Welfare Programs and the Time Allocation, Savings, and Child Quality of Single-Mother Families

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Abstract

The paper investigates the effects of U.S. welfare programs on the labor supply, childcare investment, welfare use, and savings behaviors of single mothers. It also explores how these behaviors affect human capital accumulation for mothers and development outcomes for their children in the long run. To understand the mechanisms behind these behavioral responses and their long-run impacts on human capital development, I develop and estimate a lifecycle model in which single mothers make decisions on labor supply, savings, welfare use, and childcare investment, under the detailed rules of Temporary Assistance for Needy Families, the Supplemental Nutrition Assistance Program, and the Earned Income Tax Credit. Using data from the Panel Study of Income Dynamics and its Child Development Supplement, the model is estimated to replicate observed life-cycle patterns in employment, welfare use, wealth accumulation, and child development. Moreover, counterfactual analysis is conducted to evaluate the welfare effects of the program. Extending the TANF lifetime limit increases welfare participation and children skill accumulation, but reduces single mothers' labor supply and retirement security. The results highlight the dynamic trade-offs between program generosity, work incentives, and family well-being in the design of welfare policy.

JEL classification: D15, H53, I31, J13, J22, J24
Keywords: Female labor supply; life cycle; welfare reform, time use; child investment

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1 Introduction

In the United States, welfare programs serve as a crucial safety net for low-income households. Single-mother families, constituting approximately 60 percent of families with children living in poverty in the United States, are the primary recipients and targets of welfare programs. In the 1990s, the noteworthy innovation of the Personal Responsibility and Work Opportunity Reconciliation Act of 1996 (PRWORA) introduced time limits on welfare benefits and reduced implicit work disincentives embedded in the preceding program, the Aid to Families with Dependent Children (AFDC). Unlike AFDC, which granted entitlements to all poor, single-parent families with children under 18, the current Temporary Assistance for Needy Families (TANF) program imposes strict limits on the duration of welfare receipt – no more than five years under the Federal law.[1] Concurrently, the expansion of the Earned income Tax Credit (EITC) aimed to increase work incentives among targeted beneficiaries, signaling a shift in policy focus towards promoting work over dependence on welfare. Nevertheless, these work incentives can lead to unintended consequences, affecting household decisions related to work, childcare investment, savings, and welfare use – decisions that have far-reaching implications on the development outcomes of children and the accumulation of parental human capital.

Importantly, not all families have the privilege to increase their labor force participation. Single mothers, in particular, face significant challenges in time and budget constraints compared to married couples (Bruins (2017)). These limitations place them at a disadvantage, affecting not only their labor market behaviors but also the crucial development of their children. When policy reforms reduce their access to welfare benefits, it could push them towards increased labor supply, potentially sacrificing quality childcare time—an essential factor for long-term child development (Del Boca et al. (2014a), Mullins (2019), and Bolt et al. (2023)). On the flip side, working less could impeded mothers' human capital accumulation, affecting future earnings and financial security. This could make them less secure during retirement and more dependent on anti-poverty programs. Consequently, understanding the tradeoff between incentives and insurance for such welfare programs and their broader effects in both the short run and the long run is a central motivation of this research.

To that end, this paper develops and estimates a dynamic life-cycle model of single mothers to investigate how welfare programs affect decisions about work, welfare participation, savings, and investment in children, and how these choices affect the human-capital accumulation of both mothers and children. In the model, mothers allocate time between

[1] States can exempt up to 20 percent of their caseload from the five-year time limit.

market work and childcare, and decide how much to save and whether to participate in welfare programs. Children's skills evolve through a production function that combines parental time and monetary inputs. The childcare investment determine children's development outcomes through a skill production function. The skill level at maturity evolves over multiple periods, combining current skills with investments to determine future skills. Mothers accumulate human capital through work experience, which further affects their future earnings and retirement wealth. The framework incorporates the institutional details of TANF, SNAP, and the EITC, including time limits, income and asset tests, and work requirements, thereby linking policy design to household decision-making across the life cycle.

The model is estimated using post-reform data from the Panel Study of Income Dynamics (PSID) and its Child Development Supplement (CDS). The data document large and persistent differences between single- and two-parent families: single mothers work more hours but earn lower wages, save less, and invest fewer resources in children, whose cognitive test scores and educational attainment remain significantly lower. The estimated model reproduces these patterns and provides a framework to interpret how welfare policies generate such disparities through their effects on work incentives, liquidity, and time allocation.

I use the model to conduct a series of policy counterfactuals that evaluate how alternative welfare designs affect mothers' behavior and child outcomes. Removing TANF's lifetime limit increases program participation and reduces labor supply during the childrearing years. Correspondingly, mothers accumulate less human capital and lifetime earnings by the timing of retirement, reflecting greater reliance on public support at older ages. However, it enhances childcare investment. The additional time in the program allows mothers to make more consistent investments in children, resulting in improved skill accumulation and college attainment potential. These findings highlight the dynamic trade-offs inherent in welfare policy—between promoting work and fostering long-run human-capital growth. Further policy experiment considers tightening time limits or income tests raises, increasing EITC generosity, and relaxing income and asset thresholds of the programs.

The paper is extending the model to incorporate heterogeneity in education, cognitive and noncognitive skills, and family size. These extensions capture variation in earnings potential, parenting productivity, and the division of time and financial resources among children. Accounting for these dimensions of heterogeneity provides a richer understanding of how welfare reforms affect families with different characteristics and how policy can be better targeted to support both economic security and human capital outcomes.

This paper builds on an extensive body of research on welfare programs, household decision-making, and human capital development, contributing to this literature in two main ways. First, it unifies two strands of literature: the dynamic welfare and labor-supply literature, which studies short-term behavioral responses to policy incentives, and the human-capital and child-development literature, which focuses on the long-run evolution of skills within families. Second, this paper explores the interaction between major welfare and tax-transfer programs—TANF, Food Stamps (SNAP), and the EITC. The model framwork analyze welfare effects on single mothers' labor supply, savings, welfare use, and childcare choices, while allowing these behavioral changes to feed into children's development outcomes and mother's human capital accumulation, and ultimately, mothers' retirement outcomes through lifetime earnings. By linking welfare-induced behavioral responses to both maternal and child outcomes, the paper offers new insights into how policy design affects family decision-making and welfare.

This paper contributes to a growing literature that links welfare policy, parental labor supply, and children human capital formation. Existing studies have provided valuable insights into how parental time and financial resources shape children's development and how welfare reforms influence maternal labor supply and family behavior. Yet, these strands of research have largely evolved separately.

A substantial literature emphasizes the importance of early parental investments for child development. Foundational work by Carneiro and Heckman (2003) and Cunha and Heckman (2007) highlights the dynamic complementarity between early and later-life investments, showing that time and cognitive engagement during early childhood are critical inputs into later skill accumulation. Del Boca et al. (2014b) develop a structural model of parental labor supply, time allocation, and child skill formation, demonstrating that parental time is more productive than monetary spending in fostering cognitive outcomes. Caucutt et al. (2025) extends this framework by incorporating both parental and market-based investments, revealing that these inputs can act as substitutes or complements depending on the child's age and the nature of the activity. Recent research broadens this perspective to include heterogeneity in family structure and parental characteristics, such as Chan and Liu (2024), Blandin and Herrington (2022), and Attanasio et al. (2020). The broader literature underscores that inequality in children's human capital accumulation reflects differences in both parental resources and the public policy environment (Heckman and Mosso (2014)).

Parallel work on welfare reform and labor supply focuses on how policy incentives shape female employment and family wellbeing. Moffitt (2002) and Blundell et al. (2016) show

that reforms to welfare and tax credit systems substantially affect women's labor supply, with especially strong responses among single mothers. The 1996 U.S. welfare reform that introduced work requirements and time limits increased labor supply among low-income and single mothers (Grogger, 2001; Chyi et al., 2022), but also reduced benefit participation and consumption smoothing, often to the detriment of the most disadvantaged families. Empirical evidence on child outcomes of these reforms is mixed. Herbst (2018) finds that TANF work requirements raise maternal employment but lower early cognitive test scores in children. Similarly, Agostinelli and Sorrenti (2022) show that expansions of the EITC can generate short-run trade-offs between maternal time and child development, where the substitution effect of maternal employment offsets income gains. In contrast, Lochner and Bastian (2020) find that while EITC-driven employment reduces mothers' non-investment time, it does not reduce developmental engagement with children.

A complementary body of research examines the long-term consequences of children's exposure to social safety net programs. Hoynes and Schanzenbach (2018) and McInnis et al. (2023) provide evidence that access to programs such as SNAP and the EITC in childhood leads to higher earnings and lower poverty rates in adulthood. Moschini and Tran-Xuan (2023) and Aizer et al. (2024) show that expansions in childcare subsidies and tax credits enhance child skill accumulation, though welfare gains materialize over long horizons. Albanesi et al. (2022) show that family-friendly policies, especially subsidized childcare, increase women's labor-market participation and improve children's wellbeing. Moreover, Goldin et al. (2024) discuss that generous firm-provided paid parental leave and workplace supports significantly reduce the "motherhood penalty," improving long-term female labor-market outcomes.

