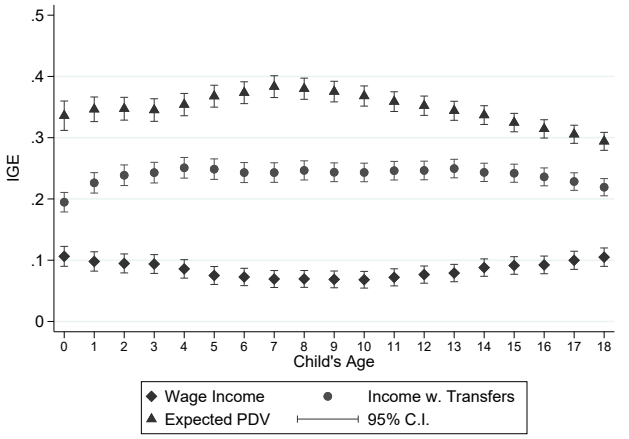
(d) Non-Intact Family- Girls

Notes: This figure plots the IGE for selected income variables. The child's income is measured at ages 30-35 and the parental income is measured at the household level at different child's ages. We include children from the 1981-1982 cohorts in these exercises. Panels (a) and (b) present the results for boys and girls growing up in intact families, respectively. Panel (c) and (d) present the results for boys and girls growing up in non-intact families, respectively. For each child, we consider a family as intact if the mother and the father were living together over the whole childhood stage (from age zero to 18 of the child).

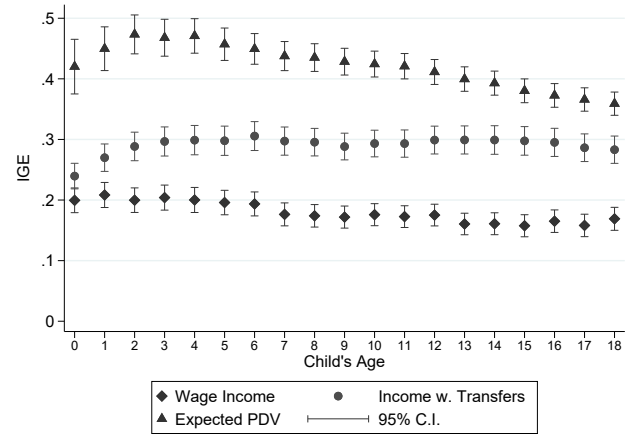
Figure G.5: Parents-Child IGE Estimates by Family Intactness, Children Measured at Ages 25–30



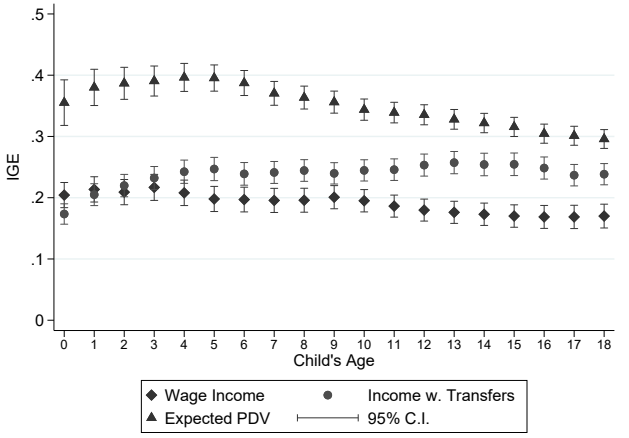
(a) Intact Family- Boys



(b) Intact Family- Girls



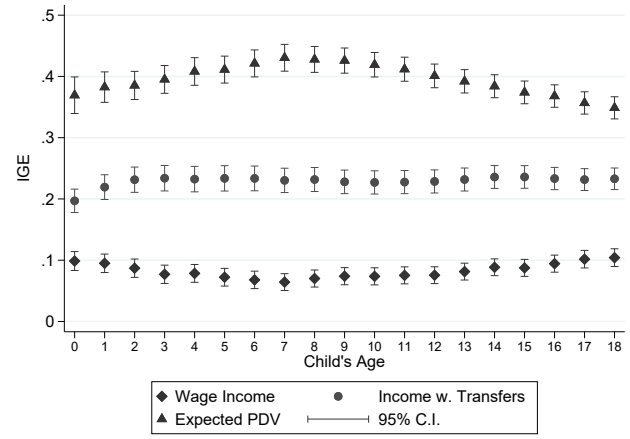
(c) Non-Intact Family- Boys



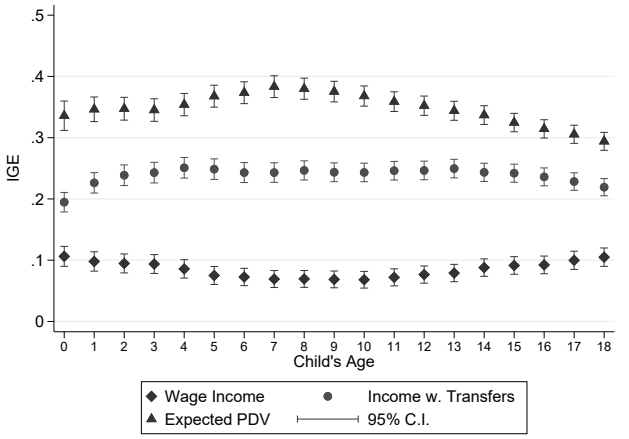
(d) Non-Intact Family- Girls

Notes: This figure plots the IGE for selected income variables. The child's income is measured at ages 25-30 and the parental income is measured at the household level at different child's ages. We include children from the 1981-1982 cohorts in these exercises. Panels (a) and (b) present the results for boys and girls growing up in intact families, respectively. Panel (c) and (d) present the results for boys and girls growing up in non-intact families, respectively. For each child, we consider a family as intact if the mother and the father were living together over the whole childhood stage (from age zero to 18 of the child).

