

Labor Market Effects of Subsidized Childcare: Evidence from Early Head Start

Bilal Raza*

Abstract

This paper explores the labor market effects of Early Head Start (EHS), a federally funded, family-centered early childhood program serving more than 200,000 children under age three. EHS provides subsidized childcare when childcare constraints are most binding, yet there is no evidence on how it impacts household labor supply. Using a staggered rollout design and Current Population Survey data from 1988-2018, I find that EHS increases maternal labor supply, with significantly larger effects for low-educated mothers. Fathers' labor supply also rises, though the effect is smaller. Supply-side analysis reveals that EHS increases employment and wages in the childcare industry, with a modest increase in childcare costs for non-subsidized families. Overall, evidence suggests that EHS reduces the motherhood penalty and supports the childcare sector.

University of Delaware. Email: raza@udel.edu

1 Introduction

Despite the “quiet revolution” and the ensuing “grand gender convergence” (Goldin, 2006, 2014), U.S. female labor force participation rate has fallen relative to other OECD countries, in part because of weaker family-friendly policies (Blau and Kahn, 2013) and lack of public expenditures on early childhood care and education (OECD, 2025). Given women are disproportionately responsible for caregiving, inadequate public support may constrain the labor supply of mothers with young children who often face trade-offs between employment and childrearing (Fitzpatrick, 2010). But successful government response¹ to ease Covid-19 related constraints on the childcare market and the subsequent recovery in the maternal employment have rekindled interest in federally funded universal childcare and its potential labor-market benefits for women (Cooksey and Thomas, 2024; Council of Economic Advisers, 2023a). Recent literature evaluating public ECE programs reports positive labor market effects from expansion in federally funded Head Start program (Wikle and Wilson, 2023), state-level rollout of universal pre-kindergarten (Humphries et al., 2024; Jackson et al., 2025), and transition from part-time to full-time kindergarten (Gibbs et al., 2025). However, these studies examine programs serving children aged three and older, whereas labor force participation is lowest among mothers of children under age three (Figure 1a).

I explore labor market effects of Early Head Start (EHS), a federally funded program serving children under the age of three. The EHS is a means-tested program launched in 1995 that supplements the federal Head Start initiative, which has served preschool age children (ages 3-4) since 1965. Among other objectives, EHS explicitly aims to improve parents’ economic self-sufficiency. However, labor market effects of EHS rollout across the U.S. remain unexplored.² Because high childcare cost can depress the net return to work (Child Care Aware of America, 2022), access to EHS can increase mothers’ attachment to labor market, especially for those with low socioeconomic status (Kimmel, 1998). By allowing mothers to return to workforce earlier, EHS minimizes breaks in employment that may impact future labor market attachment. Subsidized childcare can also free time and resources for other household members, further improving overall household welfare.

Although the literature generally finds that subsidized childcare increases mothers’ labor supply, the effect is not universal (Fitzpatrick, 2010). Economic theory predicts that childcare subsidy has two opposite effects on market work. By lowering the price of childcare, it raises net wages and induces substitution from home care to market work, thereby increasing labor supply. At the same time, subsidies raise real income; with leisure a normal good, this income effect decreases labor supply. Similarly, EHS

¹The American Rescue Plan Act provided \$24 billion for childcare stabilization grants and \$15 billion for supplemental Child Care and Development Fund (CCDF) discretionary funds. According to Childcare Aware of America, childcare industry received \$52 billion in federal relief funding during the pandemic (Girouard, 2024)

²(Love et al., 2002) use data from Early Head Start Research and Evaluation (EHSRE) project and report some improvement in employment by the end of study period. But they are mostly focused on children’s outcomes and their data covers only 17 EHS locations across the U.S.

may have infra-marginal effects by subsidizing families who would have purchased childcare anyways. Also, some mothers may strategically reduce labor market participation to meet means-tested eligibility criteria. Consequently, the net impact of EHS on maternal labor supply is ambiguous and must be determined empirically. In addition, EHS may also have positive supply-side effects on the overall capacity and wages in the childcare industry. A common objection to subsidized childcare is that it may raise prices for non-subsidized families — another empirical question I investigate in this study.

To estimate the impact of EHS on maternal labor market outcomes, I link administrative rollout data from Office of Head Start with Current Population Survey - Annual Social and Economic Supplement (CPS-ASEC) data from 1988-2018. The variation in metropolitan area level rollout is used to identify causal relationship between EHS and maternal labor market outcomes. Specifically, the identification strategy compares mothers of children under age three in treated metropolitan areas to counterparts in metropolitan areas that have not yet been treated. The identifying assumption is that mothers in treated and not-yet treated metropolitan areas would have parallel trends in the absence of EHS rollout. Because this assumption is inherently untestable, I assess its plausibility by examining pre-treatment dynamics. If parallel pre-treatment trends are observed, any post-treatment differential trends can be reliably interpreted as causal.³ Finally, for childcare industry outcomes, I use county-level data from the Quarterly Census of Employment and Wages (1990-2018) and the National Database of Childcare Prices (2008-2018).⁴

I utilize rich demographic information in CPS-ASEC to explore heterogeneity in effects. The EHS is means-tested program that primarily reduces the childcare affordability barrier to market work. Because educational attainment is positively associated with income, I expect the effects to be larger for low educated mothers. Single mothers are another potentially high impact group, who often lack informal care and face binding childcare constraint on labor supply. Likewise, for mothers with multiple children under age five, higher return to home care may dampen labor supply response, but greater childcare and household needs may increase the incentive to work relative to mothers with a single young child. Finally, racial income inequality means EHS impacts may be larger for lower-income racial groups. However, given the differences in access to childcare (Malik et al., 2018), and the possibility that EHS sites are not located near these communities, may suppress these effects.

First, I present evidence on the effects on the childcare industry, which also serve as a first-stage channel underpinning mothers' labor market responses.⁵ Following the EHS rollout, the number of childcare establishments increased by 9.4 percent and industry employment by 14.5 percent, indicating

³I have addressed other identification assumptions such as no contemporaneous shocks or anticipation effect in the research design section.

⁴Administrative data on EHS rollout has exact location of the program. For childcare industry outcomes, I prefer county level analysis because it is more granular. The most granular information consistently available during the study period in CPS-ASEC data is at the metropolitan area level.

⁵Because micro data on enrollment is not available, which may be considered ideal, I have to rely on county level outcomes for first stage analysis.

greater utilization of childcare services. The wages in childcare industry also rise by 1.6 percent. However, center based childcare cost also rises for non-subsidized families.

I find that maternal labor force participation rate increases by 4.6 percentage points, with similar gains for single mothers (4.7 pp) but markedly larger for those who are low educated (6.6 pp). The increase in employment exhibit similar pattern: 4.2 percentage points for the overall sample and relatively larger increase for single (4.5 pp) and low-educated (5.2 pp) mothers. The usual weekly working hours increase 13.5 and 19 percent for the overall sample and low-educated mothers, respectively, but do not change significantly for single mothers. The average wage earnings rise by 6.6 percent for the overall sample and 16 percent for low-educated mothers, but decline by 15 percent for single mothers. However, household income rises for all groups: 7.8 percent for the overall sample, 10.9 percent for single, and 13.1 percent for low-educated mothers. Further heterogeneity analysis reveal that EHS effects are larger for mothers with multiple young children and those from non-white and non-hispanic backgrounds. Finally, for fathers of children under age three, EHS rollout increases labor force participation rate (1.6 pp), employment rate (1.4 pp), weekly working hours (9 percent), and wage earnings (14.4 percent). Within fathers, effects are driven largely by those with multiple children under age five.

This paper makes several contributions to the existing literature. First, it enriches the growing literature evaluating labor market effects of public ECE programs. While the existing literature focuses on policies targeting children above age three such as head start, universal pre-kindergarten, and full-time kindergarten (Gibbs et al., 2025; Humphries et al., 2024; Jackson et al., 2025; Wikle and Wilson, 2023), I explore how publicly funded ECE program for children under age three impacts labor market outcomes.⁶ This is important for a number of reasons. Childcare constraints are most binding for mothers with infants and toddlers due to higher prices and limited availability (Center for American Progress, 2019; Child Care Aware of America, 2022). Children at these ages need continuous full-time supervision, which likely limits access to informal care substitutes. The labor force participation rate is also lowest for mothers who have children under age three (Figure 1a). Because mothers' labor supply on the extensive margin is more elastic around childbirth, EHS's focus on children under age three can facilitate continuous employment, lengthen the lifetime work horizon, and incentivize human capital accumulation, thereby helping to reduce the child penalty and gender inequality (Bertrand et al., 2010; Goldin, 2006; Goldin and Mitchell, 2017; Kleven et al., 2019).

Second, it adds to evidence that subsidized ECE programs serve as an active labor market intervention that enables low-income mothers to achieve economic self-sufficiency, distinguishing such programs from traditional income transfer programs (Blau and Tekin, 2007; Gelbach, 2002; Herbst, 2010; Schiman, 2022; Wikle and Wilson, 2023). This may directly reduce welfare receipts and increase tax revenue. In addition, it can also increase income-based investments in young children from disadvantaged back-

⁶To the best of my knowledge, this is the first study to explore labor effects of a public ECE program focused solely on children under age three.

ground (Gensowski et al., 2024; Løken et al., 2012), for whom alleviating financial constraints may yield the largest improvement in developmental outcomes (Currie and Almond, 2011). Additionally, I find positive effects on fathers’ labor supply, resulting in a much larger increase in household income. While some studies also show that more employment can have negative effects on child development (Baker et al., 2008; Brooks-Gunn et al., 2010), the family-centered design of the EHS program mitigates such concerns, resulting in better parenting practices and comprehensive progress in child development in the short run (Love et al., 2002) as well as improvement in long-term educational outcomes (Hess, 2025). Overall, this indicates that EHS is a powerful instrument for empowering women, enhancing family welfare and promoting intergenerational mobility.

Third, it presents evidence on the supply-side effects of EHS. Previous studies exploring similar Head Start program focus solely on maternal outcomes (Schiman, 2022; Wikle and Wilson, 2023). By expanding capacity and raising wages, EHS may help stabilize childcare industry otherwise characterized by chronic under-supply, high staff turnover and minimum wages (Brown and Herbst, 2023; Malik et al., 2018). Increases in wages may also attract more qualified workers, thereby improving quality of childcare services (Brown and Herbst, 2023). However, these improvements come with a modest increase in childcare cost for non-subsidized families. This may raise affordability challenges for families just above the thresholds. By documenting these spillover effects, this paper demonstrates that evaluating public ECE programs solely through participant outcomes substantially understates their economic impact and distributional consequences.

Finally, it uses a *novel* variation to provide causal evidence on how EHS affects labor market outcomes.⁷ Despite EHS serving families when childcare constraints bind most, existing research has focused on children’s outcomes, leaving questions about labor market impacts unanswered. The variation in roll-out timing can be leveraged to examine impacts on child mortality, developmental milestones, educational attainment, human capital accumulation, criminal behavior, and intergenerational mobility—mirroring the rich literature evaluating Head Start’s long-term effects (Bailey et al., 2021; Currie and Thomas, 1995; Deming, 2009; Garces et al., 2002; Ludwig and Miller, 2007) but for even younger children.

The rest of this paper is organized as follows: Section 2 describes policy background and reviews previous evidence. Section 3 presents research design and section 4 layouts data sources. Section 5 discusses results from empirical analysis. Section 6 concludes.

2 Background

The EHS program was established in 1994 as an extension of federal Head Start initiative, originally created in 1965 as part of President Lyndon B. Johnson’s vision of The Great Society and War on Poverty

⁷(Hess, 2025) uses the same variation in EHS rollout to study impact on long run educational outcomes.

efforts. While the Head Start focused on preschool-aged children, EHS reflected a growing recognition that earliest years - prenatal through age three - are foundational for lifelong development. The shift was grounded in a robust body of developmental research, as synthesized in [Raikes et al. \(2013\)](#), showing that interventions during prenatal to age three significantly influence cognitive and linguistic ability, social and emotional development, and parenting and self-regulation. Advances in the field of epigenetics challenged the deterministic view presented in *The Bell Curve* ([Herrnstein and Murray \(1994\)](#)), which attributed socioeconomic success largely to inherited cognitive ability, by demonstrating that environmental factors can alter the gene expression and developmental trajectories ([Phillips and Shonkoff \(2000\)](#)). Home environment and parenting practices were found to be strongly associated with cognitive development ([Bradley et al. \(1989\)](#)), and early intervention programs for the disadvantaged were shown to improve maternal employment, education and mother-infant interaction ([Benasich et al. \(1992\)](#)). In this context, EHS program emerged as a targeted intervention aimed at leveraging early environments to promote positive developmental outcomes, counteracting the risks associated with poverty, and enhancing both individual wellbeing and social equity.

The first EHS grants were given in September of 1995; however, some Head Start programs were providing services to children under three before the implementation of EHS⁸. The program was expanded to full-day and full-year services in October of 1998 and has since been reauthorized in 2007. Another major expansion occurred in 2009, when the American Reinvestment and Recovery Act (ARRA) added more than 64,000 slots to Head Start and Early Head Start programs. Figure 2 illustrates that by 2005, about 600 counties had implemented an EHS program, and this number grew to around 900 counties by 2018. Approximately 1,600 grantees operate these programs, collectively serving 170,000 funded enrollees in 2018 ([Lynch \(2019\)](#))⁹. Building on the aforementioned scientific evidence, EHS offers family-centered services for low-income families with infants and toddlers to promote child development, parental role fulfillment, and movement toward self-sufficiency ([U.S. Congress \(1994\)](#)).

The EHS is a means-tested program and follows the same eligibility requirements set for the Head Start program. Children and pregnant women are eligible if household income is below federal poverty level, if household receives public assistance, or if child is homeless or in foster care ([Lynch \(2019\)](#)). Each program may have up to 35% children with household income between 100% and 130% of poverty line, while 10% of the children may exceed income limits altogether. In addition, programs must ensure that at least 10% of the enrollment slots are allocated to children with disabilities ([U.S. Department of Health and Human Services \(2020\)](#)). One of the goals of EHS is to connect families with other means-tested programs like Head Start and Medicaid. Although PIR data does not specify how many EHS children later enroll in Head Start, it does show that a majority of participating families meet income eligibility

⁸Most of these programs had relatively small number of under three children. One potential explanation for the existence of these programs is large expansion in Head Start funding since late 1980's as documented in [Wikle and Wilson \(2023\)](#).

⁹There are 170,000 funded enrollment slots. Total number of enrolled children is usually higher due to turnover. For example, as per PIR data, total enrollment in 2018 is more than 213,000.

criteria and use Medicaid. Combined with the program’s means-tested design, this suggests that EHS primarily serves socioeconomically disadvantaged population. This gives credence to this study’s focus on potentially high-impact subsamples of low-educated and single mothers.

The EHS offers center-based, family-based, and home-based options, and is administered by a mix of public agencies as well as private nonprofit and for-profit organizations. To receive funding, grantees demonstrated the need by providing location, population, service delivery options, organizational capacity, and justification for the budget ([Office of Head Start \(2025\)](#)). Since 2011, grants have been awarded on a five-year cycle, during which grantees must deliver high-quality services to avoid re-competition—a process that approximately one-third of grantees underwent between 2011 and 2016 ([Lynch \(2019\)](#)). Figure 3 shows that this application process has resulted in a scattered rollout at the county-level. As documented in [Hess \(2025\)](#), counties where Head Start programs were already offering services to under three applied earlier and counties with newer EHS programs applied later on.