My paper integrates these competing welfare and time-allocation mechanisms into a unified life-cycle framework. Low et al. (2020) specify a life-cycle model of family formation and dissolution, welfare program participation, labor supply and savings to analyze the welfare programs impact. A closely related study, Mullins (2025), develops a dynamic model of single mothers' labor supply, welfare participation, and parental investments to design optimal cash transfers when child human capital effects are internalized. My paper complements it by modeling the joint evolution of mothers' and children's human capital within a single dynamic structure, capturing how policy changes work through across the lifecycle through behavioral responses in savings, work effort, and parental investment decisions. This distinction shifts the focus from the design of optimal transfers to understanding the behavioral and long-run consequences of existing welfare policies.

The rest of the paper proceeds as follows. Section 2 describes the institutional back-

ground of TANF, SNAP, and the EITC. Section 3 presents the data and key empirical facts motivating the analysis. Section 4 develops the dynamic life-cycle model, and Section 5 describes its estimation. Section 6 presents the counterfactual experiments and policy implications, and Section 7 discusses extensions of the framework. Section 8 concludes.

2 Background: Welfare and Tax Programs

Temporary Assistance for Needy Families (TANF), Supplemental Nutrition Assistance Program (SNAP), and the Earned Income Tax Credit (EITC) form the core of the post-reform U.S. safety net for single-mother families.

2.1 Welfare Program Reform

The 1996 Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA) fundamentally restructured cash assistance in the United States. The Aid to Families with Dependent Children (AFDC) program, created by the Social Security Act of 1935, had provided open-ended federal matching grants to states to assist families with children deprived of parental support due to absence, death, or incapacity. AFDC served as the principal income-support program for female-headed households for over six decades (e.g., Chan (2013).

PRWORA replaced AFDC with Temporary Assistance for Needy Families (TANF), marking a fundamental shift in U.S. welfare policy. The reform embedded a "work-first" philosophy. Key provisions included a federal lifetime limit of 60 months of federally funded assistance (states may shorten or extend it using state funds) and mandatory work participation, at least half of TANF families must engage in employment, job search, or training activities, usually 20–30 hours per week. TANF thus shifted the emphasis from income maintenance to employment. Table 1 shows the implementation of time limit across states. As shown by Low et al. (2022), reductions in cash support were particularly pronounced among mothers with younger children, for whom meeting work requirements was more challenging.

2.2 Supplemental Nutrition Assistance Program

The Supplemental Nutrition Assistance Program (SNAP), formerly the Food Stamp Program, provides in-kind assistance to low-income households through electronic benefit

Table 1: TANF Policy: Time Limits and Implemented Year in Each State

State	Begin	Type of Limit	Month	State	Begin	Type of Limit	Month
Alabama	1996	Lifetime	60	Montana*	1995	Lifetime	60
Alaska	1997	Lifetime	60	Nebraska*	1996	Lifetime	60
Arizona*	1996/2002	Periodic/Lifetime	60	Nevada*	1997	Lifetime	60
Arkansas	1997	Lifetime	24	New Hampshire	1996	Lifetime	60
California*	1998	Benefit Reduction		New Jersey	1997	Lifetime	60
Colorado	1997	Lifetime	60	New Mexico*	1997	Lifetime	60
Connecticut	1996	Lifetime	21	New York	1996	Lifetime	60
Delaware*	1995/2000	Lifetime	60/36	North Carolina	1997	Lifetime	60
D.C.*	1997	Lifetime	60	North Dakota*	1997	Lifetime	60
Florida	1996	Lifetime	48	Ohio*	1997	Lifetime	60
Georgia	1997	Lifetime	48	Oklahoma*	1997	Lifetime	60
Hawaii	1997	Lifetime	60	Oregon	1996	Periodic Limit	
Idaho	1997	Lifetime	24	Pennsylvania	1997	Lifetime	60
Illinois	1997	Lifetime	60	Rhode Island	1997	Benefit Reduction Limit	
Indiana*	1996/2002	Benefit Reduction/Lifetime	60	South Carolina*	1996	Lifetime	60
Iowa	1997	Lifetime	60	South Dakota*	1996	Lifetime	60
Kansas	1996	Lifetime	60	Tennessee	1996	Lifetime	60
Kentucky	1996	Lifetime	60	Texas*	1996	Lifetime	60
Louisiana	1997	Lifetime	60	Utah	1997	Lifetime	36
Maine	1996	No Limits		Vermont	1996	No Limits	
Maryland*	1997	Lifetime	60	Virginia	1997	Lifetime	60
Massachusetts	1997	No Limits		Washington*	1997	Lifetime	60
Michigan	1996	No Limits		West Virginia	1997	Lifetime	60
Minnesota	1997	Lifetime	60	Wisconsin*	1996	No Limits	
Mississippi	1996	Lifetime	60	Wyoming	1997	Lifetime	60
Missouri	1996	Lifetime	60				

Note: The year when the time limit was implemented may differ from when the policy officially began. States marked with an asterisk (*) indicate those that changed their time limit policies between 1997 and 2007; in some cases, the revised policy was applied retroactively to earlier years. States with a Periodic Limit Program of x/y months provide benefits for up to x months within any y-month period.
Source: Welfare Rules Database Project , author's calculations.

transfers that can be used to purchase food. Eligibility is primarily based on household income and assets relative to the federal poverty guidelines.

It remained largely intact under PRWORA but gradually incorporated similar work-oriented features. Unlike TANF, SNAP is a federal entitlement, meaning all eligible households can receive benefits regardless of state budget conditions. States administer the program within federal guidelines, leading to limited but notable variation in administration and work-related requirements.

For single-mother families, SNAP serves as a vital supplement to low wages and intermittent employment. While benefit levels decline as earnings rise, the implicit phase-out rate is less steep than for TANF, making SNAP more persistent among working mothers. Non-compliance with work requirements, such as the 20-hour weekly rule for able-bodied adults without dependents (ABAWDs), may lead to temporary sanctions or time-limited benefits, but single mothers with dependent children are typically exempt from these ABAWD restrictions. Consequently, SNAP functions as an ongoing supplement for low-income working families and for those transitioning off TANF (see Bitler et al. 2017).

2.3 Earned Income Tax Credit

Complementing the shift from unconditional welfare to work-based support, the Earned Income Tax Credit (EITC) expanded dramatically during the 1990s as the principal income-support mechanism for low-income working families. The EITC is a refundable tax credit that increases with earned income up to a threshold, remains constant over a plateau region, and then phases out as income rises further.

Unlike TANF and SNAP, the EITC does not impose asset tests or work-hour mandates, but eligibility and benefit size depend strictly on earned income reported through the tax system. Credit generosity depends heavily on the number of qualifying children and marital status. Because the credit is delivered through the tax system, it supplements earnings rather than replacing them, thereby encouraging labor-force participation among single mothers transitioning off welfare. Empirical evidence shows that expansions of the credit during the 1990s substantially increased labor-force participation among single mothers (Eissa and Liebman 1996; Meyer and Rosenbaum 2001).

3 Data and Empirical Facts

This section provides empirical evidence of single-mother families in comparison to married-couple families, documenting key patterns in labor supply, welfare participation, childcare investment, and children's development that motivate the structure of the model.

3.1 Data

My empirical analysis relies on datasets including the Current Population Survey (CPS), the Panel Survey of Income Dynamics (PSID) along with its Child Development Supplement (CDS) and Transition into Adulthood Supplement (TAS). Together, these datasets provide rich longitudinal information on mothers' labor supply, earnings, program participation, household assets, childcare investments, and children's development outcomes.

The CPS is one of the oldest, largest, and most well-recognized surveys in the United States. It is immensely important for providing information on employment, earnings, and welfare program receipts over time. It is used to document national trends in mothers' labor force participation and welfare program use around the 1996 reform.

The PSID is a nationally representative household panel survey initiated in 1968, providing economic, social, and demographic information. It provides panels tracking working

status, earnings, wealth, and program participation for mothers of children in the CDS. The CDS collected surveys in 1997, 2002, and 2007 from a random sample of PSID households with children between the ages of 0 and 12 in 1997. Approximately 3,500 children aged 0-12, residing in 2,400 households, were interviewed in 1997 and followed through two subsequent waves. The dataset contains information on child development and family dynamics, including parental time-use diaries, expenditure on children, and children's cognitive achievements. The TAS follows CDS children into adolescence and early adulthood, providing information on high school completion, college attendance, and early labor market outcomes. Linking CDS cognitive measures to TAS outcomes allows for interpreting early skill indicators in terms of meaningful long-run educational benchmarks.

Childcare Investment and Development Outcomes The time-use diary in the CDS collects detailed information about child activities on a randomly selected weekday and weekend day. Each child, with the assistance of a primary caregiver if needed, fills out a detailed 24-hour time diary, recording all activities throughout the day and who else participated with the child in these activities.

To quantify time investment in childcare, I calculate a weighted sum of the total hours devoted to activities in which the mother actively participated. Monetary investment is calculated by summing up total expenditure on children, including items such as food, toys, vacation, school supplies, clothing, sporting activities, lessons, participation in community groups, tutoring, and private school tuition.

Children's cognitive achievement are measured using the Woodcock-Johnson Achievement Test. In 1997, children aged 3-5 underwent the Letter-Word Identification and Applied Problem sub-tests, while those aged six and above underwent Letter-Word and Passage Comprehension sub-tests, along with the Applied Problems and Calculation sub-tests. In the second wave, these tests were re-administered, except for the Calculation sub-test. I use the data on the Letter Word (LW), Applied Problems (AP), and Passage Comprehension (PC) as the measure of children's development outcomes.