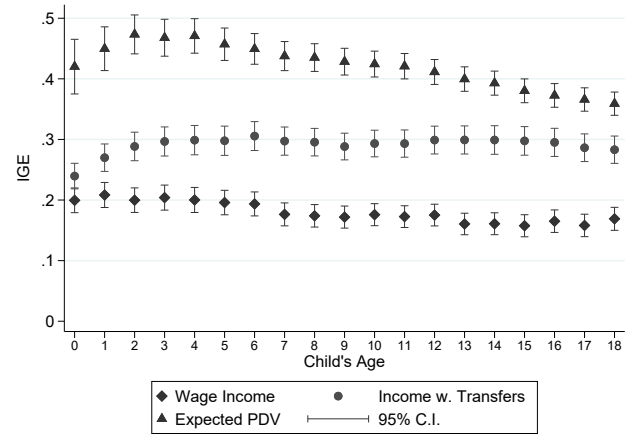
Figure G.6: Parents-Child IGE Estimates by Family Intactness, Children Measured at Ages 25–37



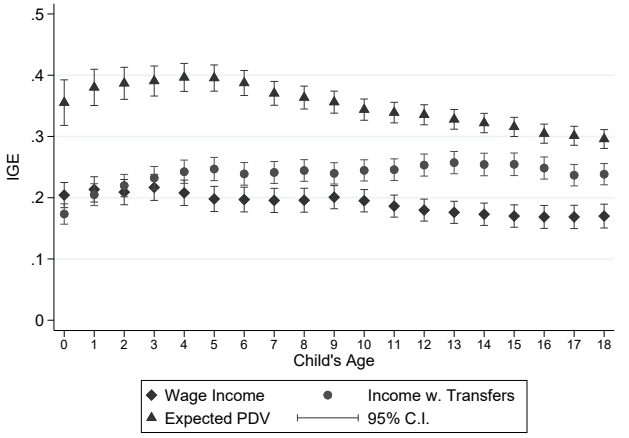
(a) Intact Family- Boys



(b) Intact Family- Girls



(c) Non-Intact Family- Boys

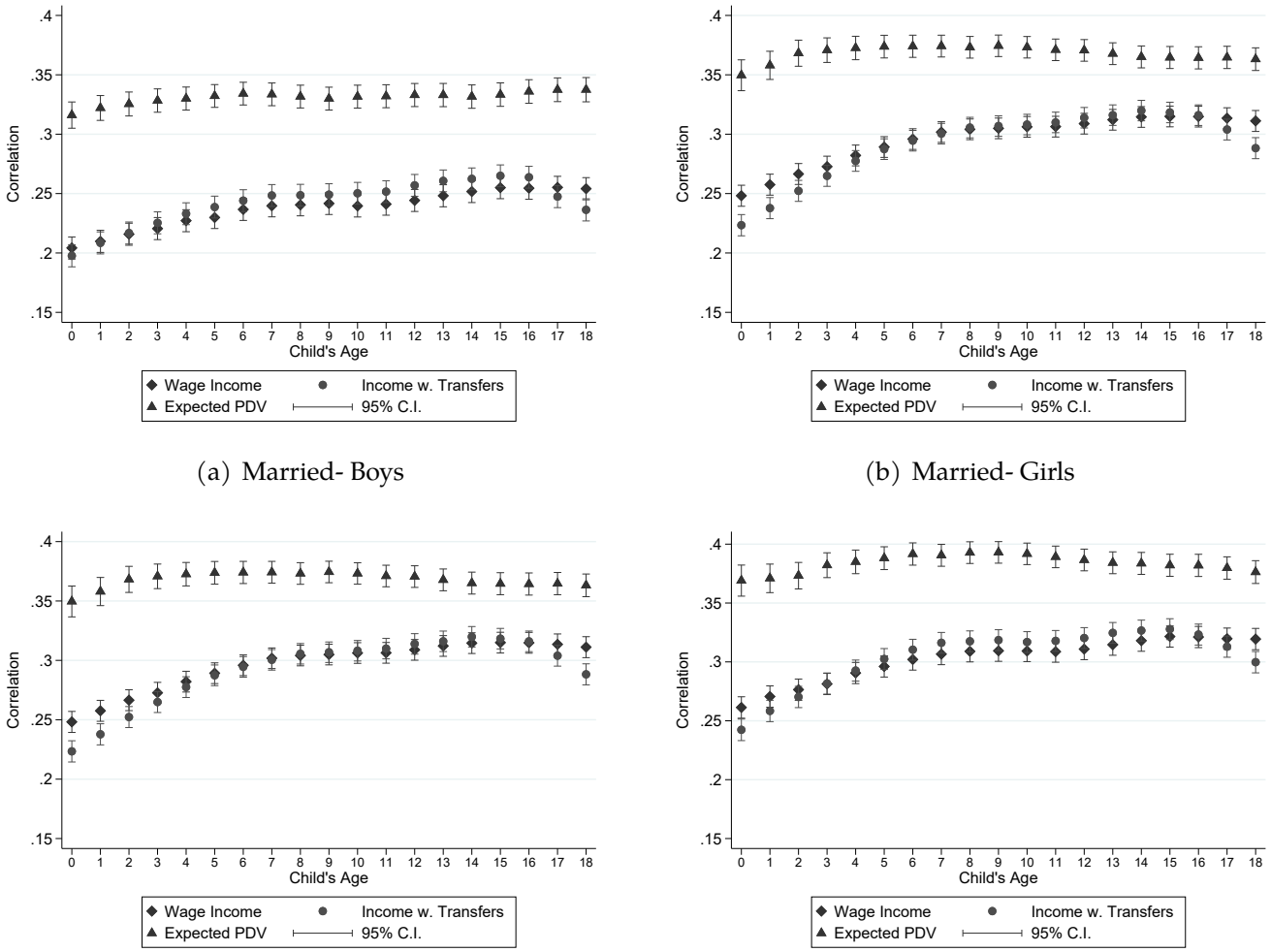


(d) Non-Intact Family- Girls

Notes: This figure plots the IGE for selected income variables. The child's income is measured at ages 25-37 and the parental income is measured at the household level at different child's ages. We include children from the 1981-1982 cohorts in these exercises. Panels (a) and (b) present the results for boys and girls growing up in intact families, respectively. Panel (c) and (d) present the results for boys and girls growing up in non-intact families, respectively. For each child, we consider a family as intact if the mother and the father were living together over the whole childhood stage (from age zero to 18 of the child).