Publicly funded early childhood care and education (ECE) programs can change mothers’ labor supply as well as outcomes in the childcare industry. Lower cost and increased availability of childcare facilitates the substitution of maternal care with formal care, thereby likely increasing maternal labor supply ([Kimmel \(1998\)](#); [Morrissey \(2017\)](#)). The accommodation model of childcare choice posits that mothers face a tradeoff between employment and family demands, while simultaneously contending with financial and social constraints ([Meyers and Jordan \(2006\)](#)). Therefore, welfare programs that lower costs associated with work are particularly beneficial for disadvantaged mothers, who often strive to be both primary caregivers and household providers ([Edin and Lein \(1997\)](#); [Gelbach \(2002\)](#); [Herbst \(2010\)](#)). Evidence from the Head Start program also finds upstream effects on maternal labor market outcomes, especially for single mothers ([Schiman \(2022\)](#); [Wikle and Wilson \(2023\)](#)). Economic literature evaluating causal impact of subsidized ECE programs on childcare industry is relatively scant. Household subsidies provided through the Child Care Development Fund (CCDF) in Minnesota produced a significant increase in childcare capacity, accompanied by a modest rise in prices ([Lee et al. \(2024\)](#)), whereas direct assistance to childcare providers resulted in higher employment and wages, along with a reduction in prices ([Council of Economic Advisers \(2023b\)](#); [Herbst \(2018\)](#)).

Although the EHS program has existed for over three decades, there remains a surprising lack of rigorous causal research on its effects. To fulfill the congressional mandate for ongoing research and evaluation of the program, the Administration for Children and Families (ACF) funded the Early Head Start Research and Evaluation (EHSRE) project. The EHSRE investigated the program’s impact on children and families in three waves: the Birth-to-Three phase (1996-2001), the Pre-Kindergarten follow-up phase (2001-2004), and the Elementary School follow-up phase (2005-2010) ([Administration for Children and Families \(2024a\)](#)). The original project included 17 earliest treated program sites across the US and randomly assigned 3001 families in either EHS or in the control group. The most

notable study evaluating Birth-to-Three phase is [Love et al. \(2002\)](#), which reports significant improvement in cognitive, language, and social-emotional development of children. Importantly, parents also made progress toward self-sufficiency, with significant increases in participation in education and job training, and emerging impacts on employment by the end of study period. Overall, the effects were larger for Black families and those facing a higher number of demographic risk factors. The Pre-K follow-up finds that a number of the impacts seen at age 3 persisted when children were about age 5, with larger benefits for children and families who participated in formal programs after the EHS ([Administration for Children and Families \(2024b\)](#)). Finally, the elementary school follow-up revealed that Early Head Start (EHS) did not sustain broad impacts for the overall sample; however, subgroup analyses indicated lasting positive effects on children’s social-emotional development and parenting among Black families, as well as higher educational attainment among Hispanic mothers ([Vogel, Xue, Moiduddin, Carlson, and Kisker \(Vogel et al.\)](#)). In addition to EHSRE, a recent working paper explores the impact of county-level rollout of EHS on long-run outcomes, and finds that exposure to EHS increased cohort’s college attendance by 1.7% and college graduation by 4% ([Hess \(2025\)](#)).

Given its size and geographic spread, the EHS has received far less attention relative to comparable ECE programs. There is virtually no published work using its staggered rollout design to identify causal effects. The EHSRE studies are based on small sample size and experiment design artificially restrict substitution alternatives, which raises concerns about external validity. Moreover, these studies have limited focus on maternal labor market outcomes and impacts on the childcare sector are completely ignored. This study fills these gaps in literature by exploiting novel variation in the rollout of EHS to identify causal impacts on maternal labor supply and childcare sector outcomes.

3 Research Design

The EHS has staggered rollout as shown in [Figure 2](#). Recent literature has demonstrated that classical two-way fixed effects (TWFE) estimators yield biased results when treatment effects are heterogeneous and dynamic — features commonly observed in staggered rollout designs ([De Chaisemartin and d’Haultfoeuille \(2020\)](#); [Goodman-Bacon \(2021\)](#); [Sun and Abraham \(2021\)](#)). Therefore, I use the difference-in-differences estimator provided by [Callaway and Sant’Anna \(2021\)](#), which avoids problems associated with TWFE. Following is the event study regression specification:

$$Y_{imt} = \alpha_m + \lambda_t + \sum_{\tau \neq -1} \beta_\tau \cdot \mathbf{1}(t - g_m = \tau) + \varepsilon_{imt} \quad (1)$$

where Y_{imt} is outcome i in metropolitan area m in year t . The α_m and λ_t are metropolitan area and year fixed effects, respectively. The g is group of metropolitan areas with same first year of treatment and τ is the event time which is measured as difference between the current year (t) and the year a

metropolitan area is treated first time (g_m). The event time $\tau = -1$ serves as the reference period and is therefore excluded. As never-treated metropolitan areas may have systemic differences with treated ones, I do comparison with not-yet treated metropolitan areas because it utilizes more information and also more likely to serve a valid counterfactual. This method first estimates multiple group-time average treatment effects i.e. the average treatment effect for group g at time t , which results in a set of event study estimates for each treatment timing group g . The intent-to-treat (ITT) coefficient of interest β_τ is then obtained by taking vertical weighted average of these group specific event study estimates for each event time τ . Specifically, β_τ captures the average difference in maternal outcomes between treated and not-yet-treated metropolitan areas, measured τ years relative to rollout of EHS program. All regressions are weighted by individual probability weights provided in ASEC-CPS. To address potential correlation in errors among individuals within the same metropolitan area, standard errors are clustered at the metropolitan area level.

I use similar research design to estimate the impact of EHS rollout on childcare sector outcomes. Although micro data is not available, both QCEW and NDCP offer county level information, which still provides more granularity as counties are usually smaller than metropolitan areas. Standard errors are also clustered at the county level.

Table 1 presents summary statistics for treatment and control counties in 1990 using U.S. Census data. Both groups have statistically significant differences on most of the baseline characteristics. The most notable difference is that treatment counties have substantially larger populations than control counties. This is expected as grantees must identify target population to receive funding, and counties with larger populations are far more likely to have these populations and receive EHS program. Treatment counties also have more single women and higher female labor force participation rate. This raises concerns that the timing of treatment may be endogenous, potentially threatening identification if EHS was rolled out earlier in counties with higher underlying demand for ECE services.

However, the validity of my research design rests on parallel trends assumption rather than on equivalence in baseline levels. A threat to identification will arise if treatment timing is determined by different trends in outcome variables or confounders. For example, grantees can use rising female labor force participation to justify need for the EHS services. The choice of not-yet treated comparison group helps in allaying some of these concerns as each treatment cohort has a different set of controls comprising of never-treated and not-yet treated geographies. However, observing parallel trends in the pre-treatment event study coefficient is necessary, but not sufficient, condition to claim any effect as causal.

Another possible threat to identification is the presence of contemporaneous shocks. The timing of initial EHS rollout coincides with Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA), a major reform of the U.S. tax and welfare system. The existing evidence shows that

these reforms increased female labor supply, especially for single mothers and those with children under age three (Meyer and Rosenbaum (2001); Micheltore and Pilkauskas (2021)). However, a contemporaneous shock such as PRWORA that simultaneously affects both treatment and control groups does not compromise the validity of the identification strategy. Moreover, well-spread staggered rollout and use of not-yet treated areas as comparison help mitigate any concerns even if the shock has differential impact on treatment and control groups. Another possible category of confounding shocks is the rollout of publicly funded programs which may serve as a substitute to EHS. However, unlike Head Start which has over time more competing public pre-school offerings (Cascio and Schanzenbach (2013)), there has been no rollout of any significant public ECE program for children under three which may serve as a substitutes to EHS.

Finally, EHS experienced a large geographic expansion in 2010 as American Recovery and Reinvestment Act (ARRA) added more than 64,000 slots to Head Start programs (Figure 2). Because this expansion was an emergency response during a period of economic distress and high unemployment, these newly treated geographies may have systemic differences from earlier treated ones. Apart from posing threat to identification, these newly treated geographies may have differential impact on outcomes of interest. Therefore, I perform sensitivity analysis by estimating results with and without ARRA-induced expansion.

4 Data

EHS rollout data is obtained from Performance Indicator Reports (PIR), which are managed by the Head Start Enterprise System - an administrative body under the Office of Head Start within the U.S. Department of Health and Human Services (HHS). The PIRs contain detailed grantee level data on enrollment, staff and services from 1988 onward. Although EHS began funding in 1995, some Head Start programs had been providing services similar to EHS model even before its official implementation. This study assigns treatment if official EHS program exists¹⁰. To avoid confounding effects from the COVID-19 shock, the analysis is restricted to programs that began prior to 2019. As PIRs provide precise program location data, it can be linked with the corresponding county or metropolitan area. Hence, this data enables the construction of the relevant treatment variable used in the analysis.

For maternal labor market outcomes, I use CPS Annual Social and Economic Supplement (CPS-ASEC) data from 1988 to 2018. The smallest geographic unit available in the CPS is metropolitan area. To ensure geographic consistency despite boundary changes over time, I use 1990 Census county-to-metropolitan area crosswalk to aggregate EHS rollout data to geographically consistent metropolitan areas. The overall sample comprises 286 metropolitan areas, of which 239 received EHS programs

¹⁰Supplementary results, in which treatment is defined based on the presence of any EHS-like program even prior to its official rollout, are presented in the appendix.

and 47 remained untreated, and includes 142,007 mothers with age-eligible children. However, some treated metropolitan areas have only a few post-treatment years (Figure 5). To avoid compositional bias from metropolitan areas entering or exiting the sample, I restrict the main analysis to metropolitan areas observed for at least nine years post-treatment. The CPS-ASEC does not provide any direct measure of EHS eligibility. Although PIRs show a large majority of enrolled children are income eligible, other reports indicate that 30-50% recipients in similar Head Start program are not income-eligible (Besharov and Morrow (2007)). Income is also potentially endogenous, so I do not use it to impute program eligibility. Instead, I rely on observable characteristic to find out potentially eligible households. Consistent with prior literature on the impact of Head Start program (Wikle and Wilson (2023)), I find that both education and marital status are strong predictors of poverty status - the primary criterion for EHS eligibility. Among age-eligible mothers, having a high school education or less is associated with a 33% higher probability of falling below the 100% poverty threshold, while being single¹¹ increases this probability by 45%. Given that low education and single motherhood are strongly associated with poverty, the study focuses on these potentially high-impact subsamples, comprising 61,570 mothers with high school or less education and 37,749 single mothers. Both of these groups have significant overlap as 24,067 (approximately 64%) single mothers also have high school or less education. Accordingly, I anticipate a relatively larger and statistically significant impact for these mothers.

The main outcome of interest is the extensive margin of labor force participation, which is equal to one if mother is participating in the labor force, and zero otherwise. Another outcome of interest is the extensive margin of employment, defined equal to one if mother is employed, and zero if not. I also explore the intensive margin of labor supply by constructing outcomes such as total hours worked during the previous week, usual weekly hours worked over the last year, number of weeks worked in the last year, and binary indicators for full-time and part-time work during the last year. Additionally, I examine the welfare impact of EHS by looking at income, poverty status and receipt of welfare benefits like food stamp and medicaid.

To analyze the impact on the childcare industry, I use county-level annual averages¹² from Quarterly Census of Employment and Wages (QCEW) spanning 1990 to 2018. The data has 874 counties with an EHS program. The outcomes of interest include average real annual pay¹³, employment level and number of establishments in the childcare industry. Because of the lack of individual level data on childcare utilization for under three children, the impact of EHS on childcare industry also serves as first-stage for secondary effects such as maternal labor market outcomes.

To examine the impact of the EHS rollout on the cost of childcare services, I utilize the National

¹¹Single marital status category includes all mothers except those married with a spouse present. Specifically, it encompasses those who are never-married, separated, divorced, widowed, or married with a spouse absent.

¹²I use county-level data as it is more granular compared to metropolitan area. Because childcare services are highly correlated with seasonal variation, I am using annual averages instead of quarterly numbers to avoid seasonality.

¹³I use the annual Consumer Price Index (CPI) to adjust nominal wages to real wages, expressed in 2018 dollars.

Database of Childcare Prices (NDCP), a comprehensive federal dataset maintained by the U.S. Department of Labor that provides county-level information on childcare prices. Because NDCP began in 2008 and this analysis is limited to pre-Covid period, the data span 2008 to 2018. Out of 882 treated counties, only 273 began EHS rollout after 2008. The main outcomes of interest are weekly full-time median price for infants (0-23 months), toddlers (24-35 months), and preschoolers (36 months - school age) in both center and family based settings. The EHS rollout may also affect childcare cost for children not under three. Therefore, I estimate the effect on childcare prices for preschool and school age children. Additionally, I use the 75th percentile instead of the median price to detect the impact of EHS rollout if it is concentrated among high cost settings.

5 Results and Discussion

Impact on Childcare Industry Outcomes: Figure 6 shows that net effect of EHS on childcare industry in ex ante ambiguous. While this makes estimating the general equilibrium effects of EHS on childcare sector outcomes valuable in its own right, this analysis also serves a critical role in validating a key assumption underlying the study of maternal labor market outcomes i.e., EHS led to increased enrollment of under three years old children in ECE settings. Due to the lack of micro-level enrollment data,¹⁴ I rely on county-level annual averages from Quarterly Census of Employment and Wages (QCEW) to assess program impact. Specifically, I compare treated counties to not-yet treated counties to estimate the impact of EHS rollout on the log of average employment level, the log of number of establishments, and the log of real wages in the childcare industry. The event study estimates for these outcomes are presented in Figure 7.

The EHS rollout is associated with a 9.4 percent growth in the number of establishments in the childcare industry, corresponding to approximately 5.5 additional establishments relative to a baseline of 58. The increase in the number of establishments alone does not necessarily indicate an expansion of the childcare industry, as it could reflect a shift toward smaller-sized providers rather than overall growth in capacity. However, the average employment levels in the childcare industry also increased by 14.5 percent, representing an increase of about 98 employees from a baseline of 675. This shows that EHS actually increased average establishment size in childcare industry as percentage increase in employment level is greater than the percentage change in number of establishments. It is natural to expect that higher labor demand from EHS induced expansion may put upward pressure on wages in the childcare industry. I find supporting evidence that real wages increased by 1.6 percent, corresponding to an annual gain of approximately \$302 relative to the baseline wage of \$18,886. Overall, these results suggest that

¹⁴Recent literature evaluating Head Start programs (Wikle and Wilson (2023)) has used CPS October education supplement to study impact on enrollment. However, this provides enrollment information for children age 3 and above. There is no survey which consistently provides micro-level enrollment information for children under three years old with county/metropolitan area identifiers.

EHS rollout contributed to an expansion of the childcare industry, accompanied by increase in wages.

A common concern is that publicly funded ECE programs like EHS may lead to higher childcare prices for non-subsidized families. I estimate change in log of childcare prices in treated counties relative to not-yet treated counties using National Data of Childcare Prices (NDCP) from 2008 to 2018. I find a general positive trend in weekly full-time childcare prices for infants, toddlers, and preschoolers in center based settings (8). The median childcare price rises for infants and preschoolers by 4.4 and 3.2 percent, respectively.¹⁵ The 75th percentile childcare price rises by 5.1 percent for infants, 4.3 percent for toddlers, and 5 percent for preschoolers.¹⁶ The impact on weekly full-time childcare prices in family based settings is relatively small and statistically insignificant for all age groups. These results are unsurprising for several reasons. First, EHS is primarily a center-based program and has negligible enrollment with family childcare providers (National Head Start Association, 2022); therefore, larger and significant effects only for center-based settings is expected. Second, the U.S. Department of Health and Human Services generally recommends setting reimbursement rate for providers at least 75th percentile of market rates. This effectively shifts demand toward the highest cost quartile of providers, thereby increasing the 75th percentile price more than the median. Third, higher quality standards¹⁷ and competition for staff can increase operational cost for providers. Fourth, some eligible families may demand additional private care to "wrap-around" EHS benefits e.g., care for uncovered hours or child, thereby putting upward pressure on prices. Finally, given the childcare is very labor-intensive, rise in childcare prices is consistent with the evidence on wage growth in childcare industry.