Table 2 outlines the construction of the PSID–CDS linked sample, including restrictions on children's test score availability, parental identification, and mothers' age ranges. The final analytic sample contains over 1,400 single mothers observed across roughly 26,000 mother–year observations, and more than 3,100 children observed in time diaries, cognitive assessments, and household demographic files. These datasets allow the model to capture detailed information on labor supply, earnings, assets, welfare participation, childcare expenditures, and child skill development over time.

Table 2: PSID-CDS and PSID Sample Selection

PSID-CDS Sample Selection	Children	
Combined Time Diary, Child Assessment, and PCG files (all CDS waves)	3,564	
Drop if mother's active time is missing in all CDS waves	3,330	
Drop if no test scores available in all CDS waves	3,153	
Drop if parent ID missing	3,117	
PSID-CDS children and mothers	Children	Mothers
Matched children and mothers	3,117	2,143
Drop if no biological mother appear in PCG/OCG in all CDS waves	2,994	2,056
Drop if mother has more than two children	2,988	2,054
PSID Sample Selection	Mothers	Observations
PSID-CDS Moms linked to PSID main file	2,050	79,950
Female heads or wives	2,013	33,521
Ages at childbirth between 22–40	1,418	25,935
Ages between 20–65	1,417	25,629

Sources: Panel Study of Income Dynamics and Child Development Supplement, authors' calculations.

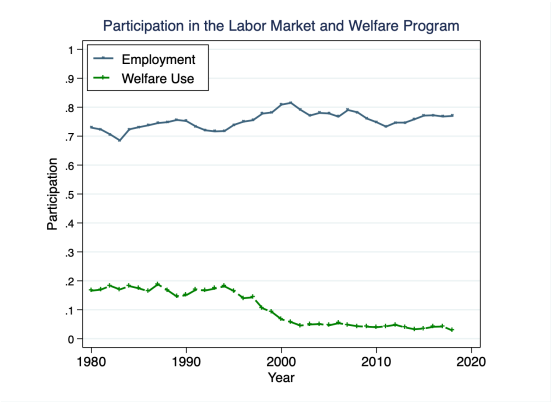
3.2 Facts

The datasets reveal several noteworthy patterns that motivate research questions and the model framework.

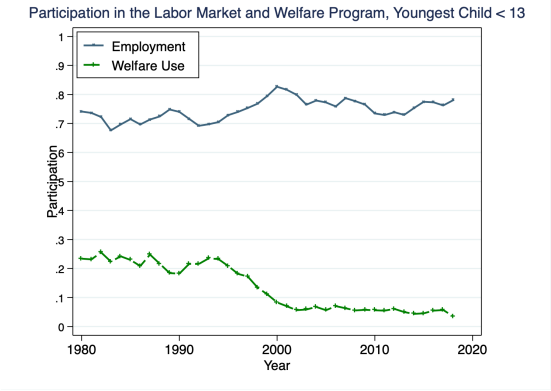
Labor Supply and Welfare Participation First, the implementation of time limit resulting from welfare reform has has a significant impact on the labor force participation and welfare claims of single mothers. As illustrated in Figure 12, there is a distinct increase in employment rates and a decline in welfare claims post-reform. Notably, these changes primarily stem from mothers with household children under the age of 13, reflecting that this is group was affected by the time limit the most (Low et al. (2022)).

Economic Disparities Between Single and Married Mothers Furthermore, single-mother families face disadvantages compared to families with married couples in both the labor market and their child's development. Table 3 summarizes the demographic characteristics of mothers and children in the CDS sample, separately for ever-single mothers and married mothers. The table shows that single mothers tend to have lower education and accumulate substantially less wealth by the age 50, indicating large gaps in long-run

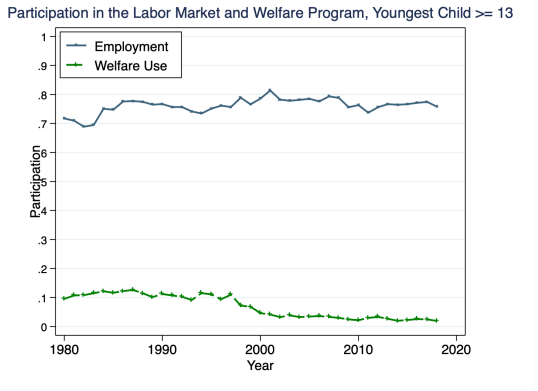
Figure 1: Trends in Labor Force Participation and Welfare Program Participation of Single Mothers



(a) Single Mothers



(b) Single Mothers with a child $\leq$ 13 years old



(c) Single Mothers with a child $>$ 13 years old

Data Source: Current Population Survey, author's calculations.

financial security. On the child side, children of single mothers are more likely to be Black, are less likely to have completed high school or attended college by age 20, and are more likely to have spent time in the care of grandparents.

Table 4 presents summary statistics comparing single-mother and married-couple families along key dimensions of time use, childcare investments, child development outcomes, household income, mothers' labor supply, and program participation. It shows that single mothers work more hours but earn lower wages, have lower household income and wealth, rely more heavily on public assistance, and invest less time and money in their children. Children in single-mother families receive fewer weekly hours of active time with their mothers and significantly less time with fathers, while also receiving lower monetary investments in goods and activities. These input differences are reflected in children's cognitive outcomes: single mothers' children score consistently lower on the Letter Word, Applied Problems, and Passage Comprehension assessments.

Together, Table 3 and Table 4 illustrate persistent differences in resources, time availability, and developmental environments between single- and married-parent families.

Labor Market and Wealth Profiles Single and married mothers exhibit markedly different labor supply and wealth accumulation patterns. Figure 2 shows that single mothers maintain higher labor force participation and work more hours across most of the life cycle. Despite this higher labor effort, single mothers earn lower hourly wages, and suggesting different wage growth path from work experience. This difference in earnings and lack of husband's income contribute to significant differences in wealth, resulting in low asset holdings approaching retirement. These patterns suggest that sngle mothers face more limited economic resources even though they work more, reflecting the underlying financial constraints that shape their behavior.

Childcare Investment Differences in time and monetary investments in children mirror the economic disparities across family structures. Figure 3 shows that married mothers consistently devote more active time to their children across all child ages. Single mothers, who work more hours, provide less direct engagement time on average. Monetary investments also differ between the two groups, but the differences are more modest.

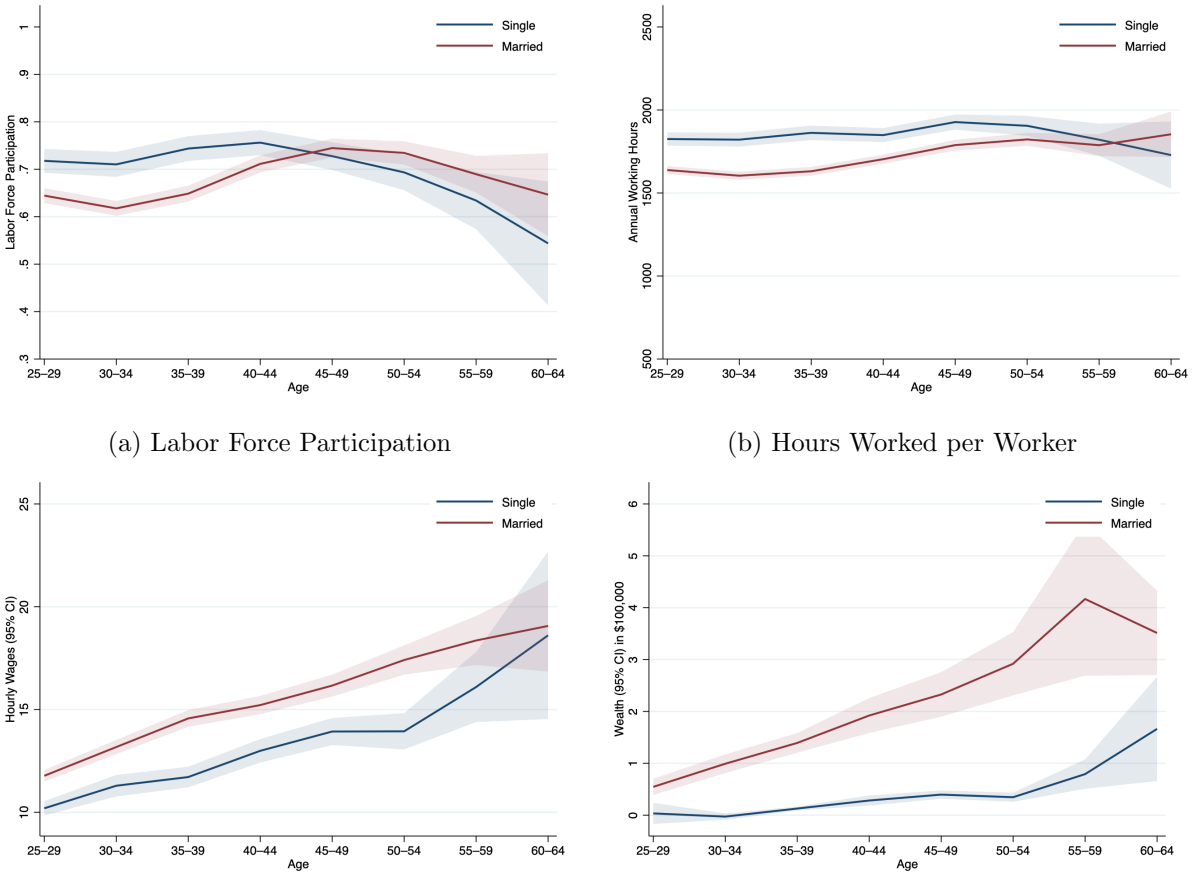
Child Development Outcomes The disparities in economic resources and parental investments are reflected in children's cognitive outcomes. Figure 4 displays cognitive test scores by child age and mother's marital status. Across all age groups, children of married