G.1.3 Parental Marital Status at the Child's Birth

Figure G.7: Parents-Child IGE Estimates by Parents' Marital Status, Children Measured at Ages 25–30



(a) Married- Boys

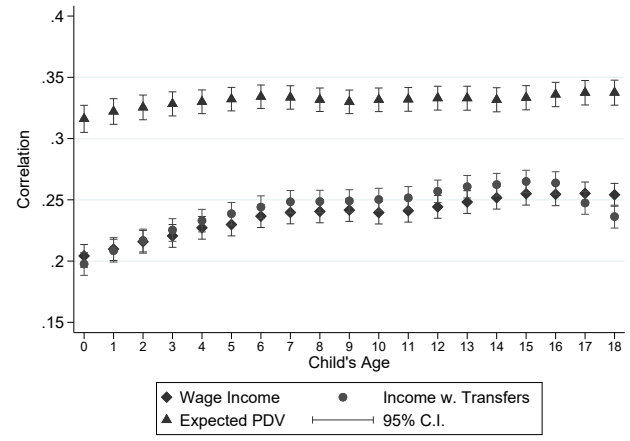
(b) Married- Girls

(c) Non-Married- Boys

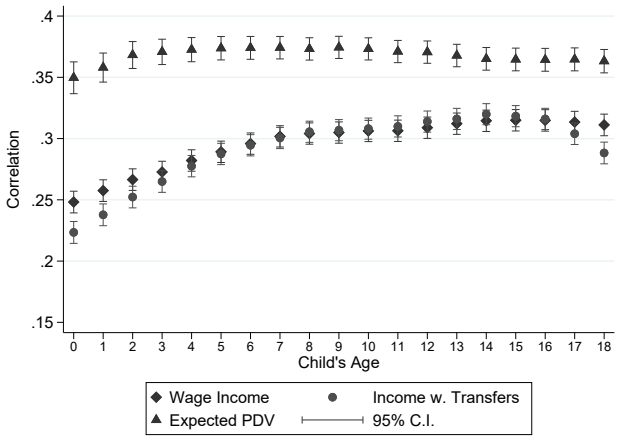
(d) Non-Married- Girls

Notes: This figure plots the IGE for selected income variables. The child's income is measured at ages 25-30 and the parental income is measured at the household level at different child's ages. We include children from the 1981-1982 cohorts in these exercises. Panels (a) and (b) present the results for boys and girls growing up in married families, respectively. Panel (c) and (d) present the results for boys and girls growing up in non-married families, respectively. For each child, we consider the family as married if the mother and the father were registered as married at the arrival of the child.