Impact on Labor Market Outcomes for All Mothers: Figure 10 reports event study estimates of the EHS impact on labor market outcomes for all mothers with age-eligible children in treated metropolitan areas relative to their counterparts in not-yet treated metropolitan areas. The EHS rollout is associated with a 4.6 percentage point increase in the labor force participation. From the baseline of 59.7 percent for treated metropolitan areas, this corresponds to a 7.7 percent increase in labor force participation rate.¹⁸ Employment increases by 4.0 percentage point, 0.6 percentage point less than labor force participation, equivalent to a 7.2 percent gain from the baseline of 55.4 percent. The log weekly working hours also rise by 13.1 percent, a jump of 2.1 hours relative to the baseline average 16.1 hours. Consistent with the higher labor supply, mothers' wage earnings grow by \$827 (6.6 percent relative to the baseline average of \$12775). Finally, household income rises by \$4020 (7.8 percent) from the baseline average of \$51786. Overall, these findings suggest that substitution effects from EHS subsidy exceed income effect, resulting in higher labor supply and earnings. As pre-treatment event study estimates exhibit no differential trends, post-treatment effects can be interpreted as plausibly causal. Event studies

¹⁵Price for preschoolers significant at the 10 percent level.

¹⁶Price for toddlers is significant at the 10 percent level.

¹⁷Programs like EHS often mandate higher quality standards such as high staff qualifications and lower child to caretaker ratios, thereby directly increasing operational cost for providers.

¹⁸I use the same baseline for all comparisons. To avoid excessive repetition, I simply refer to it as baseline.

for women with no children and at most high school education are presented as robustness check. Consistent with the expectations, their estimates generally remain flat and close to zero in both pre-treatment and post-treatment periods, suggesting no impact of EHS on labor market outcomes. This further reinforces validity of the results presented above. Overall, these findings suggest that substitution effects from EHS subsidy exceed income effect, resulting in higher labor supply and earnings.

These event studies reveal some interesting patterns. First, there is a general upward trend in treatment effect. This is consistent with the gradual increase in average treatment intensity (Figure 4). Second, the treatment effects appear a few years after the EHS rollout. This is inline with delayed effects on employment found in Early Head Start Research and Evaluation (EHSRE) Project (Love et al., 2002) and can also be explained by initially low average treatment intensity. Third, the impact on household income is significantly larger than on wages, suggesting income benefits of EHS go beyond mothers.¹⁹ Finally, household income also rises for women without children, though smaller than for mothers with age-eligible children, potentially reflecting shared caregiving of eligible children within households or positive general equilibrium effects of EHS.

Heterogeneity in Impact of EHS on Maternal Labor Market Outcomes: Economic theory predicts that a means-tested program like EHS would have larger labor market effects for mothers from disadvantaged backgrounds. Figure 11 presents impact of EHS on labor market outcomes for two such groups comprising single and low educated mothers. Labor force participation rate rises for low educated and single mothers by 6.6 percentage points (13.2 percent from the baseline of 50 percent) and 4.7 percentage points (7.8 percent from the baseline of 60 percent), respectively. Employment rate rises by 5.2 percentage points for low-educated mothers (11.8 percent from the baseline of 0.44) and 4.5 percentage points for those who are single (8.8 percent from the baseline of 52 percent).²⁰ Weekly working hours increase by 19 percent for low educated mothers (3.4 hours from baseline of 17.7 hours) but there is no statistically significant effect for single mothers. Overall, labor supply responses are significantly larger for low-educated mothers compared to single mothers. These effects are plausible because on average low educated mothers have 12.8 percentage points lower labor force participation rate relative to single mothers (Figure 1), making them more susceptible to experience positive extensive margin effects and less likely to have negative infra-marginal effects. Low educated mothers also have roughly 70 percent lower wage earnings compared to single mothers,²¹ making them more likely to be eligible for EHS services. Moreover, low income mothers may face more binding childcare constraint and experience “welfare cliffs” where working actually reduces net income. Free childcare through EHS reduces this barrier to labor market entry most for low educated mothers.

¹⁹Mothers total income, which includes non-wage income, has similar effect as wage income. So, change in mothers’ non-wage income can not explain the difference between there wage and household income.

²⁰Employment effect for single mothers is significant at the 10 percent level.

²¹Average wage income is \$5600 for low educated mothers and \$9460 for single mothers. So, the exact difference is $(9460 - 5600)/5600 = 0.69$. Even conditional on employment, wage earnings for single mothers are 42 percent (\$4700) higher compared to low-educated mothers.

The impact on income outcomes is less straightforward. While wage earnings rise by \$685 for low educated mothers (16 percent increase from the baseline of \$4288), they decline by \$822 for single mothers (15 percent decrease from the baseline of \$5503). The lack of significant effect on weekly working hours, despite significant increase in labor force participation and employment, suggests increase in part-time employment for single mothers that may put downward pressure on wages.²² Single mothers have high baseline labor force participation, so many would work even without EHS despite low incomes. Following EHS rollout, they may strategically reduce their work hours to qualify for free childcare while still achieving higher net return to work. This is especially true if leisure is a normal good. Another potential explanation is growing underreporting of income by single mothers following welfare reform in late 1990s (Han et al., 2021). However, despite decline in wage income, household income for single mothers increases by \$2213 (10.9 percent increase from the baseline of \$20,321), suggesting positive spillover effects of EHS for other household members. Likewise, household income for low educated mothers increases by \$2649 (13.1 percent from the baseline of \$20,217).

The number of young children is another potential sources of heterogeneity in treatment effects. Figure 12 shows that labor supply responses are consistently larger for mothers with multiple children under age five compared to mothers with only one child under five. This pattern aligns with baseline differences in labor force participation: mothers with multiple young children exhibit approximately 27 percent lower participation rates than mothers with only one child under five.²³ This baseline gap indicates substantially larger room for improvement on the extensive margin of labor supply for mothers with multiple young children. This also suggests that mothers with multiple young children face more binding work-family constraints, including greater demands for family time and higher total childcare cost, that elevate their reservation wages and prevent labor force entry entirely. Under these circumstances, free childcare through EHS can generate substantial responses even when providing only partial cost relief. For mothers whose reservation wages marginally exceed market wages, EHS may provide sufficient cost reduction to make work profitable and trigger labor force participation. Consistent with the previous findings, while wage income effects remain subdued, household income rises approximately 11 percent relative to baseline levels for mothers regardless of the number of young children.

Given the widespread racial disparities, it is natural to explore how race determines differences in treatment effects. Figure 13 demonstrates that impact of EHS on maternal labor supply is generally larger for non-white mothers compared to white mothers.²⁴ As baseline labor force participation rate is similar for both white and non-white mothers, it can not explain heterogeneity in treatment effects.

²²Indeed, part-time employment for single mothers increases by 5.5 percentage point, approximately 17.9 percent from the baseline of 30.8 percent. The results are provided in the Appendix.

²³Baseline labor force participation rates are 64.4 percent for mothers with one child under five and 50.7 percent for mothers with multiple children under age five, yielding a difference of $(64.4 - 50.7)/50.7 = 0.27$.

²⁴The effect on weekly working hours is insignificant for non-white mothers. However, given that parallel pre-treatment trend assumption is clearly violated, it can not be reliably interpreted as causal. Moreover, small sample size for non-White mothers make their event study estimates more noisy.

However, non-white mothers have 34 percent less household income and roughly double poverty rate compared to white mothers, making them more likely to meet EHS eligibility criteria.²⁵ Moreover, EHS programs are likely to be located in high poverty areas that makes larger effects for non-white mothers even more plausible. Finally, overall income effects are driven largely by non-White mothers, whose wage income rises by about 31 percent and household income by 27 percent.

Another interesting comparison is hispanic and non-hispanic mothers. While hispanic mothers also have high baseline poverty rate (47 percent compared to 16 percent for non-hispanic mothers) and low household income (\$22,308 compared to \$39,019 for non-hispanic mothers), they don't experience any significant increase in labor supply (Figure 14). In fact, all labor force participation, employment and weekly working hours initially decrease and then gradually rise back to baseline levels. This suggests that income effect from childcare subsidy is dominant for hispanic mothers, at least initially, thereby causing decline in their labor supply. The overall null effect on labor supply is consistent with the fact that hispanic families disproportionately reside in childcare deserts (Malik et al., 2018), which suggests that EHS programs may not be located around hispanic neighborhoods. However, because parallel pre-treatment assumption is not satisfied, it is not possible to claim these effects as causal.²⁶

Impact on Labor Market Outcomes for Fathers: While the existing literature predominantly examines maternal labor supply responses to subsidized childcare interventions, these programs may generate spillover effects on paternal employment outcomes. The relaxation of childcare constraints could facilitate fathers' transitions from part-time to full-time employment and potentially induce labor force entry among previously non-participating fathers. Furthermore, above mentioned empirical findings reveal that household income gains consistently exceed increases in maternal wage earnings, suggesting that fathers experience substantial positive income effects from EHS participation. This pattern indicates that labor market effects of EHS extend beyond mothers to encompass broader household-level labor market adjustments, with fathers potentially contributing to the observed income gains through increased work intensity, occupational mobility, or wage growth.

The empirical analysis reveals significant increase in paternal labor supply, though less than mothers (Figure 15).²⁷ The 9 percent increase in working hours is much larger than approximately 1.6 percentage points increase in labor force participation and 1.4 percentage points increase in employment.²⁸ This suggests that EHS increased fathers' work intensity more than their labor market entry.²⁹ Consistent with expectations, \$3,046 rise in fathers' wage earnings (14.4 percent from the baseline of \$23,731) is much

²⁵Baseline household income is 36,022 for white mothers and 26,876 for non-white mothers, yielding a difference of $(36022 - 26876)/26876 = 0.34$. Poverty rate for non-white mothers is 36 percent compared to 18.6 percent for white mothers.

²⁶Moreover, the pre-treatment trend is not strictly linear so it is not possible to adjust for the linear pre-treatment trend as I did for childcare prices.

²⁷Fathers' labor supply event studies suggest some anticipation effect and labor supply initially has declining trend, though still above baseline level, which needs further investigation.

²⁸Fathers' baseline labor force participation and employment rate is 95 and 91 percent, respectively. The baseline average for weekly working hours is 37.9, so 9 percent increase represent additional 3.4 hours per week.

²⁹There is no significant effect on fathers' hourly wage rate.

larger than \$827 rise for mothers (6.6 percent from the baseline of \$12,775), thereby providing explanation for large increase in household income. Within fathers, labor market effects are driven largely by those with multiple young children (Figure 16). Families with multiple young children experience greater financial pressure from direct costs and foregone earnings, increasing the marginal utility of additional income and making fathers more responsive to opportunities for increased labor market participation. The presence of multiple children also create threshold effects, where caring for even one fewer child may push the net return to work above reservation wage and increase labor market entry.

These findings provide evidence of intra-household spillover effects in childcare programs, demonstrating labor market gains from EHS go beyond mothers. Positive paternal labor supply response shows that EHS functions as a comprehensive family investment program, with important implications for cost-benefit analyses. This is also in line with the findings that EHS raises cognitive development of children, reduces depression, and improves home environment and parenting practices (Love et al., 2002), all of which can increase labor supply by both mothers and fathers. From policy perspective, documenting these effects would strengthen the economic case for early childhood investment by revealing a broader set of beneficiaries than previously recognized. Programs that enable coordinated increases in both parents' labor market participation through complementary rather than substitution effects may have larger aggregate welfare implications than those affecting only mothers.

6 Conclusions

This paper shows that EHS has successfully achieved its stated objective of parents' economic self-sufficiency. There is a significant increase in maternal labor force participation and employment rate, largely driven by low educated mothers. Further heterogeneity analysis reveals that these effects are more pronounced for mothers with multiple young children. Racial comparison reveals larger effects for non-white and non-hispanic mothers. In general, labor supply responses are driven by mothers who have low baseline labor force participation rate and high poverty rate. Across all groups, household income increases substantially more than mothers' wage earnings, suggesting positive spillover effects of EHS on other household members. Consistent with this expectation, I find a significant increase in fathers' labor supply, particularly for weekly working hours, and wage earnings. In addition, EHS rollout expands childcare capacity and raises workers' wages, with a modest increase in childcare cost for non-subsidized families.

Collectively, this evidence demonstrates that EHS operates as a comprehensive two-generation intervention that generates economy-wide benefits extending far beyond its primary beneficiaries. The program not only improves maternal labor market outcomes, but also creates positive spillover effects on paternal labor supply that amplify family economic gains. General equilibrium effects on childcare

industry outcomes reveal that EHS is a strong instrument to stabilize an otherwise precarious industry characterized by high turnover rate and minimum wage workers. The magnitude and breadth of these impacts underscore the potential for well-designed early childhood interventions to promote economic mobility and reduce child penalty, especially for disadvantaged mothers. Indeed, we need programs like EHS to finish the "quiet revolution".

References

- Office of Head Start (2025, February). Grant application: Understand the review process. Web page. Last updated February 11, 2025.
- Administration for Children and Families (2024a). Early head start research and evaluation project (ehsre), 1996–2010.
- Administration for Children and Families (2024b). Prekindergarten follow-up study: Outcomes for early head start participants. Research report, U.S. Department of Health and Human Services, Administration for Children and Families. OPRE Report.
- Bailey, M. J., S. Sun, and B. Timpe (2021). Prep school for poor kids: The long-run impacts of head start on human capital and economic self-sufficiency. *American Economic Review* 111(12), 3963–4001.
- Baker, M., J. Gruber, and K. Milligan (2008). Universal child care, maternal labor supply, and family well-being. *Journal of political Economy* 116(4), 709–745.
- Benasich, A. A., J. Brooks-Gunn, and B. C. Clewell (1992). How do mothers benefit from early intervention programs? *Journal of applied developmental psychology* 13(3), 311–362.
- Bertrand, M., C. Goldin, and L. F. Katz (2010). Dynamics of the gender gap for young professionals in the financial and corporate sectors. *American economic journal: applied economics* 2(3), 228–255.
- Besharov, D. J. and J. S. Morrow (2007). Nonpoor children in head start: Explanations and implications. *Journal of Policy Analysis and Management* 26(3), 613–631.
- Blau, D. and E. Tekin (2007). The determinants and consequences of child care subsidies for single mothers in the usa. *Journal of population economics* 20(4), 719–741.
- Blau, F. D. and L. M. Kahn (2013). Female labor supply: Why is the united states falling behind? *American Economic Review* 103(3), 251–256.
- Bradley, R. H., B. M. Caldwell, S. L. Rock, C. T. Ramey, K. E. Barnard, C. Gray, M. A. Hammond, S. Mitchell, A. W. Gottfried, L. Siegel, et al. (1989). Home environment and cognitive development in the first 3 years of life: A collaborative study involving six sites and three ethnic groups in north america. *Developmental psychology* 25(2), 217.
- Brooks-Gunn, J., W.-J. Han, and J. Waldfogel (2010). First-year maternal employment and child development in the first 7 years. *Monographs of the Society for Research in Child Development*, i–148.
- Brown, J. H. and C. M. Herbst (2023). Minimum wage, worker quality, and consumer well-being: Evidence from the child care market.