Table 3: Demographics of CDS Mothers and Children

	Ever-single Mothers	Married Mothers
Panel A: Demographics of Children in CDS		
Age at childbirth	27.7	28.3
Birth year	1962	1961
Education (percentage)		
Less than high school	9.3	9.9
High school graduates	25.1	18.7
Some college	40.8	31.0
College graduates	14.0	23.6
Post-college	10.8	16.8
Race (percentage)		
Whites	63.2	33.2
Non-whites	36.8	66.8
Number of kids in CDS (percentage)		
One child	60.1	52.2
Two children	39.9	47.8
Age gap if two children	2.9	3.2
Wealth by age 50 (in thousands, 1987 dollar)	33.19	220.24
Observations	666	751
Panel B: Demographics of Children in CDS		
Female (percentage)	50.5	49.7
Race (percentage)		
White	35.2	77.2
Black	61.0	20.4
Others	3.7	2.3
Education (percentage)		
Ever high school graduates	93.8	98.8
High school graduates by age 20	88.7	96.9
Some college by age 20	60.1	85.0
Having siblings in CDS (percentage)	58.0	64.8
Ever being cared by grandparents (percentage)	60.3	47.3
Observations	848	932

Source: Panel Study of Income Dynamics, Child Development Supplement, Transition into Adulthood Study, author's calculations.
Notes: Wealth dollar values are in 1987 dollars.

Figure 2: Labor Market and Wealth Outcomes



(a) Labor Force Participation

(b) Hours Worked per Worker

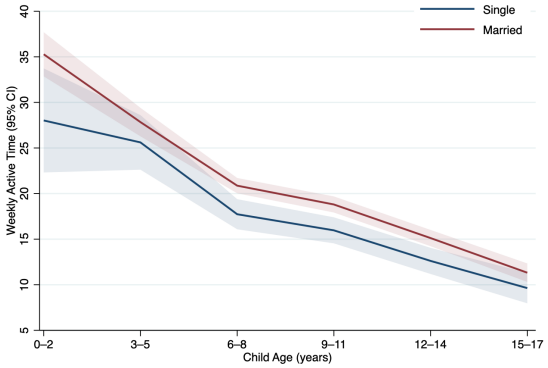
(c) Hourly Wages

(d) Household Assets

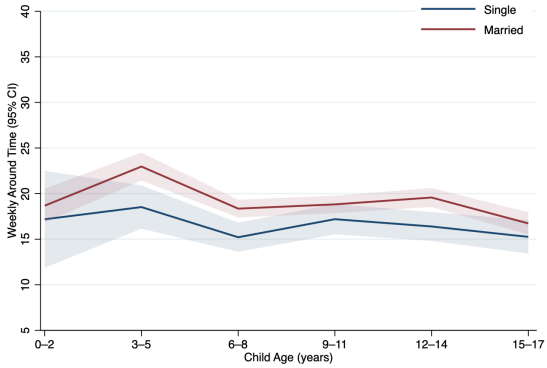
Notes: Data profiles of life-cycle labor force participation (a), working hours (b), hourly wages (c), and household assets (d), comparing single and married mothers and families. Dollar values of wages and assets are in 1996 and 1987 dollars.

Source: Panel Study of Income Dynamics, author's calculations.

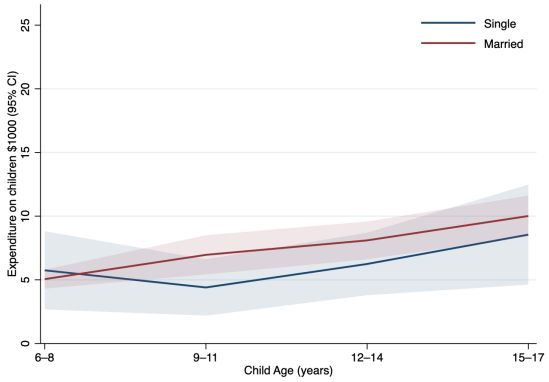
Figure 3: Childcare Investment by Marital Status



(a) Weekly Active Time with Mothers



(a) Weekly Around Time with Mothers



(b) Expenditure on Children

Notes: Data profiles of time investment (a) and monetary investment (b) over children's ages 0-17, comparing single-mother families (red) and married parents families (red). Expenditure dollar values are in 1996 dollars.

Source: Children Development Supplement, author's calculations.

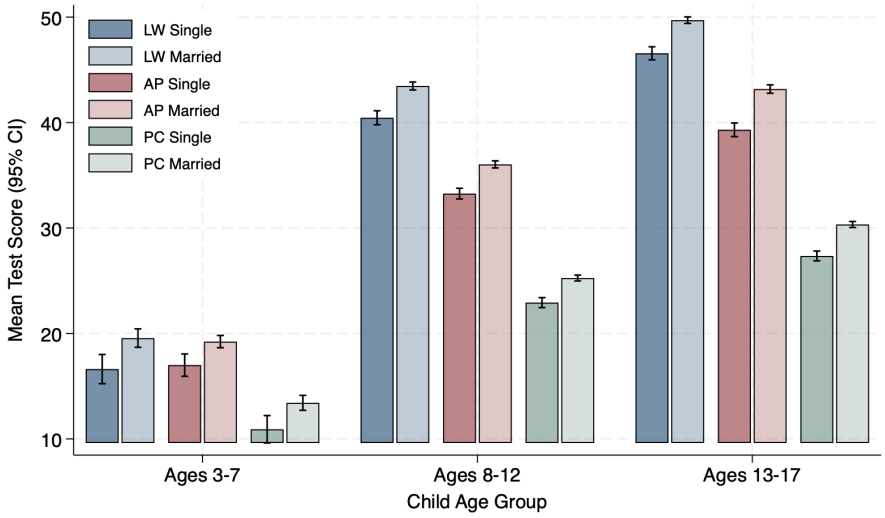
Table 4: Summary Statistics Comparing Single and Married Families

	Single Mothers	Married Mothers
Panel A: Summary Statistics From Children in CDS		
Children Weekly Time in Each Activity (in Hours)		
Active time with mother	15.50	18.96
Around time with mother	16.39	18.96
Active time with father	2.55	12.47
Around time with father	2.07	12.70
Active time with grandparents	5.86	2.88
Around time with grandparents	5.47	2.51
Active time with others	6.79	7.44
Around time with others	9.12	8.84
Children Development Outcomes		
Cognitive - Applied Problems	32.26	34.52
Cognitive - Letter Word	37.93	39.99
Cognitive - Passage Comprehension	23.33	25.43
Non-cognitive Scores	-0.001	0.14
Summary Statistics of Household		
Annual expenditure on children (in thousands)	6.34	7.83
Living with grandparents (percentage)	5.80	0.89
Annual family income (in thousands)	37.24	100.87
Hours worked per week of mothers	34.50	28.74
Days worked per week of mother	4.18	3.62
Work schedule of mothers (daytime=0; other=1; percentage)	0.67	0.64
Observations	1,582	4,012
Panel B: Summary Statistics From Mothers in PSID		
Household wealth (in thousands)	18.35	153.56
Annual hours worked	1844.19	1672.09
Hourly wages	11.86	13.88
Receiving SNAP (percentage)	38.51	6.61
Receiving AFDC (percentage)	30.56	1.52
Receiving TANF (percentage)	2.09	0.32
Living in the states with time limit on TANF (percentage)	80.89	77.00
Transfers received from relatives	334.82	297.49
Transfers received from other public programs	7057.22	454.83
Observagtions	7,195	18,434

Sources: Panel Study of Income Dynamics and Child Development Supplement, authors' calculations.
Notes: All dollar values are in 1996 dollars, except for wealth dollar values are in 1987 dollars.

mothers score consistently higher on the Woodcock–Johnson Letter Word, Applied Problems, and Passage Comprehension assessments. These gaps emerge early in childhood and persist into adolescence, with some widening over time. This pattern indicates systematic differences in skill formation environments across family structures, highlighting persistent differences in human capital accumulation that closely related to the investment and resource constraints.

Figure 4: Test Scores by Child Age Group and Mothers' Marital Status



Source: Panel Study of Income Dynamics and Child Development Supplement, author's calculations.

4 Model

This section describes a dynamic life-cycle model of consumption, labor supply, savings, program participation, and childcare investment. It incorporates key features of the US tax and welfare programs, including the EITC, SNAP, and TANF.

Time is discrete and indexed by t. Each individual enters the model with one child at age 30 and lives up to T periods In each time period t, a single mother decides how much to consume (c_t), whether to work (p_t), how much to work (n_t), whether to claim TANF ($p_t^w \in \{0,1\}$) and Foot Stamps ($p_t^f \in \{0,1\}$), if eligible, and sequence of time (τ_t) and monetary (q_t) investments in children from early childhood until period T_c.[2] For compu-

[2]This model focuses on single-child households. Extensions of the modeling framework to multiple-child households can be explored in future research.

tational simplicity, a model period is defined as a 5-year interval.