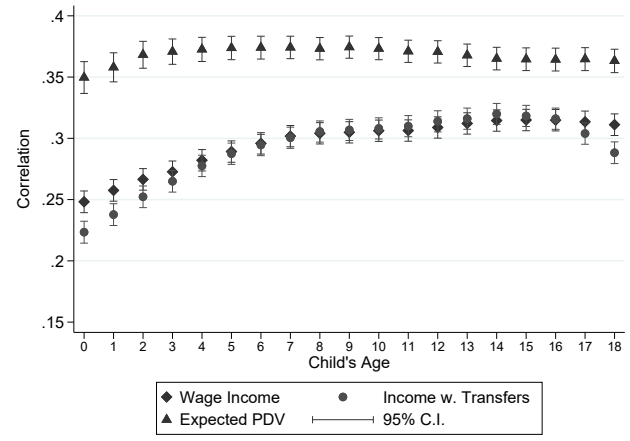
Figure G.8: Parents-Child IGE Estimates by Parents' Marital Status, Children Measured at Ages 25–37



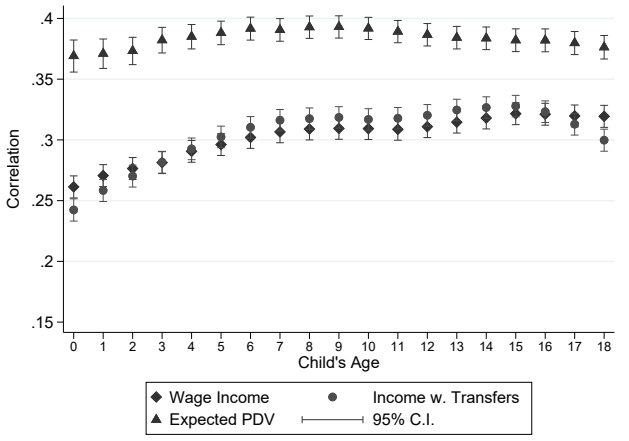
(a) Married- Boys



(b) Married- Girls



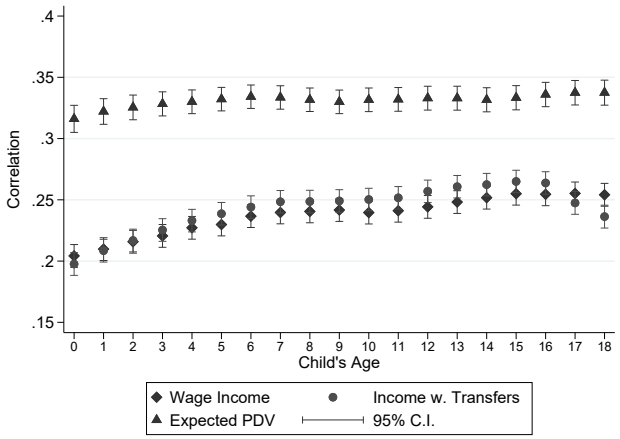
(c) Non-Married- Boys



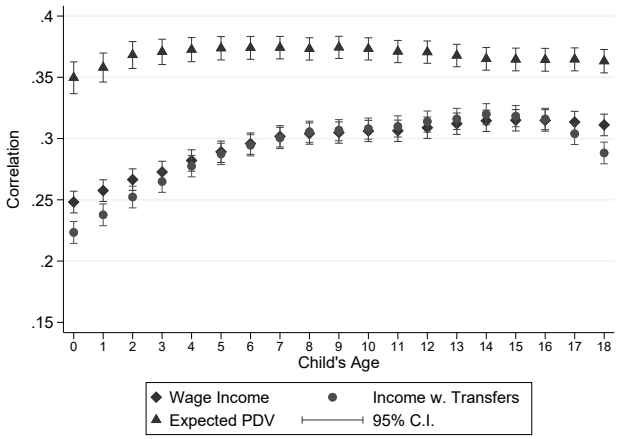
(d) Non-Married- Girls

Notes: This figure plots the IGE for selected income variables. The child's income is measured at ages 25-37 and the parental income is measured at the household level at different child's ages. We include children from the 1981-1982 cohorts in these exercises. Panels (a) and (b) present the results for boys and girls growing up in married families, respectively. Panel (c) and (d) present the results for boys and girls growing up in non-married families, respectively. For each child, we consider the family as married if the mother and the father were registered as married at the arrival of the child.

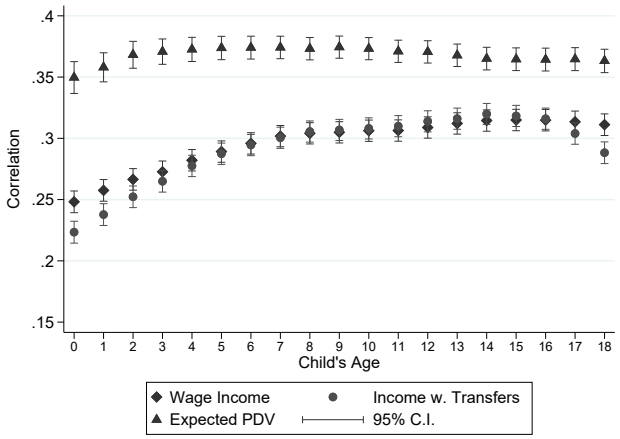
Figure G.9: Parents-Child IGE Estimates by Parents' Marital Status, Children Measured at Ages 30–35