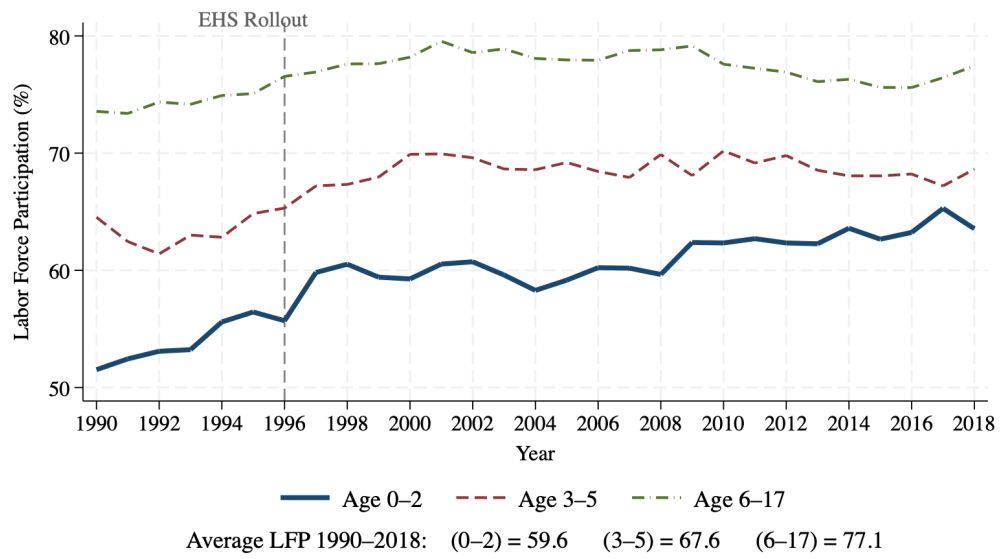
- Callaway, B. and P. H. Sant'Anna (2021). Difference-in-differences with multiple time periods. *Journal of econometrics* 225(2), 200–230.
- Cascio, E. U. and D. W. Schanzenbach (2013). The impacts of expanding access to high-quality preschool education. Technical report, National Bureau of Economic Research.
- Center for American Progress (2019, March). The child care crisis is keeping women out of the workforce. Technical report, Center for American Progress, Washington, DC. Accessed 1 Sep 2025.
- Child Care Aware of America (2022, October). Price of care: 2021 child care affordability. Technical report, Child Care Aware of America. Accessed 29 Aug 2025.
- Cooksey, K. and E. Thomas (2024). Childcare employment—before, during, and after the covid-19 pandemic. *Monthly Labor Review*.
- Council of Economic Advisers (2023a, November). Did stabilization funds help mothers get back to work after the COVID-19 recession? Working paper, Executive Office of the President, Council of Economic Advisers. Accessed 28 Aug 2025.
- Council of Economic Advisers (2023b, nov). Did stabilization funds help mothers get back to work after the covid-19 recession? White house report, Executive Office of the President of the United States.
- Currie, J. and D. Almond (2011). Human capital development before age five. In *Handbook of labor economics*, Volume 4, pp. 1315–1486. Elsevier.
- Currie, J. and D. Thomas (1995). Does head start make a difference? *The American Economic Review* 85(3), 341.
- De Chaisemartin, C. and X. d'Haultfoeuille (2020). Two-way fixed effects estimators with heterogeneous treatment effects. *American economic review* 110(9), 2964–2996.
- Deming, D. (2009). Early childhood intervention and life-cycle skill development: Evidence from head start. *American Economic Journal: Applied Economics* 1(3), 111–134.
- Edin, K. and L. Lein (1997). Work, welfare, and single mothers' economic survival strategies. *American sociological review*, 253–266.
- Fitzpatrick, M. D. (2010). Preschoolers enrolled and mothers at work? the effects of universal prekindergarten. *Journal of Labor Economics* 28(1), 51–85.
- Garces, E., D. Thomas, and J. Currie (2002). Longer-term effects of head start. *American economic review* 92(4), 999–1012.

- Gelbach, J. B. (2002). Public schooling for young children and maternal labor supply. *American Economic Review* 92(1), 307–322.
- Gensowski, M., R. Landersø, P. Dale, A. Højen, L. Justice, and D. Bleses (2024). Public and parental investments, and children’s skill formation. *Journal of Human Resources*.
- Gibbs, C., J. S. Wikle, and R. Wilson (2025). A matter of time? measuring effects of public schooling expansions on families. Technical report, National Bureau of Economic Research.
- Girouard, D. (2024). Federal relief funding for child care is over. now what? Policy & Advocacy blog.
- Goldin, C. (2006). The quiet revolution that transformed women’s employment, education, and family. *American economic review* 96(2), 1–21.
- Goldin, C. (2014). A grand gender convergence: Its last chapter. *American economic review* 104(4), 1091–1119.
- Goldin, C. and J. Mitchell (2017). The new life cycle of women’s employment: Disappearing humps, sagging middles, expanding tops. *Journal of Economic Perspectives* 31(1), 161–182.
- Goodman-Bacon, A. (2021). Difference-in-differences with variation in treatment timing. *Journal of econometrics* 225(2), 254–277.
- Han, J., B. D. Meyer, and J. X. Sullivan (2021). The consumption, income, and well-being of single mother-headed families 25 years after welfare reform. *National Tax Journal* 74(3), 791–824.
- Herbst, C. M. (2010). The labor supply effects of child care costs and wages in the presence of subsidies and the earned income tax credit. *Review of Economics of the Household* 8, 199–230.
- Herbst, C. M. (2018). The impact of quality rating and improvement systems on families’ child care choices and the supply of child care labor. *Labour Economics* 54, 172–190.
- Herrnstein, R. J. and C. Murray (1994). The bell curve: Intelligence and class structure in american life. *Nature* 372(6505), 417.
- Hess, A. J. (2025). *Think of the Children: The Role of Early Childhood Interventions in Long-Term Human Capital Formation*. Ph. D. thesis, University of California, Los Angeles. ProQuest ID: Hess_ucla.0031D.23893; Merritt ID: ark:/13030/m5k18tg7.
- Humphries, J. E., C. Neilson, X. Ye, and S. D. Zimmerman (2024). Parents’ earnings and the returns to universal pre-kindergarten. Technical report, National Bureau of Economic Research.
- Jackson, C. K., J. A. Turner, and J. Bastian (2025). Universal pre-k as economic stimulus: Evidence from nine states and large cities in the us. Technical report, National Bureau of Economic Research.

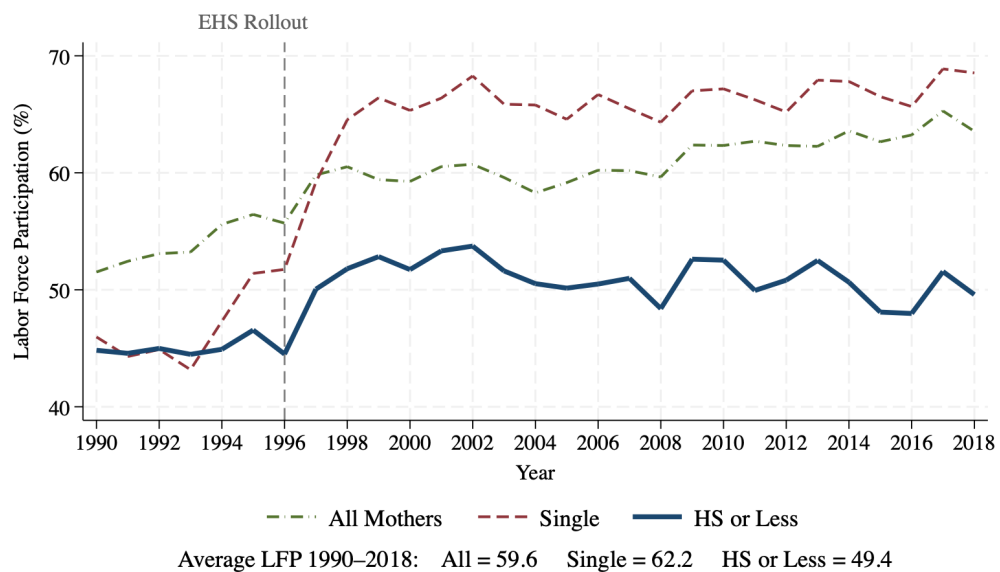
- Kimmel, J. (1998). Child care costs as a barrier to employment for single and married mothers. *Review of Economics and Statistics* 80(2), 287–299.
- Kleven, H., C. Landais, J. Posch, A. Steinhauer, and J. Zweimüller (2019). Child penalties across countries: Evidence and explanations. In *AEA Papers and Proceedings*, Volume 109, pp. 122–126. American Economic Association 2014 Broadway, Suite 305, Nashville, TN 37203.
- Lee, W. F., A. Sojourner, E. E. Davis, and J. Borowsky (2024). Effects of subsidies on the child care market: Large increases in capacity, small increases in price.
- Løken, K. V., M. Mogstad, and M. Wiswall (2012). What linear estimators miss: The effects of family income on child outcomes. *American Economic Journal: Applied Economics* 4(2), 1–35.
- Love, J. M., E. E. Kisker, C. M. Ross, P. Z. Schochet, J. Brooks-Gunn, D. Paulsell, K. Boller, J. Constantine, C. Vogel, A. S. Fuligni, et al. (2002). Making a difference in the lives of infants and toddlers and their families: The impacts of early head start. volumes i-iii: Final technical report [and] appendixes [and] local contributions to understanding the programs and their impacts.
- Ludwig, J. and D. L. Miller (2007). Does head start improve children’s life chances? evidence from a regression discontinuity design. *The Quarterly journal of economics* 122(1), 159–208.
- Lynch, K. (2019). Head start: Overview and current issues. Technical Report IF11008, Congressional Research Service.
- Malik, R., K. Hamm, L. Schochet, C. Novoa, S. Workman, and S. Jessen-Howard (2018). America’s child care deserts in 2018. *Center for American Progress*, 3–4.
- Meyer, B. D. and D. T. Rosenbaum (2001). Welfare, the earned income tax credit, and the labor supply of single mothers. *The quarterly journal of economics* 116(3), 1063–1114.
- Meyers, M. K. and L. P. Jordan (2006). Choice and accommodation in parental child care decisions. *Community Development* 37(2), 53–70.
- Micheltore, K. and N. Pilkauskas (2021). Tots and teens: How does child’s age influence maternal labor supply and child care response to the earned income tax credit? *Journal of Labor Economics* 39(4), 895–929.
- Morrissey, T. W. (2017). Child care and parent labor force participation: a review of the research literature. *Review of Economics of the Household* 15(1), 1–24.
- National Head Start Association (2022). Early head start facts and figures. Technical report, National Head Start Association. Accessed 22 Sep 2025.

- OECD (2025). Oecd family database.
- Phillips, D. A. and J. P. Shonkoff (2000). From neurons to neighborhoods: The science of early childhood development.
- Raikes, H. H., J. Brooks-Gunn, and J. M. Love (2013). I. background literature review pertaining to the early head start study. *Monographs of the Society for Research in Child Development* 78(1), 1–19.
- Schiman, C. (2022). Experimental evidence of the effect of head start on mothers’ labor supply and human capital investments. *Review of Economics of the Household* 20(1), 199–241.
- Sun, L. and S. Abraham (2021). Estimating dynamic treatment effects in event studies with heterogeneous treatment effects. *Journal of econometrics* 225(2), 175–199.
- U.S. Congress (1994). H.r. 3842: Human services amendments of 1994. 103rd Congress, 2nd Session. Introduced in the House of Representatives on February 23, 1994.
- U.S. Department of Health and Human Services (2020, January). Supporting children with disabilities, acf-im-hs-20-01. Information Memorandum, Office of Head Start, Administration for Children and Families. Log Number: ACF-IM-HS-20-01.
- Vogel, C. A., Y. Xue, E. M. Moiduddin, B. L. Carlson, and E. E. Kisker. Early head start children in grade 5: Long-term follow-up of the early head start research and evaluation project study sample. Undated.
- Wikle, J. and R. Wilson (2023). Access to head start and maternal labor supply: Experimental and quasi-experimental evidence. *Journal of Labor Economics* 41(4), 1081–1127.

Main Results



(a) Female LFP by Age of Youngest Child



(b) Female LFP if Youngest Child Under Three Years Old

Figure 1: Evolution of Female LFP in the United States (1990-2018)

Source: CPS-ASEC. Author's calculations.

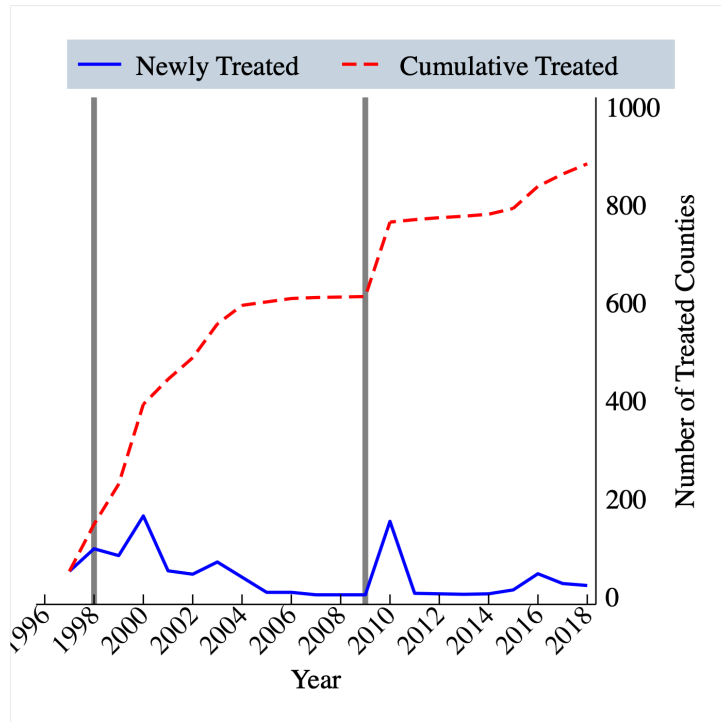


Figure 2: Treatment Rollout Over Time

Source: Performance Indicator Reports (PIRs) obtained from the Head Start Enterprise System - an administrative body under the Office of Head Start.

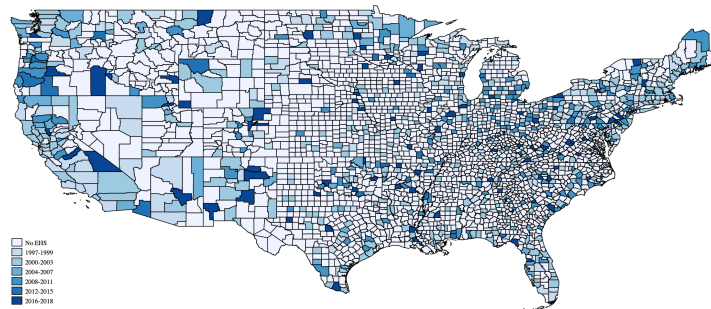


Figure 3: County-Level Rollout of EHS

Source: Performance Indicator Reports (PIRs) obtained from the Head Start Enterprise System - an administrative body under the Office of Head Start. Alaska and Hawaii are included in the data but not shown on the map.