4.1 Preferences

The within-period utility for the women is parametrized as follows:

$$u(c_t, l_t) = \frac{1}{1-\nu}(\, c_t^{\gamma} \, l^{1-\gamma} \,)^{1-\nu} - \theta_w p_t^w - \theta_f p_t^f \tag{1}$$

The parameter $\gamma \in [0, 1]$ is the weight on consumption. Individuals with a higher value of γ have stronger preferences for work. The parameter $\nu > 0$ is the coefficient of relative risk aversion (CRRA) and controls the intertemporal substitutability of consumption and leisure. The parameters θ_w, θ_f represent the utility costs from claiming TANF benefits and from claiming Food Stamps benefits, respectively.

Leisure in period t is given by:

$$l_t = L - n_t - \theta_p p_t - \tau_t \tag{2}$$

where L is an individual's total time endowment per period; τ_t is time investment in children, measured in hours; n_t is hours worked; p_t is a 0-1 indicator of participation in the labor market that is equal to 1 when n_t is positive and zero otherwise; θ_p is the fixed cost of working (measured in hours per year). It includes time spent getting ready for work, including commuting time.

4.2 Parental Human Capital and Wages

Human capital accumulation and wage dynamics are modeled in accordance with Borella et al. (2023a). Wages are a function of one's human capital, which is accumulated through working, and are affected by shocks.

Mother's human capital, $\bar{y}_t$, is defined as one's average past earnings at each age

$$\bar{y}_{t+1} = \frac{\bar{y}_t(t - t_0) + \min(Y_t, \tilde{y}_t)}{t + 1 - t_0} \tag{3}$$

$$Y_t = e_t(\bar{y}_t)\epsilon_t n_t \tag{4}$$

Equation (3) describes the evolution of human capital, measured as the average accumulated earnings (up to the Social Security earnings cap $\tilde{y}_t$). It is therefore a function of

one's initial wages and subsequent labor market experience and wages. Thus, it is not just of experience measured as the amount of time one has previously worked. This approach allows us to capture the returns to experience, which is depending on both human capital and earnings, while using only one state variable to keep track of both human capital and Social Security contributions, thereby preserving the manageability of our framework.

Wages have two components. A deterministic function of age, gender, and human capital: $e_t(\bar{y}_t)$ and a persistent shock ϵ_t that evolves as follows

$$\ln \epsilon_t = \rho \ln \epsilon_{t-1} + \eta_t, \quad \eta_t \sim N(0, \sigma_\eta^2) \tag{5}$$

The product of $e_t(\bar{y}_t)$ and ϵ_t determines one's effective hourly wage per hour.

4.3 Children's Development

Children's development outcome θ_t^c is depending on the sequence of time and monetary investments from mothers and evolved according to the childcare production technology:

$$\theta_{t+1}^c = \alpha \times \theta_t^{c\delta_\theta} \times q_t^{\delta_q} \times \tau_t^{\delta_\tau} \tag{6}$$

When her child turns adult at period T_c, there will be a final development outcome $\theta_{T_c}^c$.

4.4 Cohabitation

In each model period, there is a probability, $m_t \in [0, 1]$, that a single mother is meeting and living with a partner who would bring additional income sp_t to the household. This probability depends on age, as: $m_t = m(t)$.

4.5 Budget Constraint

The budget constraint of a single-mother household is written as follows:

$$c_t + q_t + a_{t+1} = Y_t(ra_t, w_t h_t, sp_t, t^c, \text{EITC}_t) + ny_t + b_t^f \times \text{SNAP}_t + b_t \times \text{TANF}_t$$

where the variable a_{t+1} denotes the household assets and savings. Individuals also face the borrowing constraint, so $a_{t+1} \geq 0$.

In each time period, a single mother family receives income through interest on assets, ra_t; labor income, $w_t n_t$; spousal earnings when a single mother cohabits with a partner, sp_t; non labor income or transfers received, ny_t; and benefits from Food Stamps and TANF, if participate, SNAP_t and TANF_t. The term $Y_t(ra_t, w_t h_t, sp_t, t^c, \text{EITC})$ is the after-tax income in period t subject to EITC , where r is the pre-tax risk-free interest rate.

The budget constraints captures in detail the rules of the welfare program including time limits and work requirements, as well as food stamps, federal and state EITC, payroll tax, and federal and state income, such as

$$\begin{aligned}
\text{EITC} &= f^{EITC}(w_t h_t, t^c) \\
\text{SNAP} &= f^{SNAP}(a_t, w_t h_t, q_t) \\
\text{TANF} &= f^{TANF}(a_t, w_t h_t, q_t, \text{Time limit})
\end{aligned}$$

Details of various policies including welfare time limits, work requirements, and asset test are incorporated formally in the budget constraint. Tax and welfare programs are modeled in great detail to match the current U.S. system.

4.6 Recursive Formulation

The life cycle can be divided into three stages for each individual. The first stage consists of periods before the child turns adult, when single mothers choose consumption, labor supply, time and monetary investment in children, and whether to participate welfare programs. Let $\mathbb{X}_t = (a_t, w_t, m_t, \theta_t^c, t^c, \bar{y}_t, TL_t)$ denotes the vector of state variables at age t, it includes: asset, a_t; wage shock, ws_t; cohabitation status, m_t; children development outcome, θ_t^c; children age, t^c; mother's human capital, $\bar{y}^c$; and time limit of welfare program, TL_t.

In recursive form, the individual's problem in state (X) and age t can be written as:

$$\forall t^c < T^c: \quad V_t(\mathbb{X}_t) = \max_{c_t, h_t, \tau_t, q_t, p_t^w, p_t^f} u(c_t, l_t, p_t^w, p_t^f) + \beta \mathbb{E} V_{t+1}(\mathbb{X}_{t+1})$$

$$\text{subject to: } l_t + h_t + \tau_t = L$$

$$c_t + q_t + a_{t+1} = Y_t(ra_t, w_t h_t, sp_t, t^c, \text{EITC}) + ny_t + p_t^f \times \text{SNAP}_t + p_t^w \times \text{TANF}_t$$

The parameter β is the discount factor. Individuals with higher values of β are more patient and more willing to defer their consumption and leisure.

After the child turns adult and before the retirement age, mothers only choose consumption, labor supply, and whether to participate Food Stamps. The value function of the individual in state ($\mathbb{X}_t$) is described as:

$$\forall t^c >= T^c: \quad V_t(\mathbb{X}_t) = \max_{c_t, h_t, b_t^f} u(c_t, l_t) + \mathbb{I}_{t^c=T^c}\kappa\tilde{V}(\theta^c_{T^c}) + \beta\mathbb{E}V_{t+1}(\mathbb{X}_{t+1})$$

$$\text{subject to: } l_t + h_t = L$$

$$c_t + a_{t+1} = Y_t(ra_t, w_t h_t, sp_t, \text{EITC}) + p_t^f \times \text{SNAP}_t$$

where $\mathbb{X}_t = (a_t, w_t, m_t, \theta^c_t, hc_t)$. Note that during the period when the child turns adult, there is a final child's development outcome $\theta^c_{T^c}$. Mothers value the final child's development outcome according to a function $\kappa\tilde{V}(\theta^c_{T^c})$.

The third stage is an entire retirement period where individuals only decide on consumption and Food Stamps participation, with assets and retirement benefits based on the single mother's human capital at the retirement age. Then the individual's value function during the entire retirement period is given as follows, with $\mathbb{X}_t = (a_t, m_t, \bar{y}_t)$.

$$t >= 65: \quad V_t(\mathbb{X}) = \max_{c_t, b_t^f} u(c_t, l_t) + \beta[s_{t+1}\hat{V}_{t+1}(a_{t+1}, \text{hc}_{65}) + (1 - s_{t+1}B(a_{t+1}))]$$

$$\text{subject to: } c_t + a_{t+1} = (1+r)a_t + Y_t(ra_t, sp_t, hc_{65}) + b_t^f \times \text{SNAP}_t$$

Upon retired, mothers are subject to mortality rates and leave bequest to their heirs if died.

5 Estimation

I estimate the model using the Method of Simulated Moments and post-reform data on single mothers from the Panel Study of Income Dynamics (PSID) and its Child Development Supplement (CDS). Specifically, the model is required to match observed data profiles of employment, working hours, savings, time and monetary investments in children, and children development outcomes. I utilize data from the PSID and its Child Development Supplement to estimate those data moments and the skill production function for children's outcomes.

I estimate and select the parameters of the model in three steps. First, some parameters are set using standard values in the literature. Second, I estimate some parameters directly from the data without imposing the model's structure. Table 5 summarizes the parameters in the first two steps. Finally, the remaining parameter, $(\nu, \gamma, \beta, L, \phi, \theta_w, \theta_f, \kappa, B(\cdot)$, are to be estimated using the Method of Simulated Moments, matching data, and model-based simulated moments.

I use the Generalized Method of Moments techniques to estimate the remaining preference parameters. The objective of the MSM is to find a vector of parameters that generates simulated decision profiles that best match (measured by a GMM criterion function) the corresponding profiles from the data. require my model to match the observed data profiles of employment, savings, and time and monetary investments in children that are estimated from the PSID and CDS.