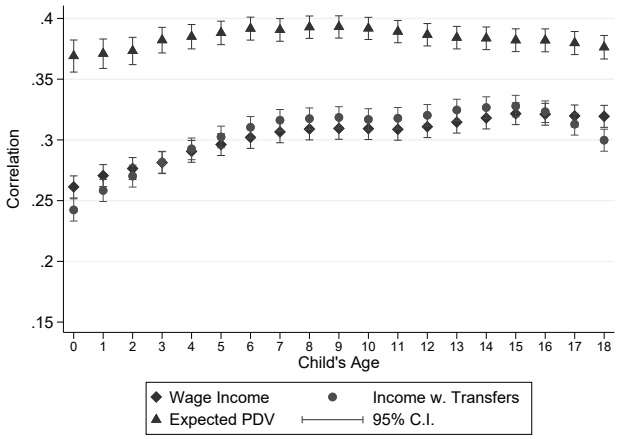
(a) Married- Boys



(b) Married- Girls



(c) Non-Married- Boys



(d) Non-Married- Girls

Notes: This figure plots the IGE for selected income variables. The child's income is measured at ages 30-35 and the parental income is measured at the household level at different child's ages. We include children from the 1981-1982 cohorts in these exercises. Panels (a) and (b) present the results for boys and girls growing up in married families, respectively. Panel (c) and (d) present the results for boys and girls growing up in non-married families, respectively. For each child, we consider the family as married if the mother and the father were registered as married at the arrival of the child.

H Tests for Equality of Correlations across Child Ages

This appendix explains how we test different hypotheses regarding the equality of the by-age correlations of parental income and child outcomes, pairwise and jointly. The notations are borrowed from Meng et al. (1992).

Note that the Fisher transformation of correlation r is $z_r = \frac{1}{2}ln(\frac{1+r}{1-r})$. To test for the equality of two age-specific correlations between parental income (X) and child outcome (Y), we use Fisher transformation as follows. Let X_i denote parental income at the child's age i. Let r_{Y,X_i} and $r_{Y,X_{i'}}$ denote correlation coefficients between the child's outcome (Y) and parental resources at ages i and i', respectively. Now, define:

$$Z = (z_{r_i} - z_{r_{i'}})\sqrt{\frac{N-3}{2(1-r_x)h}},$$

where N is the sample size (child-family pairs), z_{r_i} is the Fisher z-transformed of $r_i \equiv r_{Y,X_i}$, and r_x is the correlation between the two predictor variables, parental income at the two ages, X_i and $X_{i'}$ (i.e., $r_{X_i,X_{i'}}$),

$$h = \frac{1-f\overline{r^2}}{1-\overline{r^2}} = 1 + (1-f)\frac{\overline{r^2}}{1-\overline{r^2}} \tag{1}$$

$$f = \frac{1-r_x}{2(1-\overline{r^2})}, \tag{2}$$

and $\overline{r^2}$ is the mean of the r_i^2, i.e., $(r_i^2 + r_{i'}^2)/2$, and f should be set to 1 if $\frac{1-r_x}{2(1-\overline{r^2})} \geq 1$.

H.1 F-Test

To test for equality of the age-specific correlations jointly (for all ages from zero to 18 for example), we can use the following chi-squared test:

$$\chi^2(k-1) = \frac{(N-3)\Sigma_i(z_{r_i} - \overline{Z_r})^2}{(1-r_x)h},$$

where $\overline{Z_r}$ is the mean of the z_{r_i}. The χ^2 statistic is distributed on $k-1$ degrees of freedom where k is the number of predictive correlations (19 in the example above where we test for

all ages from zero to 18 simultaneously). In this equation, r_i takes on k values for different by-age correlations, so that in the definition of h given by Equation 1 and 2 above, r^2 is the average of all k values of r_i^2, and r_x is the median intercorrelation among all by-age predictors tested for equality (Meng et al. (1992)).

I Approximating The Skill Formation Technology

I.1 Summary Statistics

Table I.1 shows that parental expected PDVs are highly correlated across different intervals of childhood. Table I.2 presents the correlations across all children's ages from zero to 18. Figure I.1 presents the eigenvalues from principal components analyses of parents' expected PDV over the child's age intervals of $[0, 5]$, $[6, 11]$, $[12, 17]$, $[18, 23]$, and $[24, 29]$. Except for the first eigenvalue, other eigenvalues are close to zero.

Table I.1: Correlations Between Parents' Expected PDV across Intervals of Children's Ages

Child Ages	Child Ages $[0, 5]$	Child Ages $[6, 11]$	Child Ages $[12, 17]$	Child Ages$[18, 23]$
Child Ages $[6, 11]$	0.952			
Child Ages $[12, 17]$	0.926	0.962		
Child Ages $[18, 23]$	0.894	0.912	0.957	
Child Ages $[24, 29]$	0.847	0.847	0.897	0.949