Table 1: Summary Statistics by Treatment Status, 1990 U.S. Census

Variable	Treatment	Control	Overall	Difference
Total Population	208695.9 (467272.5)	28614.5 (49814.7)	79181.7 (263812.7)	180081.5*** (15768.8)
% Male	0.489 (0.016)	0.491 (0.018)	0.490 (0.018)	-0.001** (0.001)
% White	0.851 (0.157)	0.879 (0.158)	0.871 (0.158)	-0.028*** (0.006)
% Black	0.085 (0.127)	0.086 (0.149)	0.086 (0.143)	-0.000 (0.005)
% Hispanic	0.057 (0.121)	0.039 (0.105)	0.044 (0.110)	0.018*** (0.005)
% Under Age 5	0.073 (0.012)	0.070 (0.011)	0.071 (0.011)	0.003*** (0.000)
% Under Age 18	0.265 (0.038)	0.270 (0.035)	0.269 (0.036)	-0.006*** (0.001)
% Age 18-64	0.602 (0.043)	0.575 (0.044)	0.583 (0.045)	0.027*** (0.002)
% Age Over 65	0.133 (0.040)	0.155 (0.045)	0.149 (0.045)	-0.021*** (0.002)
Avg HH Size	2.725 (0.241)	2.702 (0.233)	2.709 (0.235)	0.023** (0.009)
% Single Female	0.459 (0.066)	0.418 (0.065)	0.429 (0.068)	0.042*** (0.003)
% Less Than HS	0.265 (0.092)	0.319 (0.104)	0.304 (0.104)	-0.054*** (0.004)
% HS Graduate	0.324 (0.063)	0.350 (0.060)	0.343 (0.062)	-0.026*** (0.002)
% Bachelors Degree	0.111 (0.047)	0.082 (0.037)	0.090 (0.042)	0.028*** (0.002)
% Female LFP	0.545 (0.071)	0.511 (0.071)	0.520 (0.072)	0.034*** (0.003)
% Female Unemployment	0.068 (0.029)	0.067 (0.033)	0.068 (0.032)	0.001 (0.001)
% HH With Public Assistance Income	0.082 (0.045)	0.085 (0.046)	0.085 (0.045)	-0.003* (0.002)
Poverty Rate Under Age 5	0.017 (0.010)	0.018 (0.010)	0.018 (0.010)	-0.001 (0.000)
Poverty Rate Under Age 18	0.055 (0.035)	0.061 (0.034)	0.059 (0.035)	-0.006*** (0.001)
Poverty Rate Age 18-64	0.078 (0.039)	0.083 (0.039)	0.081 (0.039)	-0.005*** (0.002)
Poverty Rate Over Age 65	0.019 (0.011)	0.029 (0.014)	0.026 (0.014)	-0.010*** (0.000)

Notes: Standard deviations are shown in parentheses. Statistical significance is indicated as follows: * p < 0.10, ** p < 0.05, *** p < 0.01.

Source: The data is obtained from National Historic Geographic Information System (NHGIS) database on Integrated Public Use Microdata Series (IPUMS) website.

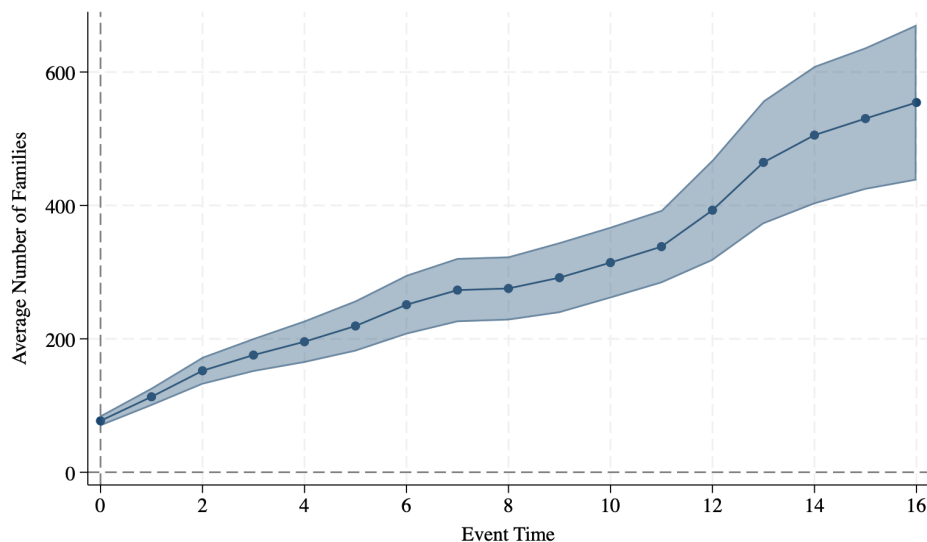


Figure 4: Average Number of EHS Families in Treated Metropolitan Areas

Note: Event study estimates represent average number of families enrolled in EHS program in all metropolitan areas. As dependent variable is by definition zero before initial rollout of EHS, there are no estimates for pre-treatment period.

Source: Performance Indicator Reports (PIRs) obtained from the Head Start Enterprise System - an administrative body under the Office of Head Start. Author's Calculation.

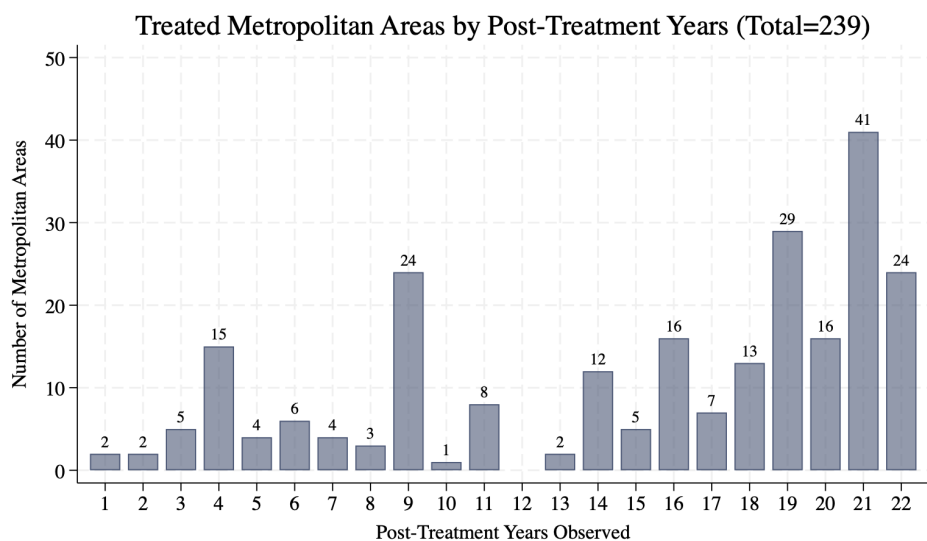


Figure 5: Number of Treated Metropolitan Areas by Observed Post-Treatment Years

Source: Performance Indicator Reports (PIRs) obtained from the Head Start Enterprise System - an administrative body under the Office of Head Start. Author's Calculation.

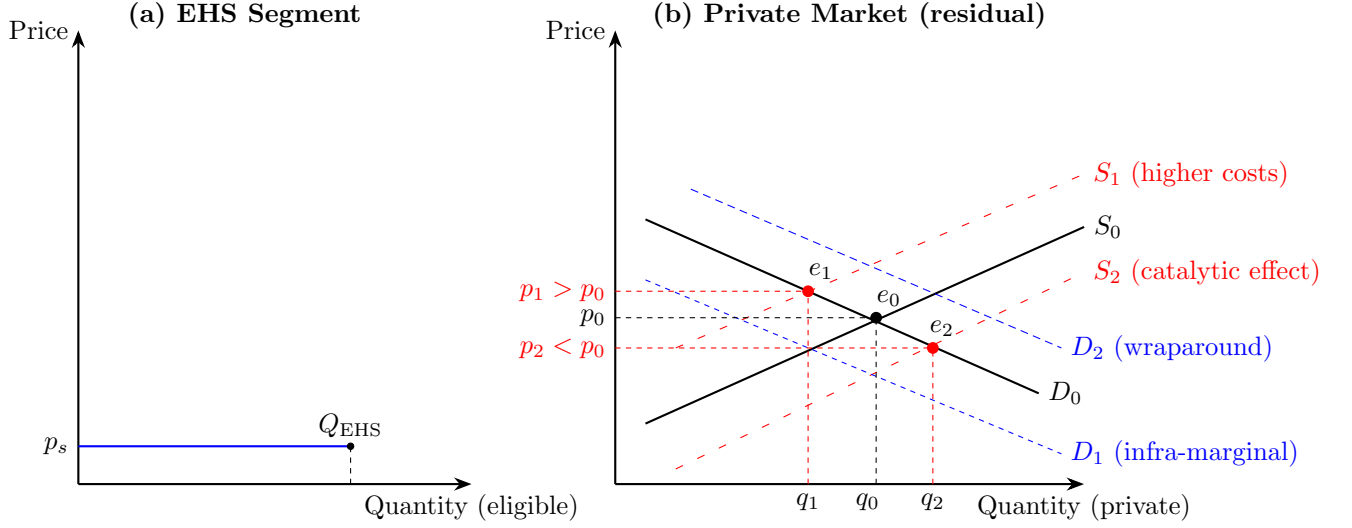


Figure 6: Potential Impact of EHS on Childcare Sector Outcomes

Panel (a) shows that EHS adds childcare slots Q_{EHS} for eligible families at subsidized price p_s that is close to zero. Panel (b) shows the potential impact of EHS on the residual private childcare market. Following four shifts are shown in this market:

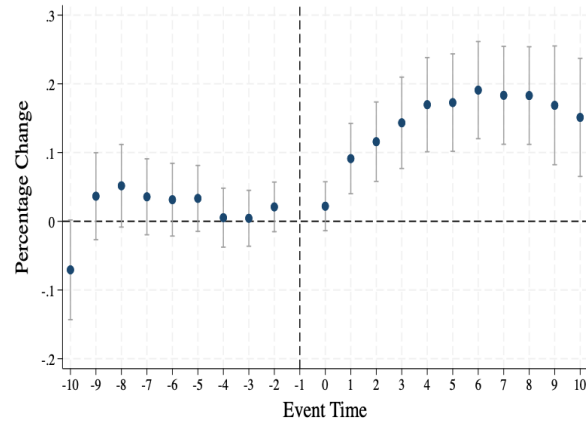
- **Wraparound Demand:** Extra private care by eligible families to take advantage of EHS $\Rightarrow D \uparrow$
- **Infra-marginal Demand:** Subsidized families who would have purchased care anyways $\Rightarrow D \downarrow$
- **Higher Cost:** Higher quality and competition for staff increases operational costs $\Rightarrow S \downarrow$
- **Catalytic Effect:** EHS infrastructure crowd-in private investment and encourages entry $\Rightarrow S \uparrow$

The overall impact on the private market depends on which effects dominate. For example, on equilibrium e_1 higher cost effect dominates, resulting in higher childcare prices ($p_1 > p_0$) and lower quantity ($q_1 < q_0$). At equilibrium e_2 , catalytic effect dominates, resulting in lower childcare prices ($p_2 < p_0$) and higher quantity ($q_2 > q_0$). Therefore, net impact on private market prices and quantity is ambiguous.

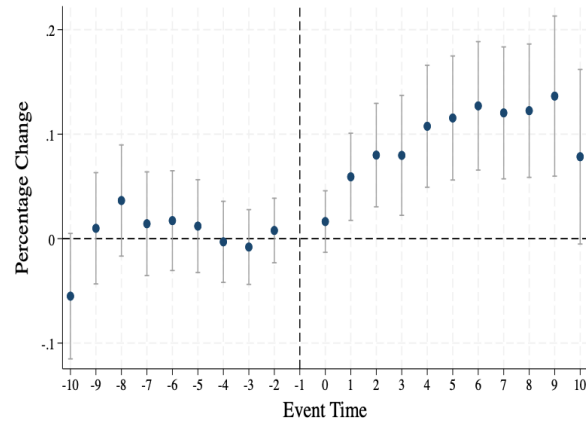
However, total quantity of childcare services changes as following:

$$\Delta \text{Total Childcare Quantity} = Q_{EHS} + (q_i - q_0) \quad (2)$$

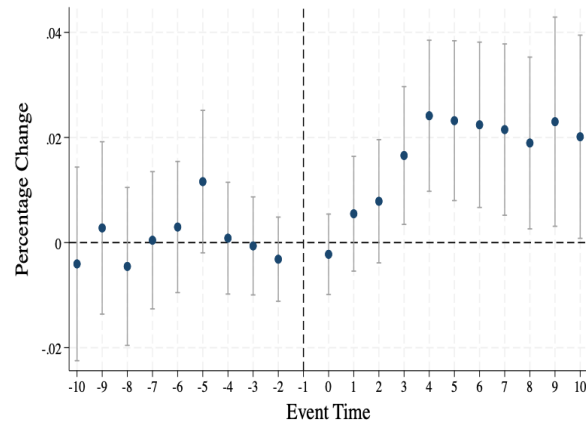
So, even if private market quantity decreases, total childcare quantity will increase as long as total slots increased by EHS are more than the decrease in the private market.



(a) Number of Employees



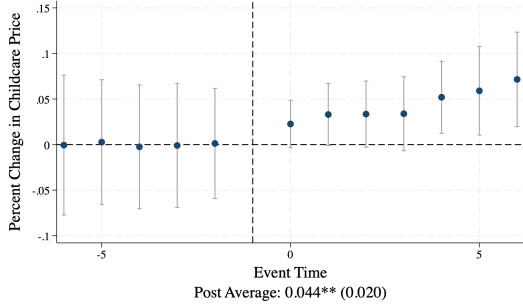
(b) Number of Establishments



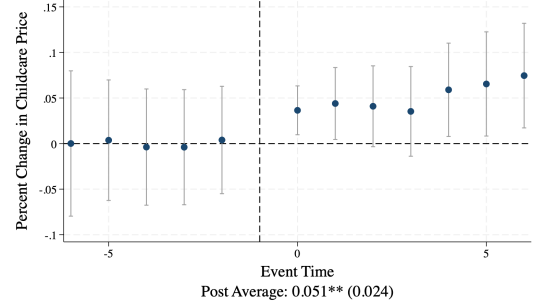
(c) Real Annual Wages

Figure 7: Impact of EHS on Childcare Industry

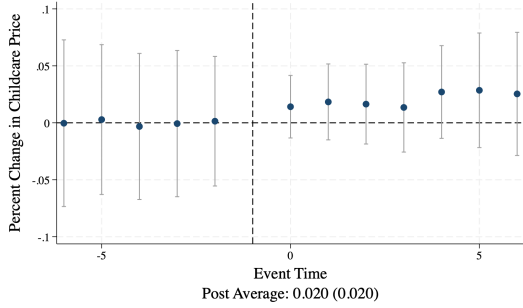
Source: Quarterly Census of Employment and Wages (QCEW) from 1990 to 2018 by U.S. Bureau of Labor Statistics. The 6-digit NAICS code for childcare industry is 624410. Author's calculations.



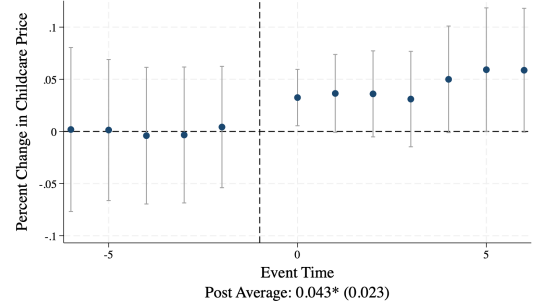
(a) Infants - Median Price



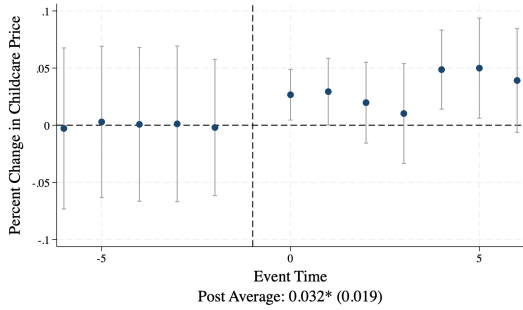
(b) Infant - 75th Percentile Price



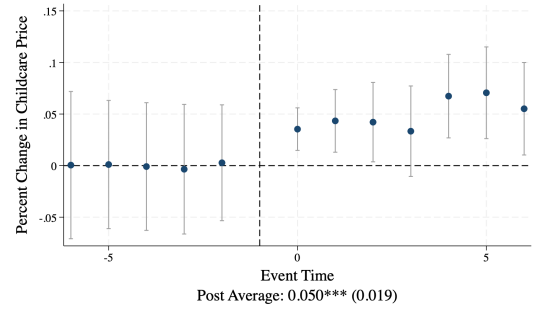
(c) Toddler: Center Based



(d) Toddler: 75th Percentile Price



(e) Preschool: Median Price

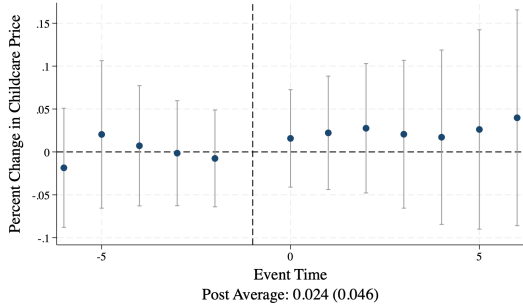


(f) Preschool: 75th Percentile Price

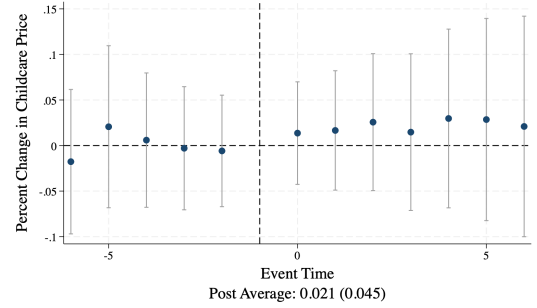
Figure 8: Impact of EHS on Center Based Weekly Full-Time Childcare Prices

Notes: The event-study regressions are weighted by total county population. The data is balanced panel of 273 treated and 2341 never-treated counties. Total number of observations is 28737. As these event studies are adjusted for linear pre-treatment trend, any post-treatment effects are relative to pre-treatment trend. To interpret, 0.1 is a ten percent change.