The estimator $\hat{\Theta}$ is given by the minimized GMM criterion function:

$$\hat{\Theta} = \arg\min_{\Theta} \frac{I}{1+\tau} \hat{\varphi}(\Theta;\chi)' \hat{\mathbf{W}}_I \hat{\varphi}(\Theta;\chi) \tag{7}$$

where τ is the ratio of the number of observations to the number of simulated observations and $\hat{\varphi}(\Theta;\chi)$ is a $6\mathbb{T}$-element vector of moment conditions, such that

$$\hat{\varphi}(\Theta;\chi) = \begin{bmatrix} E[p_{imt}|m,t] - \int p_t(X,\Theta,\chi) dF_{m,t}(X|m,t) \\ E[n_{imt}|m,t] - \int n_t(X,\Theta,\chi) dF_{m,t}(X|m,t) \\ E[a_{imt}|m,t] - \int a_t(X,\Theta,\chi) dF_{m,t-1}(X|m,t) \\ E[p^w_{imt}|m,t] - \int p^w_t(X,\Theta,\chi) dF_{m,t-1}(X|m,t) \\ E[p^f_{imt}|m,t] - \int p^f_t(X,\Theta,\chi) dF_{m,t-1}(X|m,t) \\ E[q_{imt}|m,t] - \int q_t(X,\Theta,\chi) dF_{m,t}(X|m,t) \\ E[\tau_{imt}|m,t] - \int \tau_t(X,\Theta,\chi) dF_{m,t-1}(X|m,t) \\ E[\theta^c_{imt}|m,t] - \int \theta^c_t(X,\Theta,\chi) dF_{m,t-1}(X|m,t) \end{bmatrix}_{t\in\{30-35,35-40,40-45,..\},m\in\{0,1\}}$$

where $E[p_{imt}|\cdot]$, $E[n_{imt}|\cdot]$, $E[a_{imt}|\cdot]$, $E[p^w_{imt}|\cdot]$, $E[p^f_{imt}|\cdot]$, $E[q_{imt}|\cdot]$, $E[\tau_{imt}|\cdot]$, and $E[\theta^c_{imt}|\cdot]$ are the moments that my model is estimated to match:

1. Labor force participation by cohabitation status and ages (30-65), resulting in $2\mathbb{T}$ moment conditions.

2. Hours worked conditional on participation by cohabitation status and ages (30-65), resulting in $2\mathbb{T}$ moment conditions.

3. Mean non-pension assets by cohabitation status and ages (30-65), resulting in $2\mathbb{T}$ moment conditions.

4. Welfare program participation by cohabitation status and children ages (30-45), resulting in $2\mathbb{T} - 4$ moment conditions.

5. Food stamp participation by cohabitation status and ages (30-65), resulting in $2\mathbb{T}$ moment conditions.

6. Time investment in childcare by cohabitation status and children ages (30-45), resulting in $2\mathbb{T} - 4$ moment conditions.

7. Money investment in childcare by cohabitation status and children ages (30-45), resulting in $2\mathbb{T} - 4$ moment conditions.

8. Children development outcome by cohabitation status and children ages (30-45), resulting in $2\mathbb{T} - 4$ moment conditions.

Table 5: First Two Steps Parameters Summary

Parameter	Description	Source
Budget Constraints		
r	Real interest rate	Borella et al. (2023b)
$ys(\cdot)$	Spousal earnings	PSID
$ny(\cdot)$	Non labor income or transfers	PSID
$\underline{c}$	Consumption floor after 65	French and Jones (2011)
λ_t	Income tax structure	PSID
Wage Related Parameters		
$e_t(\bar{y})$	Wage function of human capital	PSID
ρ	Autoregressive coefficient	PSID
σ^2_ρ	Variance of innovation	PSID
Program Benefits Related Parameters		
$f^{EITC}(\cdot)$	EITC	Policy Rules
$f^{SNAP}(\cdot)$	SNAP	Policy Rules
$f^{TANF}(\cdot)$	TANF	Policy Rules
Children Development Parameters		
γ	Coefficient - constant	PSID-CDS
δ_θ	Coefficient - θ^c_t	PSID-CDS
δ_q	Coefficient - expenditure q_t	PSID-CDS
δ_τ	Coefficient - time τ_t	PSID-CDS
Transition		
$m(\cdot)$	Cohabitation	PSID
$s_{t+1}(\cdot)$	Survival Rates	PSID

Abbreviation: Panel Study of Income Dynamics (PSID), Children Development Supplement (CDS), author's calculations.

5.1 Measurement of Children Development Outcomes

The time inputs of parents are defined as the total duration of activities in which they are actively participating with the child. An estimate of weekly totals is based on five times the weekday time allocation plus two times the weekend time allocation.

For cognitive ability, I use the Letter-Word (LW) and Applied Problems (AP) modules of the Woodcock-Johson Aptitude test. I exploit the longitudinal component of the PSID to tie each score to a human capital outcome of significant interest: college attainment. This approach, known as "anchoring", gives a more interpretable scale to estimates of the skill production function (see, e.g., Mullins (2025)).

5.2 Estimation Results

Below table and figures shows the estimated parameters and how model fit into the data patterns.

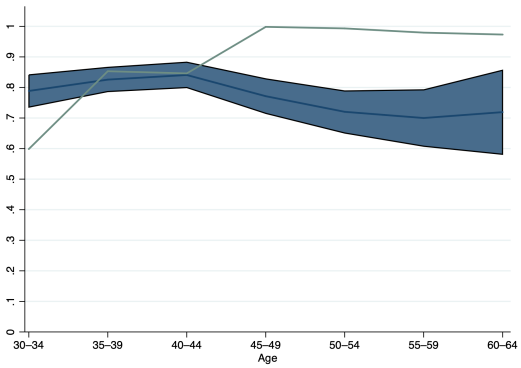
Table 6: Estimated Structural Parameters

Parameter	Definition	Values
γ	Consumption weight	0.571
ν	CRRA for flow utility	5.207
β	Time discount factor (yearly)	0.98
L	Leisure endowment (yearly)	3684.6
ϕ	Labor Market Participation Cost (yearly)	1309.5
θ_w	Participation cost of welfare program	70
κ	Weight on children final development outcomes	396.04
θ_B	Bequest weight	0.014
κ_B	Curvature of the bequest	395k

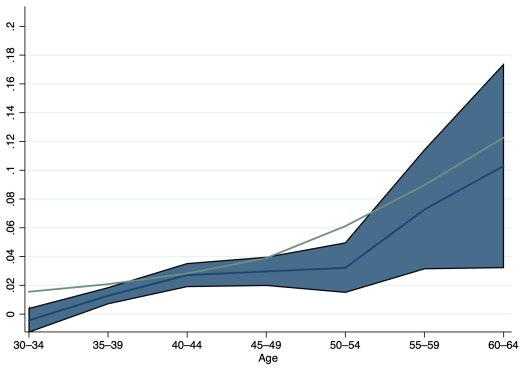
6 Counterfactual Analysis and policy Implication

Following the model estimation, I further employ the structural framework to quantify the impact of the welfare time limit on mothers' behavioral responses and the long-term effects of reform on human capital development and broader warfare implications. Specifically, the model allows for a detailed assessment of a series of policy counterfactuals that evaluate the effects of alternative welfare program designs on mothers' employment, program participation, childcare investment, and human capital accumulation, as well as the intergenerational outcomes for their children.

Figure 5: Data v.s. Estimation: Over Mothers Life-Cycle

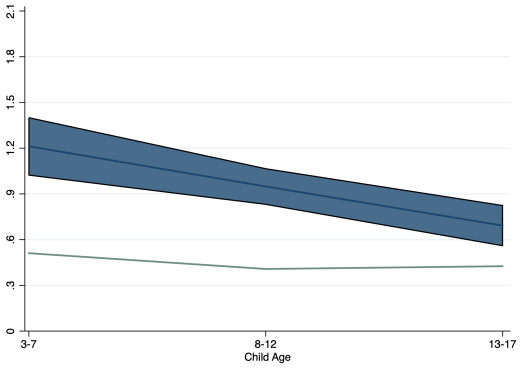


(a) Single Mothers Labor Force Participation

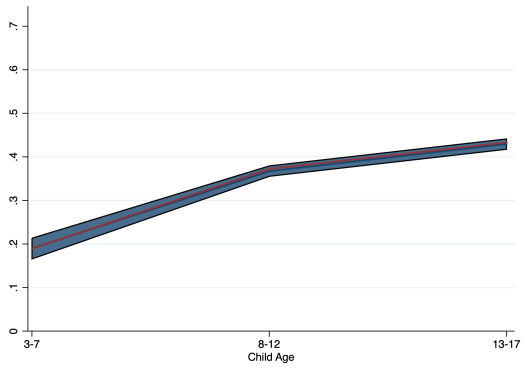


(b) Single Mothers Wealth Accumulation

Figure 6: Data v.s. Estimation: Over Children Age



(a) Single Mothers Childcare Time



(b) Single Mothers' Children Development Outcomes

Additional policy counterfactual involves evaluating the effects of several counterfactual experiments such as changing the tax rates of EITC, time limit of TANF, increasing the income test level of other welfare programs, and other relevant scenarios. By investigating the impact of welfare reforms on labor market outcomes and the long-term return to the human capital of children and mothers across different life stages, the results of this project aim to address important policy questions related to the design and delivery of income support to economically disadvantaged families with children. The insights provided will be valuable for policymakers targeting diverse outcomes resulting from future possible reforms.

6.1 Extension of TANF Time Limit

In this counterfactual experiment, I remove the TANF lifetime limit from five to unlimited as long as the child is under the age of 18. I evaluate its effects on mothers' economic behavior and child outcomes.

The simulation results indicate that relaxing the time limit leads to a 14 percentage-point (p.p.) increase in average welfare participation among single-mother households. The extended eligibility horizon reduces the urgency to leave welfare, resulting in a 12.5 p.p. decline in labor force participation during the childrearing period.