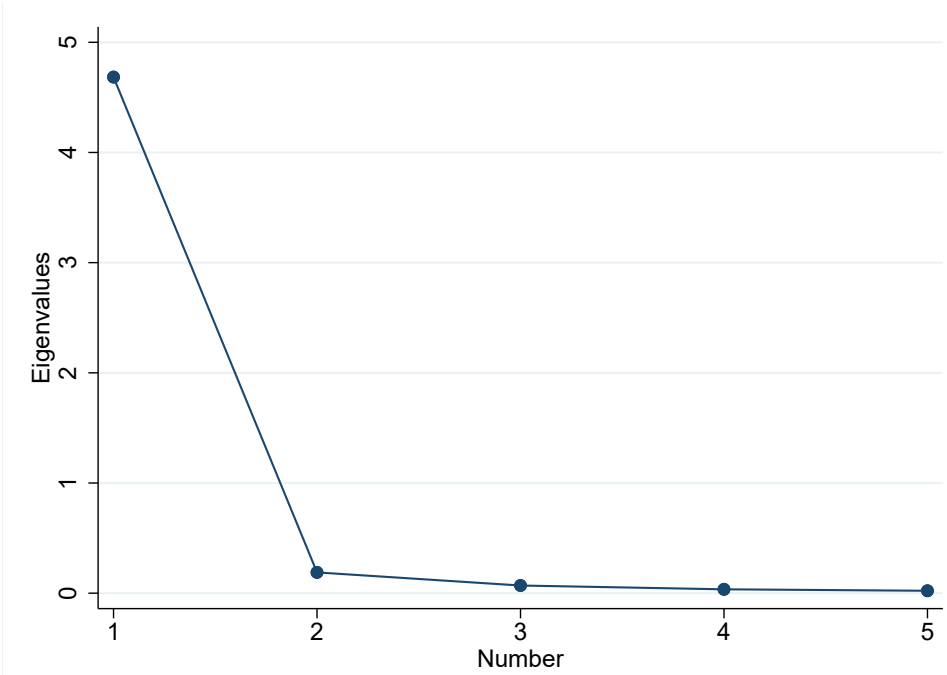
Notes: This table presents the correlations between parents' expected PDV across different intervals of child's ages, i.e., $[0, 5]$, $[6, 11]$, $[12, 17]$, $[18, 23]$, and $[24, 29]$. We include children from the 1981-1982 cohorts in Denmark and their parents.

Table I.2: Correlations Between Expected PDV across Children's Ages from 0 to 18

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Age 1 of the Child	.99																	
Age 2 of the Child	.98	.99																
Age 3 of the Child	.98	.98	.99															
Age 4 of the Child	.94	.96	.96	.96														
Age 5 of the Child	.94	.94	.94	.94	.96													
Age 6 of the Child	.94	.94	.94	.94	.95	.99												
Age 7 of the Child	.94	.94	.94	.94	.94	.98	.99											
Age 8 of the Child	.94	.94	.94	.94	.94	.98	.99	.99										
Age 9 of the Child	.94	.94	.93	.93	.93	.97	.98	.99	.99									
Age 10 of the Child	.94	.93	.93	.93	.93	.97	.98	.98	.99	.99								
Age 11 of the Child	.93	.93	.93	.93	.92	.96	.97	.98	.98	.99	.99							
Age 12 of the Child	.93	.93	.92	.92	.92	.96	.96	.97	.97	.98	.98	.99						
Age 13 of the Child	.93	.92	.92	.92	.91	.95	.96	.96	.97	.97	.98	.98	.99					
Age 14 of the Child	.92	.91	.91	.91	.90	.94	.95	.96	.96	.97	.97	.98	.98	.99				
Age 15 of the Child	.92	.91	.91	.90	.90	.94	.94	.95	.95	.96	.96	.97	.98	.99	.99			
Age 16 of the Child	.91	.91	.90	.90	.89	.93	.94	.94	.95	.95	.96	.96	.97	.98	.99	.99		
Age 17 of the Child	.91	.90	.90	.89	.88	.92	.93	.93	.94	.94	.95	.96	.96	.97	.98	.99	.99	
Age 18 of the Child	.90	.90	.89	.89	.88	.91	.92	.93	.93	.94	.94	.95	.96	.97	.97	.98	.99	.99

Notes: This table presents the serial correlations of parents' expected PDV by children's ages from zero to 18. We include children from the 1981-1982 cohorts in Denmark and their parents.

Figure I.1: Principal Component Analysis of Parental Expected PDV in Different Intervals- Eigenvalues



Notes: This figure plots the eigenvalues from principal components analyses of parents' expected PDV over the child's age intervals of $[0, 5]$, $[6, 11]$, $[12, 17]$, $[18, 23]$, and $[24, 29]$. We include children from the 1981-1982 cohorts in Denmark and their parents.

I.2 Estimates

Tables I.4-I.7 presents the estimation results for approximating the child's skill formation technology using equation (8) in the main paper, taking coeffic1079 ients $\boldsymbol{\alpha}_0'(t)$, $\boldsymbol{\alpha}_{1,i}'(t)$, and $\boldsymbol{\Psi}_{i,j}(t)$ to be constant within intervals.

Table I.4: Main Effects and Dynamic Complementarities of Parental Expected PDV at Different Childhood Intervals on Child's Language Score

	(1) Language test score (at age 11)	(2) Language test score (at age 11)
Parents' expected PDV at ages [0,5]	0.0516	0.119
	(0.0760)	(0.0831)
Parents' expected PDV at ages [0,5]- Squared	-0.000649	-0.000635
	(0.00103)	(0.00112)
Parents' expected PDV at ages [6,11]	0.0221	0.0129
	(0.0665)	(0.112)
Parents' expected PDV at ages [6,11]- Squared	-0.000693	0.000722
	(0.000901)	(0.00192)
Parents' expected PDV at ages [12,17]		-0.0458
		(0.0721)
Parents' expected PDV at ages [12,17]- Squared		0.000831
		(0.000922)
Dynamic Complementarity		
Parents' expected PDV at ages [0, 5] × [6, 11]	0.00125	0.000203
	(0.00186)	(0.00268)
Parents' expected PDV at ages [0, 5] × [12, 17]		0.000634
		(0.00183)
Parents' expected PDV at ages [6, 11] × [12, 17]		-0.00187
		(0.00229)
Constant	13.38***	12.06***
	(2.068)	(2.229)
Adjusted R^2	0.053	0.052
p_value	0.0318	0.0372