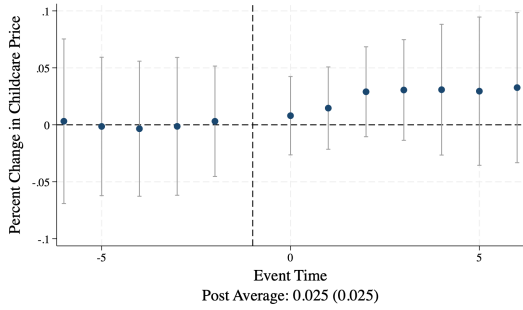
Source: National Database of Childcare Prices (NDCP) from 2008 to 2018 by Women's Bureau in the U.S. Department of Labor. Author's calculations.



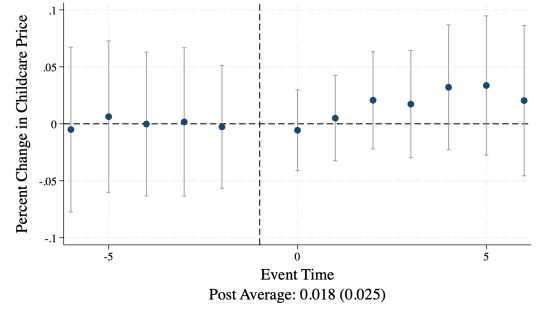
(a) Infants: Median Price



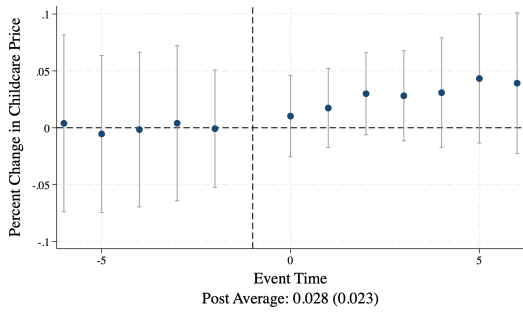
(b) Infant: 75th Percentile Price



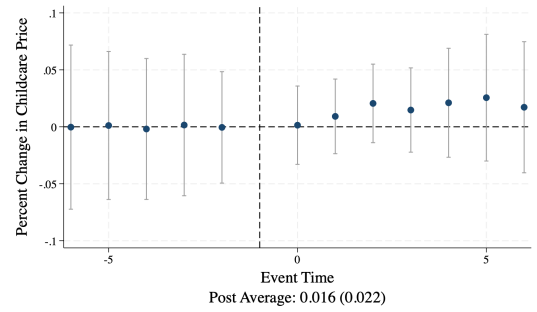
(c) Toddler: Center Based



(d) Toddler: 75th Percentile Price



(e) Preschool: Median Price

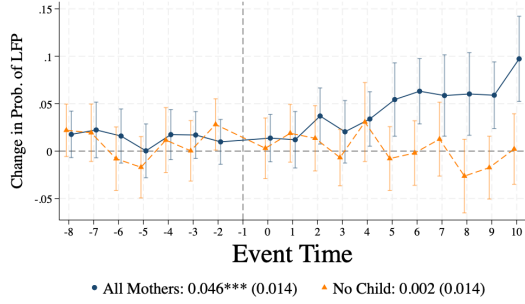


(f) Preschool: 75th Percentile Price

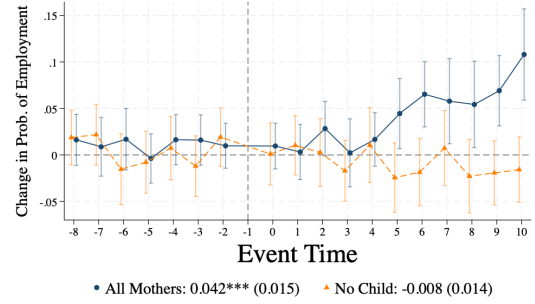
Figure 9: Impact of EHS on Family Based Weekly Full-Time Childcare Prices

Notes: The event-study regressions are weighted by total county population. The data is balanced panel of 273 treated and 2341 never-treated counties. Total number of observations is 28737. As these event studies are adjusted for linear pre-treatment trend, any post-treatment effects are relative to pre-treatment trend. To interpret, 0.1 is a ten percent change.

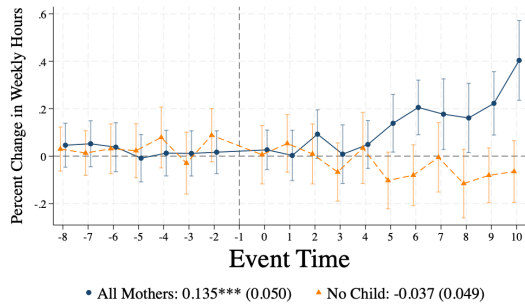
Source: National Database of Childcare Prices (NDCP) from 2008 to 2018 by Women's Bureau in the U.S. Department of Labor. Author's calculations.



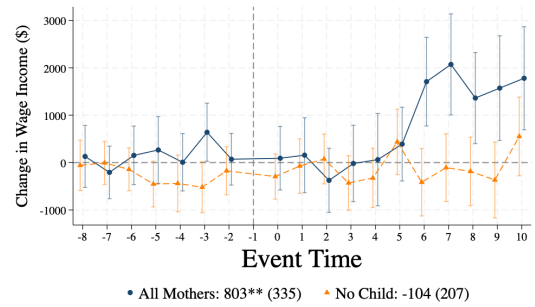
(a) Labor Force Participation



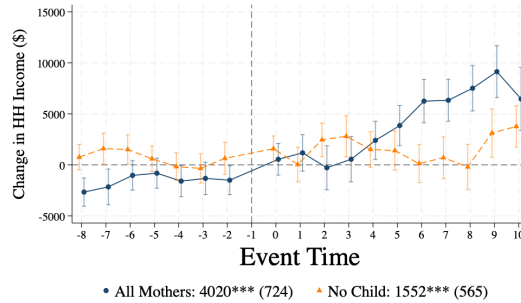
(b) Employment



(c) Usual Weekly Hours



(d) Real Wage Income

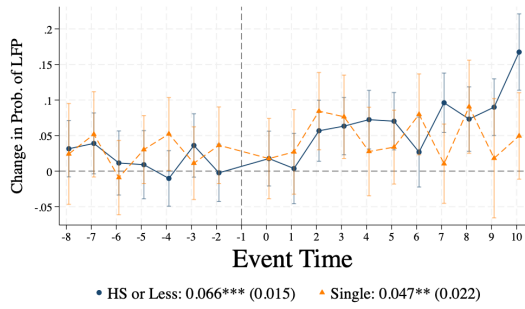


(e) Real Household Income

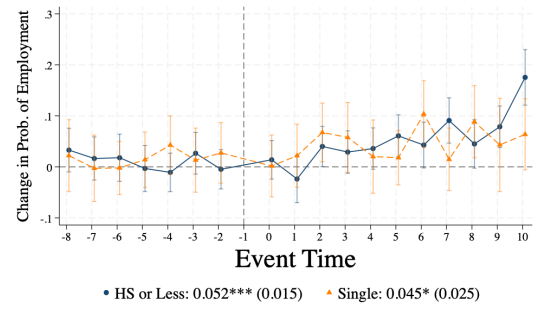
Figure 10: Impact of EHS on Labor Market Outcomes for All Mothers

Notes: Event study coefficients compare maternal labor market outcomes for all mothers with age-eligible children in treated and not-yet treated metropolitan areas. The sample includes 245 metropolitan areas, 47 of which are never treated. All treated areas are observed for at least 9 years after the treatment. The sample includes 128,689 mothers with under three years old children. All regressions include year, metropolitan area and state-by-year fixed effects and control for age and age-squared. Standard errors are clustered at the metropolitan area level. To avoid outliers, income variables are top-coded at 99th percentile. Event studies for low educated women with no children and between ages 20 and 50 are provided as a robustness check. Ninety-five percent confidence intervals are also provided. To interpret Panel (a) & (b), 0.1 is a ten percentage point increase. For Panel (c), 0.1 is a ten percent increase. Panel (d) & (e) show change in terms of 2018 dollars.

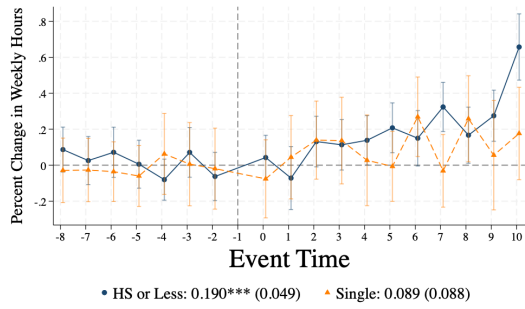
Source: CPS-ASEC 1988 -2018. Author's calculations.



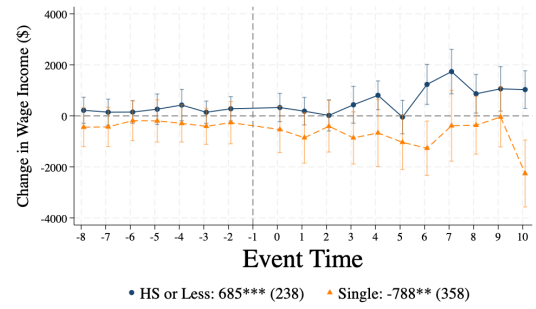
(a) Labor Force Participation



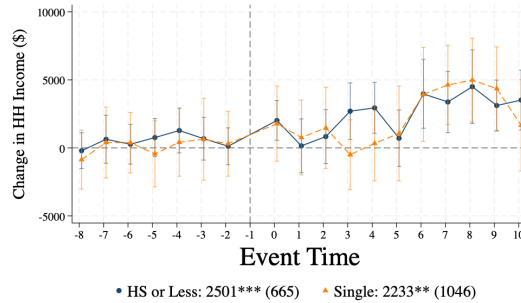
(b) Employment



(c) Usual Weekly Hours



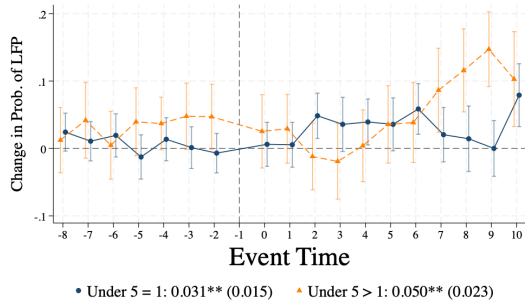
(d) Real Wage Income



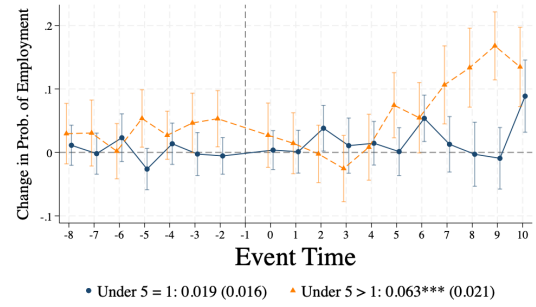
(e) Real Household Income

Figure 11: Impact of EHS on Labor Market Outcomes for Potential High Impact Samples

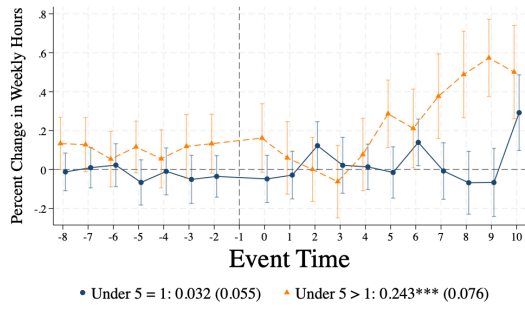
Notes: Event study coefficients compare maternal labor market outcomes for mothers with age-eligible children in treated and not-yet treated metropolitan areas. The sample includes 245 metropolitan areas, 47 of which are never treated. All treated areas are observed for at least 9 years after the treatment. The samples include 34,270 single mothers and 55,113 mothers with high school or less educational attainment. All regressions include year, metropolitan area and state-by-year fixed effects and control for age and age-squared. Standard errors are clustered at the metropolitan area level. To avoid outliers, income variables are top-coded at 99th percentile. Ninety-five percent confidence intervals are also provided. To interpret Panel (a) & (b), 0.1 is a ten percentage point increase. For Panel (c), 0.1 is a ten percent increase. Panel (d) & (e) show change in terms of 2018 dollars.
Source: CPS-ASEC 1988 -2018. Author's calculations.



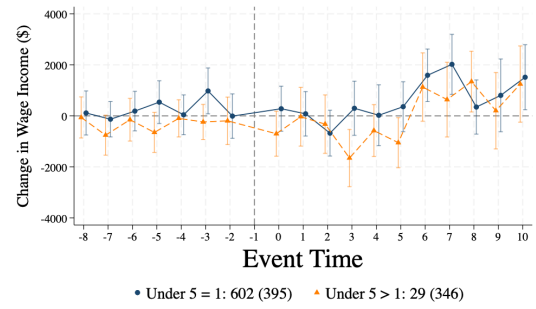
(a) Labor Force Participation



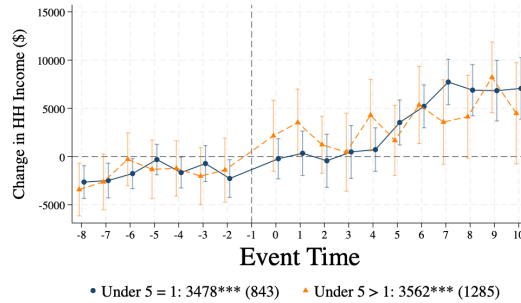
(b) Employment



(c) Usual Weekly Hours



(d) Real Wage Income

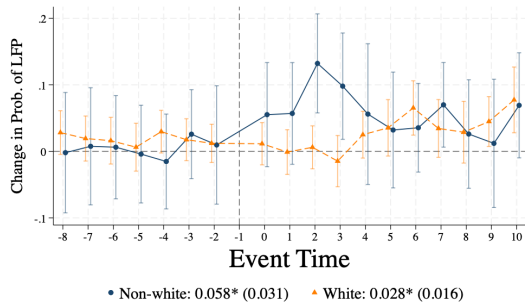


(e) Real Household Income

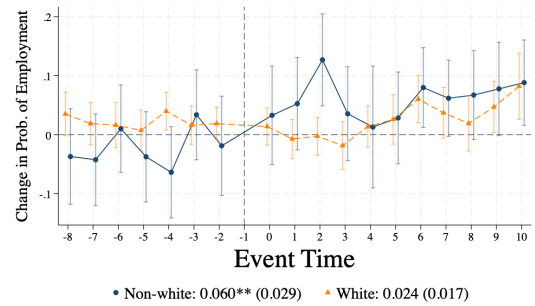
Figure 12: Impact of EHS on Labor Market Outcomes for by Number of Under 5 Children

Notes: Event study coefficients compare maternal labor market outcomes for mothers with age-eligible children in treated and not-yet treated metropolitan areas. The sample includes 245 metropolitan areas, 47 of which are never treated. All treated areas are observed for at least 9 years after the treatment. The samples include 83,726 mothers with only one child under 5 and 44,963 mothers with more than one child under 5. All regressions include year, metropolitan area and state-by-year fixed effects and control for age and age-squared. Standard errors are clustered at the metropolitan area level. To avoid outliers, income variables are top-coded at 99th percentile. Ninety-five percent confidence intervals are also provided. To interpret Panel (a) & (b), 0.1 is a ten percentage point increase. For Panel (c), 0.1 is a ten percent increase. Panel (d) & (e) show change in terms of 2018 dollars.