Correspondingly, mothers accumulate 11.5% less human capital and lifetime earnings by the age of 65 compared to the baseline scenario, reflecting greater reliance on public support at older ages. However, the additional program stability allows for more consistent childcare investment. As a result, single moms spend 30% more time in childcare, and children in extended-limit households experience a 0.07% improvement in college attainment probabilities. Overall, while the policy raises total program expenditures, it yields gains in household welfare and intergenerational human capital formation, suggesting that longer eligibility periods can improve long-run socioeconomic outcomes despite moderate short-run efficiency costs.

7 Extension and Next Steps

Next steps include extending the model to incorporate heterogeneity in parental education, cognitive and noncognitive skills, and number of children in the household.

Education and skill differences shape both earnings potential and parenting productivity: more educated parents or those with higher cognitive and noncognitive abilities face higher wages but also tend to invest more effectively in children's human capital. These affect not only labor supply and savings behavior but also the allocation of time and resources toward child development.

In families with multiple children, parents face additional trade-offs between the quantity and quality of children, as time and financial resources must be divided across siblings. This extension allows the model to capture key empirical patterns, such as stronger child-quality investments among highly educated or high-skill parents, and differences in welfare participation or labor responses between one-child and multi-child families—thereby improving its ability to evaluate how welfare and tax policies differentially affect families with varying education levels, skill endowments, and family structures.

8 Conclusion

This paper develops and estimates a dynamic life-cycle model to study how welfare programs affect the economic behaviors and human-capital accumulation of single-mother families. The framework links mothers' intertemporal decisions on labor supply, savings, and welfare participation with investments in children's development under the detailed rules of TANF, SNAP, and the EITC. By combining policy realism with behavioral dynamics, the model provides a unified approach to analyzing how welfare design shapes both short-run economic outcomes and long-run human capital accumulation.

Overall, the results show that welfare programs affect families through multiple channels, affecting work decisions, resource allocation, and household well-being. Policies that balance work incentives with consistent support for caregiving can enhance both economic security and opportunities for human-capital growth.

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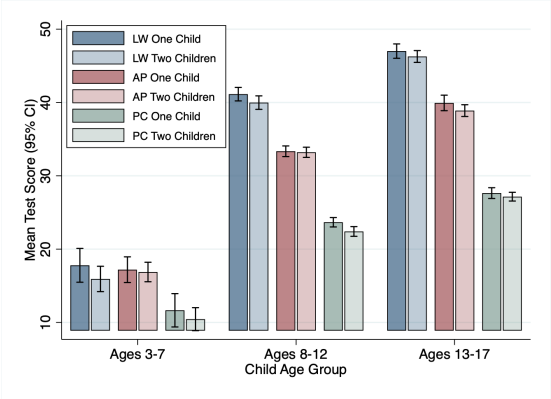
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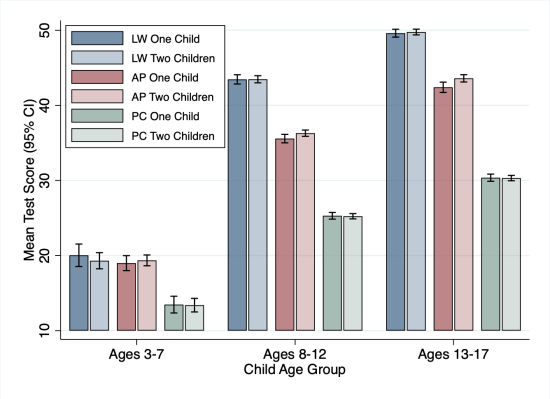
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A Additional Figures

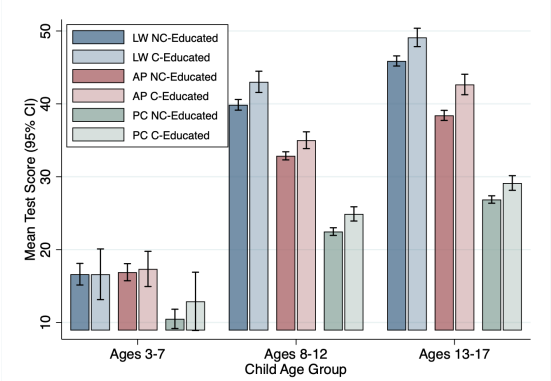
Figure 7: Test Scores by Child Age Group and Mothers' Marital Status



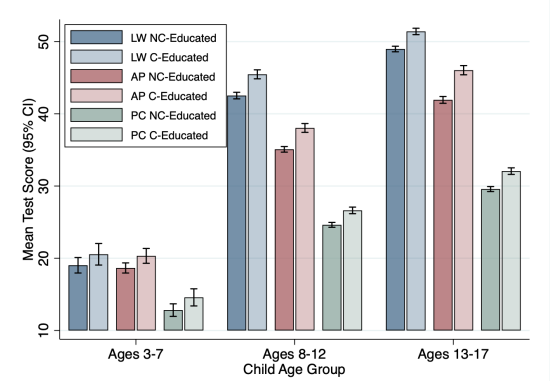
(a) Single Mothers



(b) Married Mothers



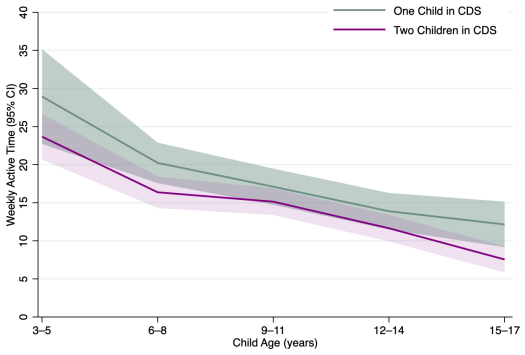
(c) Single Mothers



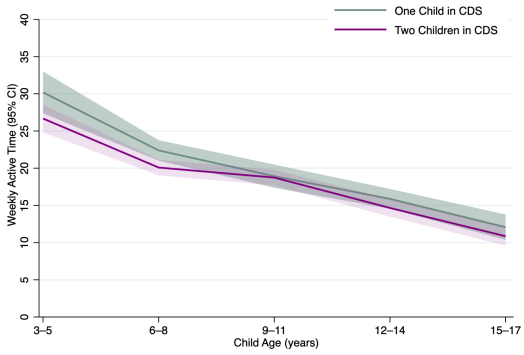
(d) Married Mothers

Source: Panel Study of Income Dynamics and Child Development Supplement, author's calculations.

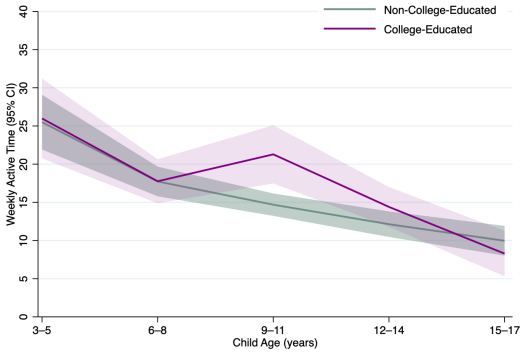
Figure 8: Active Time with Mothers by Child Age Group and Mothers' Marital Status



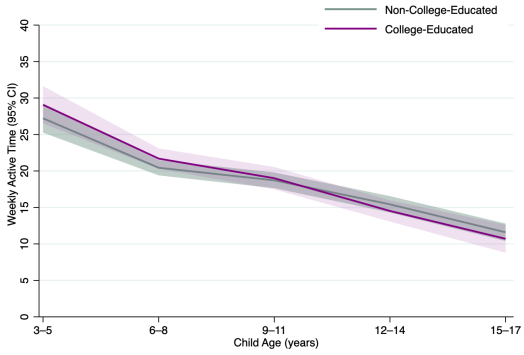
(a) Hours Actively with Single Mothers



(b) Hours Actively with Married Mothers



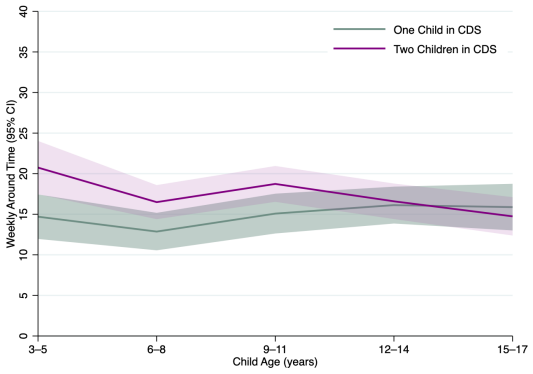
(c) Hours Actively with Single Mothers



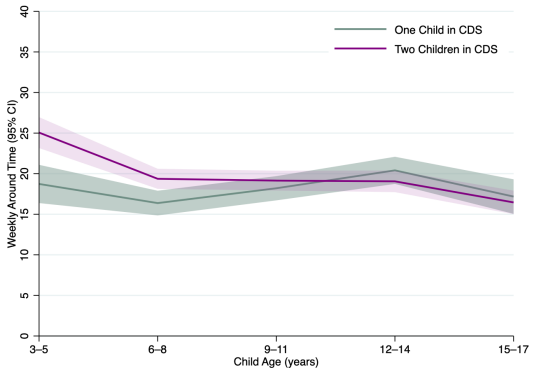
(d) Hours Actively with Married Mothers

Source: Panel Study of Income Dynamics and Child Development Supplement, author's calculations.