Standard errors in parentheses

$^{*}\ p < 0.10$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$

Note: This table shows the coefficients of the model defined in equation (8), taking coefficients $\boldsymbol{\alpha}_0'(t)$, $\boldsymbol{\alpha}_{1,i}'(t)$, and $\boldsymbol{\Psi}_{i,j}(t)$ to be constant within intervals. The $\boldsymbol{\alpha}_0'$ corresponds to the constant parameter in the model above. The $\boldsymbol{\alpha}_{1,i}'$ is the coefficient of interval i, while $\boldsymbol{\Psi}_{i,j}$ is the coefficient of the interaction between interval i and interval j. Expected PDV is expressed in units of $10,000\$$. In this table, $K(t+1)$ is taken to be the child's language test score. The first column contains all intervals until realization and their interactions. The second column contains all intervals in childhood (i.e., until age 17).

Table I.5: Main Effects and Dynamic Complementarities of Parental Expected PDV at Different Childhood Intervals on Child's Mathematics Test Score

	Mathematics Test Score at Age 16-17
Parents' expected PDV at ages [0, 5]	0.0278***
	(0.00228)
Parents' expected PDV at ages [0, 5]- Squared	-0.0000375
	(0.0000275)
Parents' expected PDV at ages [6, 11]	0.00688**
	(0.00313)
Parents' expected PDV at ages [6, 11]- Squared	-0.000207***
	(0.0000548)
Parents' expected PDV at ages [12, 17]	0.000924
	(0.00208)
Parents' expected PDV at ages [12, 17]- Squared	-0.000281***
	(0.0000237)
Dynamic Complementarity	
Parents' expected PDV at ages [0, 5] $\times$ [6, 11]	-0.0000851
	(0.0000695)
Parents' expected PDV at ages [0, 5] $\times$ [12, 17]	0.0000141
	(0.0000536)
Parents' expected PDV at ages [6, 11] $\times$ [12, 17]	0.000514***
	(0.0000638)
Constant	-2.963***
	(0.0578)
Adjusted R^2	0.131
p_value	0

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: This table shows the coefficients of the model defined in equation (8), taking coefficients $\boldsymbol{\alpha}_0'(t)$, $\boldsymbol{\alpha}_{1,i}'(t)$, and $\boldsymbol{\Psi}_{i,j}(t)$ to be constant within intervals. The $\boldsymbol{\alpha}_0'$ corresponds to the constant parameter in the model above. The $\boldsymbol{\alpha}_{1,i}'$ is the coefficient of interval i, while $\boldsymbol{\Psi}_{i,j}$ is the coefficient of the interaction between interval i and interval j. Expected PDV is expressed in units of $10,000$\$. In this table, $K(t+1)$ is taken to be the child's Mathematics test score, realized at age 16–17.

Table I.6: Main Effects and Dynamic Complementarities of Parental Expected PDV at Different Childhood Intervals on Child's Incarceration by 35

	(1) Whether incarcerated by age 35	(2) Whether incarcerated by age 35
Parents' expected PDV at ages [0, 5]	0.00180	0.000449
	(0.00259)	(0.00170)
Parents' expected PDV at ages [0, 5]- Squared	0.00000107	0.0000267
	(0.0000364)	(0.0000257)
Parents' expected PDV at ages [6, 11]	-0.00466	-0.00590***
	(0.00322)	(0.00224)
Parents' expected PDV at ages [6, 11]- Squared	0.000114*	0.000104**
	(0.0000592)	(0.0000443)
Parents' expected PDV at ages [12, 17]	-0.00518	0.000908
	(0.00351)	(0.00182)
Parents' expected PDV at ages [12, 17]- Squared	0.000162***	0.0000719***
	(0.0000627)	(0.0000245)
Parents' expected PDV at ages [18, 23]	0.00313	
	(0.00323)	
Parents' expected PDV at ages [18, 23]- Squared	0.0000343	
	(0.0000588)	
Parents' expected PDV at ages [24, 29]	-0.000115	
	(0.00246)	
Parents' expected PDV at ages [24, 29]- Squared	0.0000896***	
	(0.0000342)	
Dynamic Complementarity		
Parents' expected PDV at ages [0, 5] × [6, 11]	-0.0000590	-0.0000514
	(0.0000783)	(0.0000585)
Parents' expected PDV at ages [0, 5] × [12, 17]	0.0000766	-0.00000281
	(0.0000895)	(0.0000467)
Parents' expected PDV at ages [0, 5] × [18, 23]	-0.0000425	
	(0.0000871)	
Parents' expected PDV at ages [0, 5] × [24, 29]	0.0000138	
	(0.0000669)	