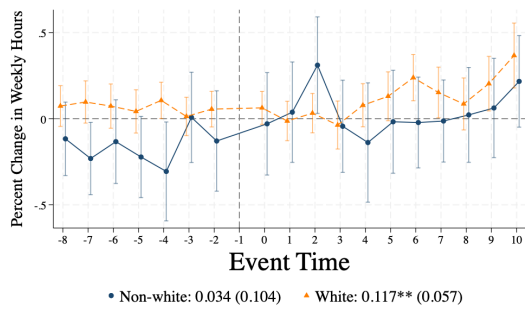
Source: CPS-ASEC 1988 -2018. Author's calculations.



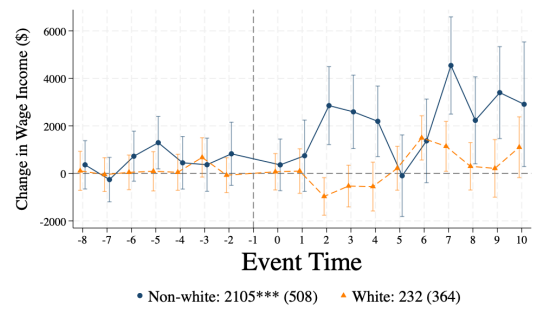
(a) Labor Force Participation



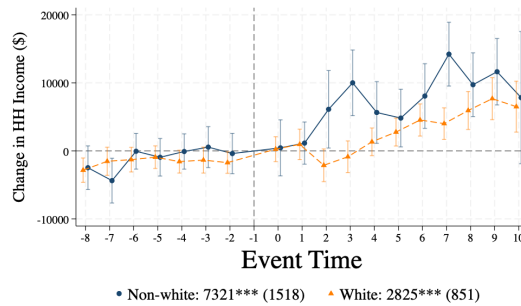
(b) Employment



(c) Usual Weekly Hours



(d) Real Wage Income

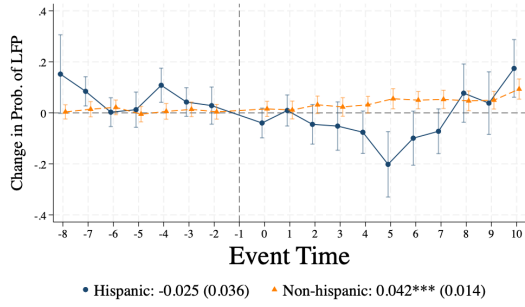


(e) Real Household Income

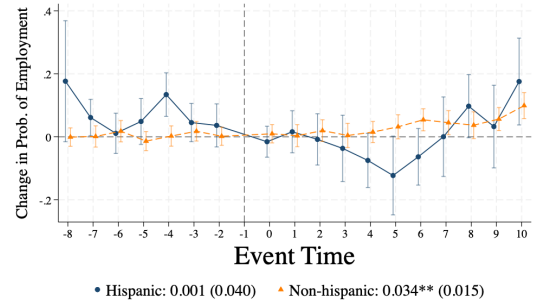
Figure 13: Impact of EHS on Labor Market Outcomes for White and non-White Mothers

Notes: Event study coefficients compare maternal labor market outcomes for mothers with age-eligible children in treated and not-yet treated metropolitan areas. The sample includes 245 metropolitan areas, 47 of which are never treated. All treated areas are observed for at least 9 years after the treatment. The samples include 102,937 white and 25,752 non-white mothers. All regressions include year, metropolitan area and state-by-year fixed effects and control for age and age-squared. Standard errors are clustered at the metropolitan area level. To avoid outliers, income variables are top-coded at 99th percentile. Ninety-five percent confidence intervals are also provided. To interpret Panel (a) & (b), 0.1 is a ten percentage point increase. For Panel (c), 0.1 is a ten percent increase. Panel (d) & (e) show change in terms of 2018 dollars.

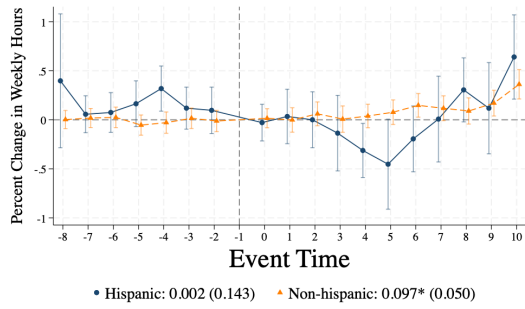
Source: CPS-ASEC 1988 -2018. Author's calculations.



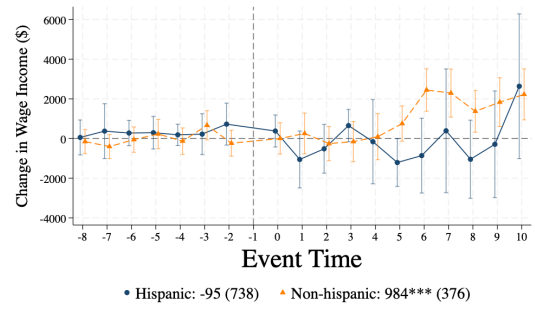
(a) Labor Force Participation



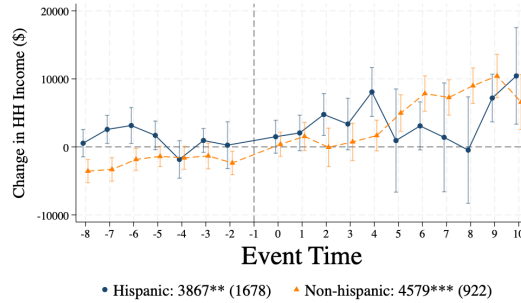
(b) Employment



(c) Usual Weekly Hours



(d) Real Wage Income

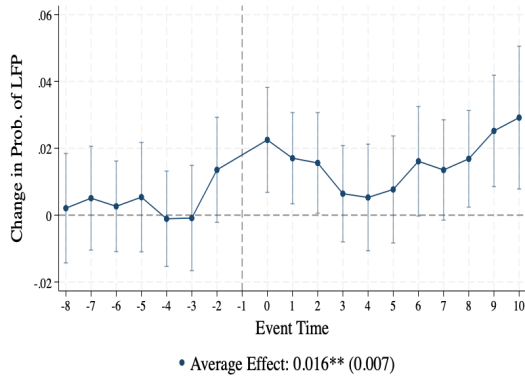


(e) Real Household Income

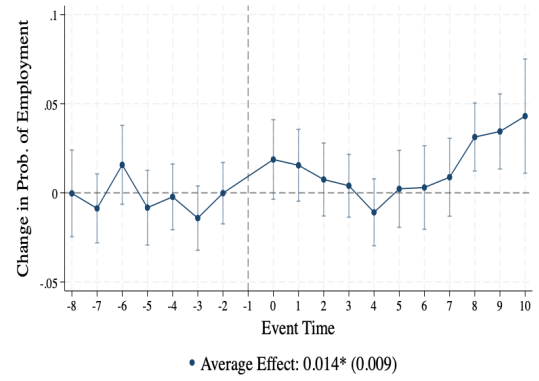
Figure 14: Impact of EHS on Labor Market Outcomes for Hispanic and non-Hispanic Mothers

Notes: Event study coefficients compare maternal labor market outcomes for mothers with age-eligible children in treated and not-yet treated metropolitan areas. The sample includes 245 metropolitan areas, 47 of which are never treated. All treated areas are observed for at least 9 years after the treatment. The samples include 30,137 hispanic and 98,236 non-hispanic mothers. All regressions include year, metropolitan area and state-by-year fixed effects and control for age and age-squared. Standard errors are clustered at the metropolitan area level. To avoid outliers, income variables are top-coded at 99th percentile. Ninety-five percent confidence intervals are also provided. To interpret Panel (a) & (b), 0.1 is a ten percentage point increase. For Panel (c), 0.1 is a ten percent increase. Panel (d) & (e) show change in terms of 2018 dollars.

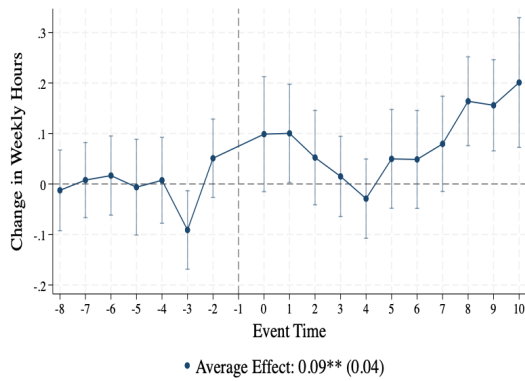
Source: CPS-ASEC 1988 -2018. Author's calculations.



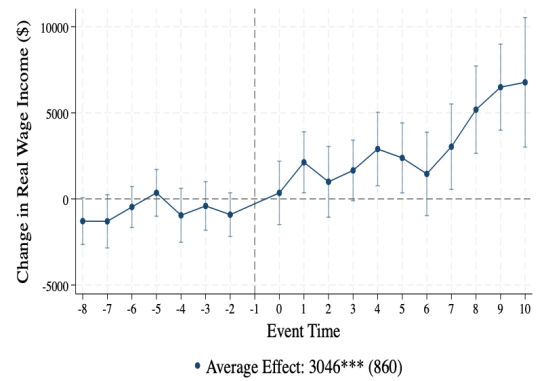
(a) Labor Force Participation



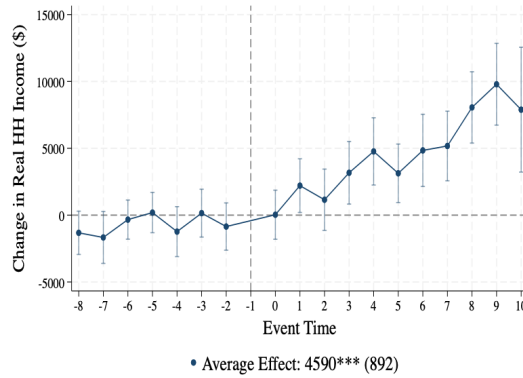
(b) Employment



(c) Usual Weekly Hours



(d) Real Wage Income

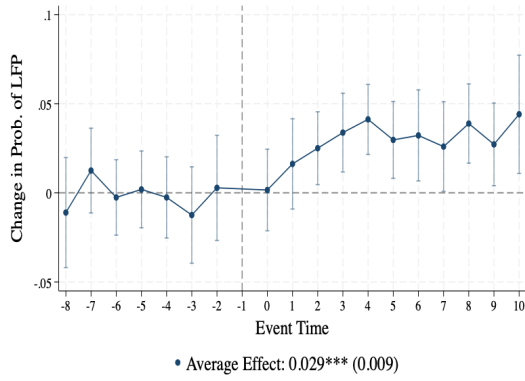


(e) Real Household Income

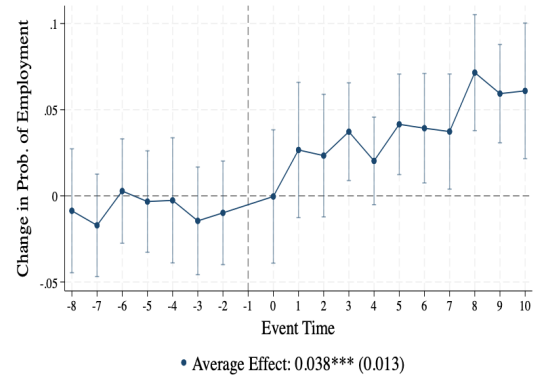
Figure 15: Impact of EHS on Labor Market Outcomes for All Fathers

Notes: Event study coefficients compare labor market outcomes for fathers with age-eligible children in treated and not-yet treated metropolitan areas. The sample includes 245 metropolitan areas, 47 of which are never treated. All treated areas are observed for at least 9 years after the treatment. The samples include 113,446 fathers. All regressions include year, metropolitan area and state-by-year fixed effects. Standard errors are clustered at the metropolitan area level. To avoid outliers, income variables are top-coded at 99th percentile. Ninety-five percent confidence intervals are also provided. To interpret Panel (a) & (b), 0.1 is a ten percentage point increase. For Panel (c), 0.1 is a ten percent increase. Panel (d) & (e) show change in terms of 2018 dollars.

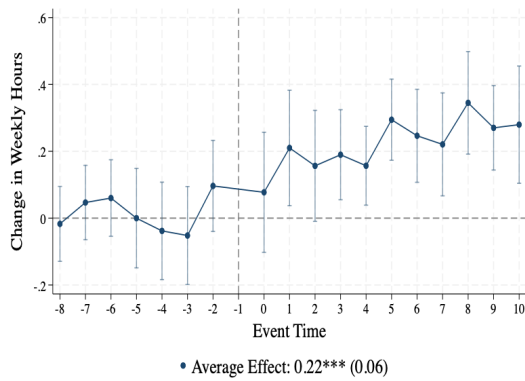
Source: CPS-ASEC 1988 -2018. Author's calculations.