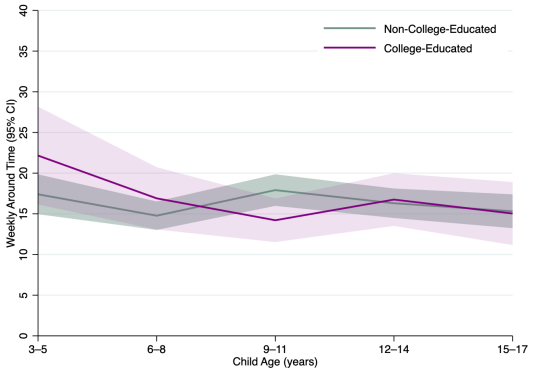
Figure 9: Around Time with Mothers by Child Age Group and Mothers' Marital Status



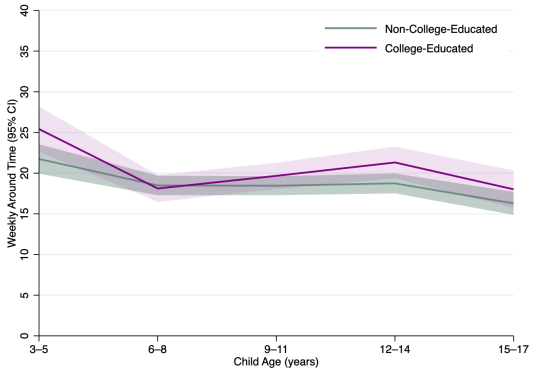
(a) Hours Around with Single Mothers



(b) Hours Around with Married Mothers



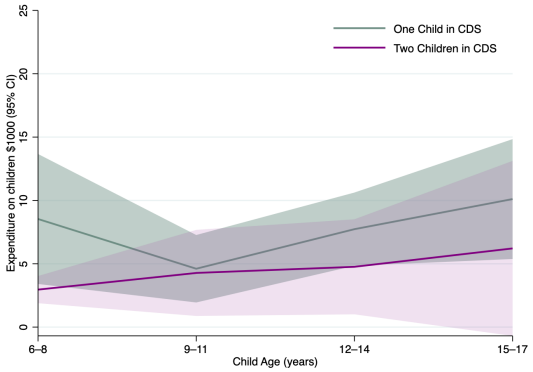
(c) Hours Around with Single Mothers



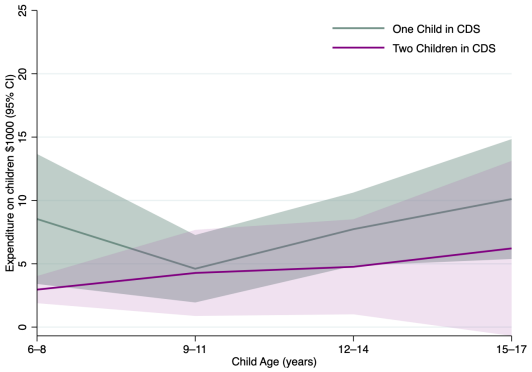
(d) Hours Around with Married Mothers

Source: Panel Study of Income Dynamics and Child Development Supplement, author's calculations.

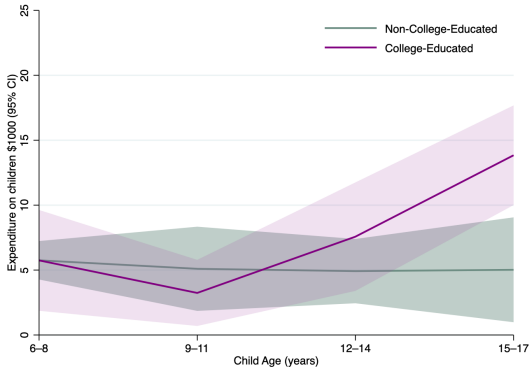
Figure 10: Childcare Expenditure by Child Age Group and Mothers' Marital Status



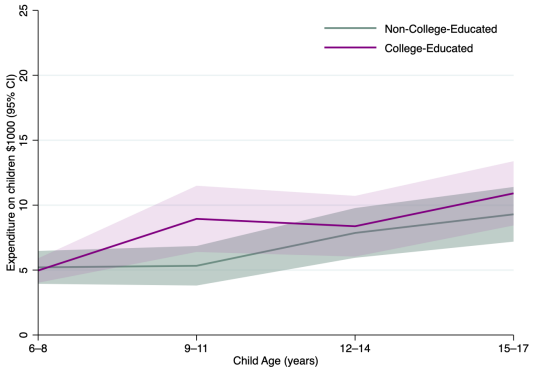
(a) Expenditure spent by single mothers



(b) Expenditure spent by married mothers



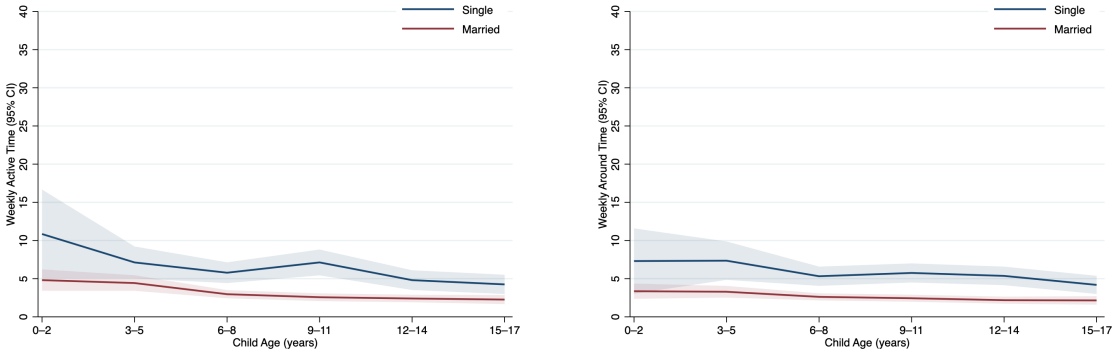
(c) Expenditure spent by single mothers



(d) Expenditure spent by married mothers

Source: Panel Study of Income Dynamics and Child Development Supplement, author's calculations.
Notes: Expenditure dollar values are in 1996 dollars.

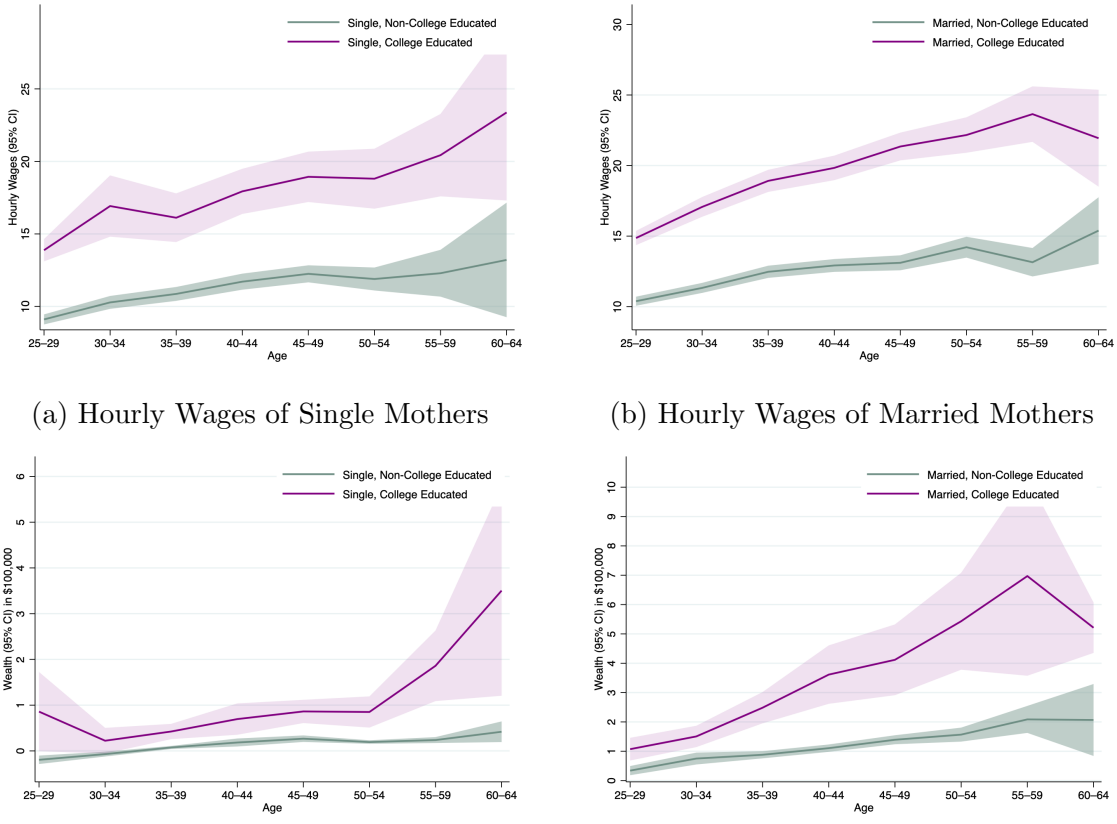
Figure 11: Time with Grandparents by Child Age Group and Mothers' Marital Status



(a) Hours Around with Single Mothers (b) Hours Around with Married Mothers

Source: Panel Study of Income Dynamics and Child Development Supplement, author's calculations.

Figure 12: Hourly Wages and Wealth Accumulation by Mothers' Marital Status and Education



(a) Hourly Wages of Single Mothers (b) Hourly Wages of Married Mothers

(c) Assets of Single-Mother Families (d) Assets of Married-Parent Families

Source: Panel Study of Income Dynamics, author's calculations.