Parents' expected PDV at ages [6, 11] × [12, 17]	-0.000202*	-0.000140**
	(0.000107)	(0.0000563)
Parents' expected PDV at ages [6, 11] × [18, 23]	-0.0000318	
	(0.000108)	
Parents' expected PDV at ages [6, 11] × [24, 29]	0.0000941	
	(0.0000862)	
Parents' expected PDV at ages [12, 17] × [18, 23]	0.00000388	
	(0.000106)	
Parents' expected PDV at ages [12, 17] × [24, 29]	-0.000193**	
	(0.0000921)	
Parents' expected PDV at ages [18, 23] × [24, 29]	-0.0000476	
	(0.0000754)	
Constant	0.775***	0.737***
	(0.0688)	(0.0447)
Adjusted R^2	0.019	0.019
p_value	0	0

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: This table shows the coefficients of the model defined in equation (8), taking coefficients $\boldsymbol{\alpha}_0'(t)$, $\boldsymbol{\alpha}_{1,i}'(t)$, and $\boldsymbol{\Psi}_{i,j}(t)$ to be constant within intervals. The $\boldsymbol{\alpha}_0'$ corresponds to the constant parameter in the model above. The $\boldsymbol{\alpha}_{1,i}'$ is the coefficient of interval i, while $\boldsymbol{\Psi}_{i,j}$ is the coefficient of the interaction between interval i and interval j. Expected PDV is expressed in units of $10,000$\$. In this table, $K(t+1)$ is taken to be whether the child is incarcerated by the age of 35, realized at age 35. The first column contains all intervals until realization and their interactions (intervals 1–5). The second column contains all intervals in childhood (i.e., until age 17).

Table I.7: Main Effects and Dynamic Complementarities of Parental Expected PDV at Different Childhood Intervals on Child's Years of Schooling

	(1) Years of education by age 30	(2) Years of education by age 30
Parents' expected PDV at ages [0, 5]	0.0109	-0.0109
	(0.0124)	(0.00826)
Parents' expected PDV at ages [0, 5]- Squared	-0.0000110	0.000124
	(0.000175)	(0.000125)
Parents' expected PDV at ages [6, 11]	0.00711	0.0516***
	(0.0154)	(0.0109)
Parents' expected PDV at ages [6, 11]- Squared	-0.000646**	-0.000373*
	(0.000282)	(0.000215)
Parents' expected PDV at ages [12, 17]	0.0775***	0.0287***
	(0.0167)	(0.00887)
Parents' expected PDV at ages [12, 17]- Squared	-0.00104***	-0.000386***
	(0.000299)	(0.000119)
Parents' expected PDV at ages [18, 23]	-0.0101	
	(0.0154)	
Parents' expected PDV at ages [18, 23]- Squared	-0.00153***	
	(0.000280)	
Parents' expected PDV at ages [24, 29]	-0.00973	
	(0.0118)	
Parents' expected PDV at ages [24, 29]- Squared	-0.00105***	
	(0.000163)	
Dynamic Complementarity		
Parents' expected PDV at ages [0, 5] × [6, 11]	0.000633*	-0.0000558
	(0.000373)	(0.000284)
Parents' expected PDV at ages [0, 5] × [12, 17]	-0.00162***	-0.000116
	(0.000428)	(0.000227)
Parents' expected PDV at ages [0, 5] × [18, 23]	0.000792*	
	(0.000416)	
Parents' expected PDV at ages [0, 5] × [24, 29]	0.000182	
	(0.000321)	

Parents' expected PDV at ages [6, 11] × [12, 17]	0.00170***	0.000656**
	(0.000511)	(0.000273)
Parents' expected PDV at ages [6, 11] × [18, 23]	-0.000876*	
	(0.000514)	
Parents' expected PDV at ages [6, 11] × [24, 29]	-0.0000699	
	(0.000412)	
Parents' expected PDV at ages [12, 17] × [18, 23]	0.00167***	
	(0.000507)	
Parents' expected PDV at ages [12, 17] × [24, 29]	-0.000105	
	(0.000440)	
Parents' expected PDV at ages [18, 23] × [24, 29]	0.00179***	
	(0.000359)	
Constant	8.926***	9.393***
	(0.329)	(0.217)
Adjusted R^2	0.124	0.126
p_value	0	0

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: This table shows the coefficients of the model defined in equation (8), taking coefficients $\boldsymbol{\alpha}_0'(t)$, $\boldsymbol{\alpha}_{1,i}'(t)$, and $\boldsymbol{\Psi}_{i,j}(t)$ to be constant within intervals. The $\boldsymbol{\alpha}_0'$ corresponds to the constant parameter in the model above. The $\boldsymbol{\alpha}_{1,i}'$ is the coefficient of interval i, while $\boldsymbol{\Psi}_{i,j}$ is the coefficient of the interaction between interval i and interval j. Expected PDV is expressed in units of $10,000$\$. In this table, $K(t+1)$ is taken to be the child's total years of completed education, realized at age 35. The first column contains all intervals until realization and their interactions (intervals 1–5). The second column contains all intervals in childhood (i.e., until age 17).

References

Meng, X.-L., R. Rosenthal, and D. B. Rubin (1992). Comparing correlated correlation coefficients. *Psychological bulletin 111*(1), 172.