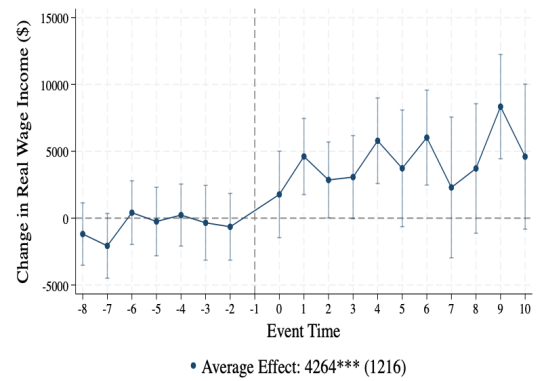
(a) Labor Force Participation



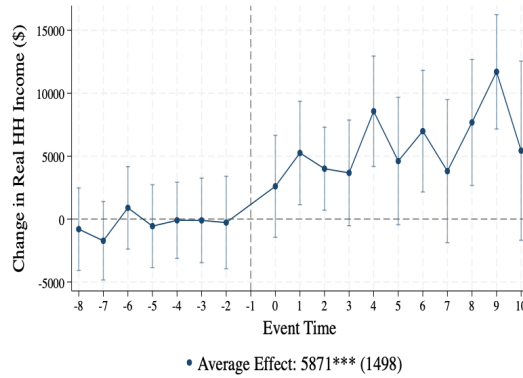
(b) Employment



(c) Usual Weekly Hours



(d) Real Wage Income



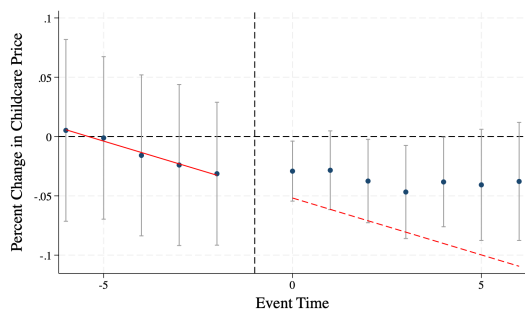
(e) Real Household Income

Figure 16: Impact of EHS on Labor Market Outcomes for Fathers with Multiple Under 5 Children

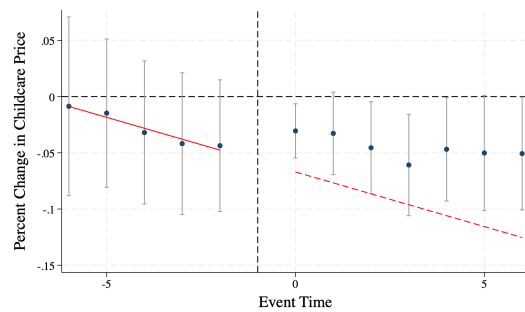
Notes: Event study coefficients compare labor market outcomes for fathers with age-eligible children in treated and not-yet treated metropolitan areas. The sample includes 245 metropolitan areas, 47 of which are never treated. All treated areas are observed for at least 9 years after the treatment. The samples include 37,194 fathers with multiple children under age five. All regressions include year, metropolitan area and state-by-year fixed effects. Standard errors are clustered at the metropolitan area level. To avoid outliers, income variables are top-coded at 99th percentile. Ninety-five percent confidence intervals are also provided. To interpret Panel (a) & (b), 0.1 is a ten percentage point increase. For Panel (c), 0.1 is a ten percent increase. Panel (d) & (e) show change in terms of 2018 dollars.

Source: CPS-ASEC 1988 -2018. Author's calculations.

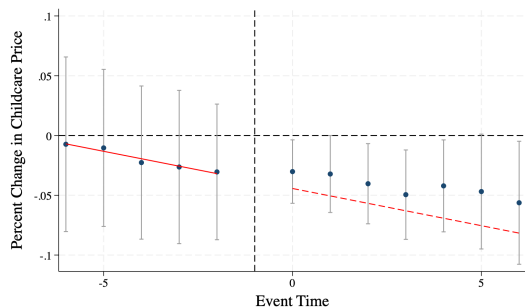
Appendix



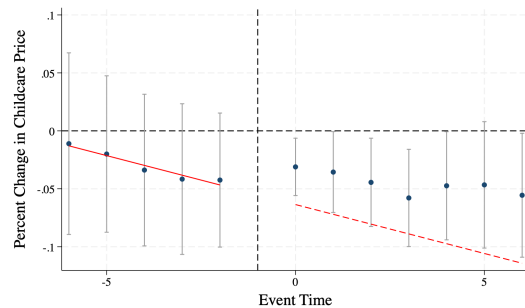
(a) Infants: Median Price



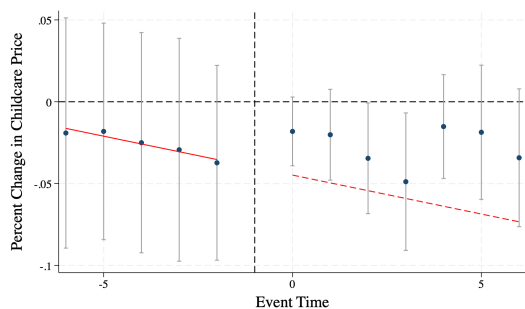
(b) Infant: 75th Percentile Price



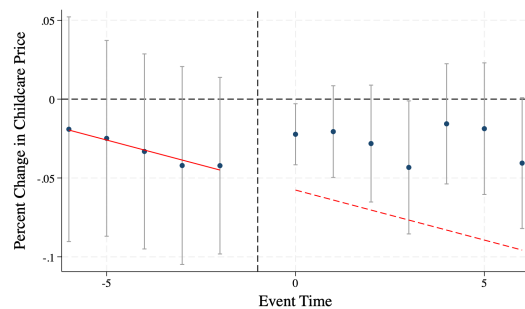
(c) Toddler: Median Price



(d) Toddler: 75th Percentile Price



(e) Preschool: Median Price

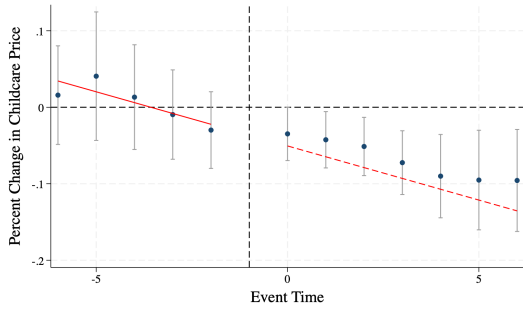


(f) Preschool: 75th Percentile Price

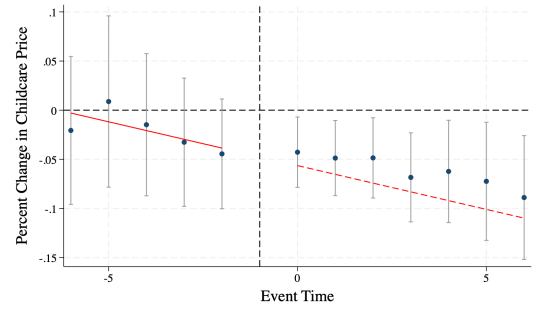
Figure 17: Raw Event Studies for Impact of EHS on Weekly Full-Time Center Childcare Prices

Notes: These event studies have same data as those in Figure 8. However, these have pre-treatment linear trend which is adjusted and detrended event studies are presented in the main results.

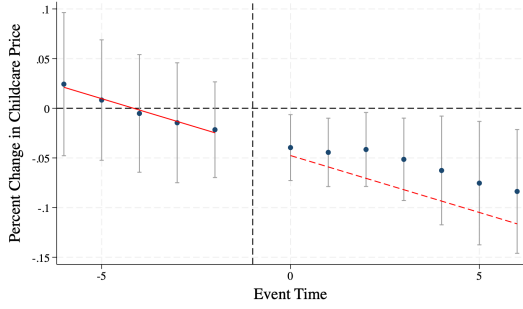
Source: National Database of Childcare Prices (NDCP) from 2008 to 2018 by Women's Bureau in the U.S. Department of Labor. Author's calculations.



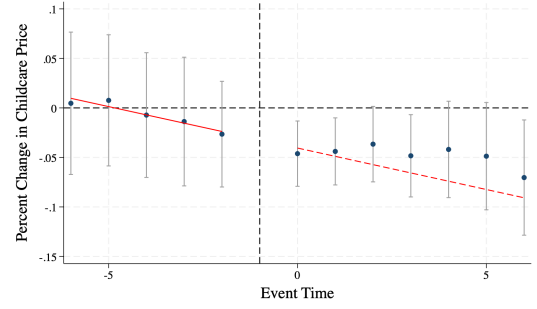
(a) Infants: Median Price



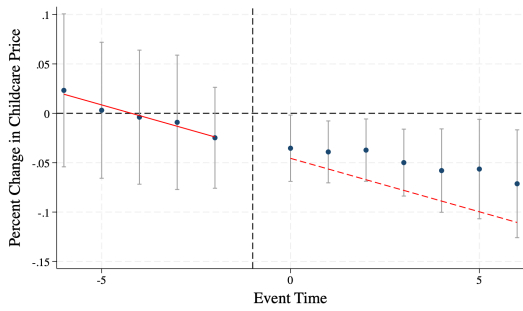
(b) Infant: 75th Percentile Price



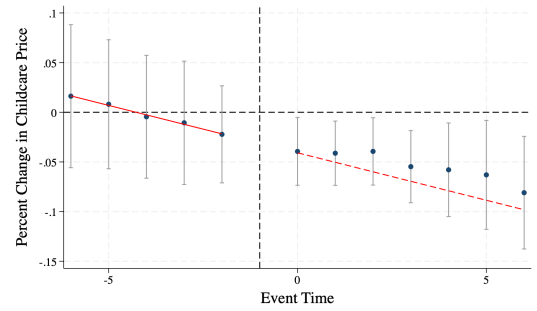
(c) Toddler: Center Based



(d) Toddler: 75th Percentile Price



(e) Preschool: Median Price



(f) Preschool: 75th Percentile Price

Figure 18: Impact of EHS on Family Based Weekly Full-Time Family Childcare Prices

Notes: These event studies have same data as those in Figure 9. However, these have pre-treatment linear trend which is adjusted and detrended event studies are presented in the main results.

Source: National Database of Childcare Prices (NDCP) from 2008 to 2018 by Women's Bureau in the U.S. Department of Labor. Author's calculations.

Detrending Methodology for Event Study Estimates

This appendix describes the step-wise process for obtaining detrended event study estimates to address potential violations of the parallel trends assumption.

Step 1: Initial Event Study Estimation

First, I estimate the standard event study specification using CSDID:

$$Y_{it} = \alpha_i + \lambda_t + \sum_{k=-6, k \neq -1}^6 \beta_k D_{it}^k + \epsilon_{it} \quad (3)$$

where Y_{it} is the outcome for unit i at time t , D_{it}^k are event-time indicators, and β_k are the coefficients of interest representing treatment effects at event-time k .

Step 2: Pre-Treatment Trend Estimation

I estimate the linear pre-treatment trend using only pre-treatment periods (excluding the reference period $t = -1$):

$$\hat{\beta}_k = \alpha + \delta \cdot k + u_k \quad \text{for } k \in \{-6, -5, -4, -3, -2\} \quad (4)$$

This regression yields trend slope $\hat{\delta}$, trend intercept $\hat{\alpha}$, standard errors $SE(\hat{\delta})$ & $SE(\hat{\alpha})$, and $\text{Cov}(\hat{\alpha}, \hat{\delta})$.

Step 3: Trend Projection

I project the estimated pre-treatment trend to all event-time periods:

$$\text{Predicted Trend}_k = \hat{\alpha} + \hat{\delta} \cdot k \quad \text{for } k \in \{-6, \dots, 6\} \quad (5)$$

with the normalization:

$$\text{Predicted Trend}_{-1} = 0 \quad (6)$$

Step 4: Detrended Coefficient Calculation

The detrended event study coefficients are:

$$\tilde{\beta}_k = \hat{\beta}_k - \text{Predicted Trend}_k \quad (7)$$

Step 5: Standard Error Calculation for Detrended Estimates

The standard error for each detrended coefficient accounts for uncertainty in both the original event study estimate and the trend projection:

$$SE(\tilde{\beta}_k) = \sqrt{SE(\hat{\beta}_k)^2 + SE(\text{Predicted Trend}_k)^2} \quad (8)$$

where the standard error of the predicted trend is:

$$SE(\text{Predicted Trend}_k) = \sqrt{SE(\hat{\alpha})^2 + k^2 \cdot SE(\hat{\delta})^2 + 2k \cdot \text{Cov}(\hat{\alpha}, \hat{\delta})} \quad (9)$$

Step 6: Confidence Intervals

The 95% confidence intervals for detrended estimates are:

$$CI(\tilde{\beta}_k) = \tilde{\beta}_k \pm 1.96 \cdot SE(\tilde{\beta}_k) \quad (10)$$

Step 7: Post-Treatment Average Effect

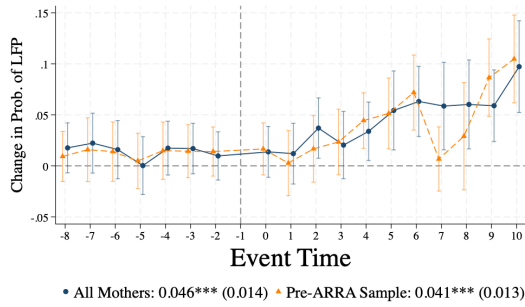
The average post-treatment effect is calculated as:

$$\bar{\tilde{\beta}}_{\text{post}} = \frac{1}{N_{\text{post}}} \sum_{k=0}^6 \tilde{\beta}_k \quad (11)$$

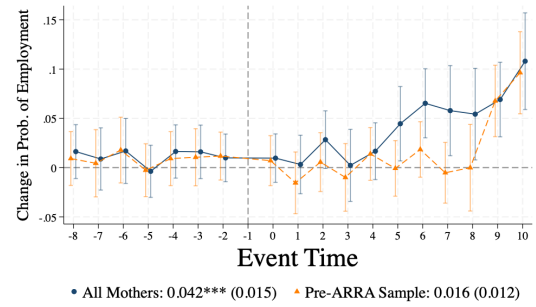
with standard error:

$$SE(\bar{\tilde{\beta}}_{\text{post}}) = \frac{1}{N_{\text{post}}} \sum_{k=0}^6 SE(\tilde{\beta}_k) \quad (12)$$

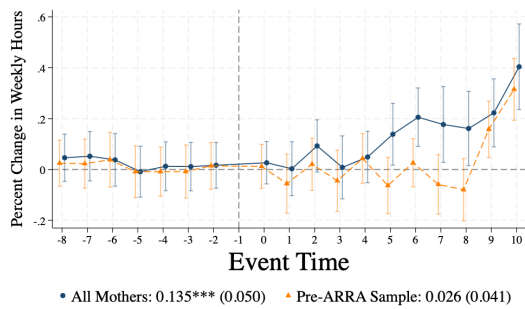
This detrending approach removes linear pre-treatment trends that violate the parallel trends assumption, providing more credible estimates of treatment effects by isolating deviations from the projected counterfactual trend.



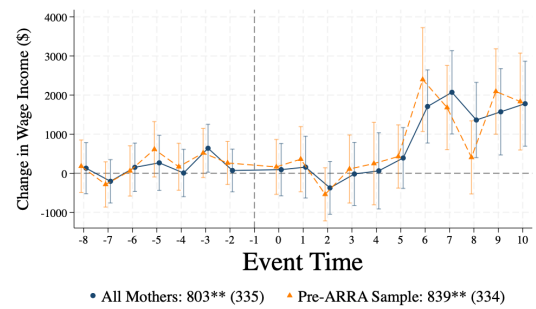
(a) Labor Force Participation



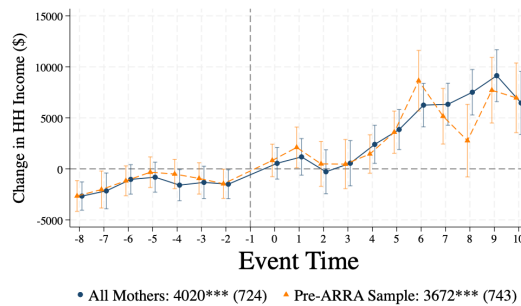
(b) Employment



(c) Usual Weekly Hours



(d) Real Wage Income



(e) Real Household Income

Figure 19: Impact of EHS Rollout in Pre-ARRA Sample vs Overall Sample

Notes: Event study coefficients compare maternal labor market outcomes for mothers with age-eligible children in treated and not-yet treated metropolitan areas. The sample includes 245 metropolitan areas, 47 of which are never treated. All treated areas are observed for at least 9 years after the treatment. The samples include 30,137 hispanic and 98,236 non-hispanic mothers. All regressions include year, metropolitan area and state-by-year fixed effects and control for age and age-squared. Standard errors are clustered at the metropolitan area level. To avoid outliers, income variables are top-coded at 99th percentile. Ninety-five percent confidence intervals are also provided. To interpret Panel (a) & (b), 0.1 is a ten percentage point increase. For Panel (c), 0.1 is a ten percent increase. Panel (d) & (e) show change in terms of 2018 dollars.

Source: CPS-ASEC 1988 -2018. Author's calculations.