Informal Childcare Provision and Maternal Wage Outcomes Across the United States

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Abstract: This study examines the relationship between childcare provision and maternal workplace impacts by evaluating the wage differential for mothers with access and/or use of informal, relative-provided childcare options. Using the NLSY97 panel data, I ran Fixed Effects, Random Effects, and Pooled Ordinary Least Squares models to look at the comparative wage impact of using non-parental family-based childcare over other childcare options for women with one child under 6 working over 20 hours per week. I also ran a pooled OLS model on a small sample (N=308) of mothers to explore the wage impact of the availability of relatives. Based on the results, I find that women changing to family-based childcare options had no significant difference in wage across the surveyed years; likewise, I find that women with access to relatives living within 15 minutes do not experience a difference in wages across the surveyed years in question.

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Contents

Source code and details of data can be found at https://github.com/connixu/Intergeneration
al_Childcare_Maternal_Wage_Gap

I. INTRODUCTION

Researchers worldwide have noted the existence of a "motherhood penalty," a "maternal wage gap," or a "family wage gap," a phenomenon in which working mothers in the labor force begin to experience proportionally larger income disparities over time comparatively to working women without children (Budig & England, 2001). In a meta-analysis of 49 papers, all but 3[1] found the existence of a negative wage impact corresponding to motherhood across a variety of regional, economic, individual and social contexts (Linde Leonard & Stanley, 2020). In the United States, the wage differential for working mothers compared to non-mothers was reported broadly to be between 5 and 10 percent per child (Gough & Noonan, 2013) across time periods, net of human capital factors such as education and work experience. Conversely, fathers in the US have been found to experience a premium (Budig & Hodges, 2010; Lundberg & Rose, 2000) in their wages (comparative to non-fathers).

While it has been generally found that such a gap exists, researchers have identified variances in the magnitude of the 'penalty' (i.e., wage difference, duration of the effects of the 'penalty'). When considering the underlying causes of this wage gap, it is pertinent to acknowledge the pervasive expectation that women take on a disproportionately larger share of the caregiver burden in the household. In practice, these expectations impact working mothers as (1) women more often disrupt their career path by devoting less time to work or by prioritizing less demanding, more flexible employment upon becoming pregnant (Gough & Noonan, 2013), and (2) employers and co-workers are more likely to view working mothers as less committed to their jobs, leading to potentially disparate workplace outcomes in areas such as hiring, promotions, and compensation (Budig & England, 2001; Correll et al., 2007).

Given this understanding, there has been a growing interest in the relationship between childcare arrangements for young children and maternal workplace outcomes. The availability

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[1] The three studies in question were completed in Nordic countries known to have higher levels of family-friendly policies and programs such as equitable parental leave and subsidized or publicly funded childcare options.

of affordable and accessible childcare options can reduce the time and energy burden of caregiving placed on working mothers. This can help to lessen the number of mothers being pressured into leaving the workforce or seeking lower-paying work, which in turn can mitigate wage consequences over time.

Current literature about the relationship between childcare arrangements and maternal wages has largely focused on state-supported policies and informal childcare arrangements (e.g., family-provided childcare). Findings have often supported the theory that access to childcare for young children has a positive relationship with workplace participation rates for women; in the West, these findings have focused on formal childcare options such as childcare and daycare centers (Halim et al., 2017; Pettit & Hook, 2005). While informal childcare is more cost-effective, it has not been as frequently referenced as a first choice in the West. Research about the comparable benefits and replace-ability of various childcare arrangement types (e.g., formal vs informal childcare) has been nuanced and has appeared to vary across cultural contexts. Furthermore, the topics of childcare and maternal career outcomes have continued to involve limited levels of discussion within the context of the United States.

This study uses the National Longitudinal Survey of Youth (NLSY97) panel data to assess how working mothers' income is impacted by the use of relative-provided childcare options. It further examines the relationship between working mothers' income and the availability of proximal relatives, to understand the potential effect that accessible relative-based childcare can have regardless of the degree that such a mode of childcare is used. The results of this paper will serve to increase our understanding of the comparative impact of family-based care on the "motherhood penalty" within the United States.

II. LITERATURE REVIEW

Overview: The Maternal Wage Gap

As noted in the introduction, the 'motherhood penalty' refers primarily to the aggregate wage consequence that motherhood has on women's wages. Researchers referring to this 'penalty' also reference the key impacts of maternity on career progression (Correll et al., 2007) and hiring, firing, promotion, and general well-being outcomes (Mu & Xie, 2016) for working women.

When examining the underlying causes for this motherhood penalty, many findings have emerged around (1) human capital consequences of workplace interruptions and disruption experienced by working women, and (2) cultural values, biases, and expectations around women's role as employees and as caretakers. These factors are often mediated through formal (i.e., corporate and state-level policies) and informal (i.e., social capital/family support) dynamics.

In a practical sense, these forces clearly interact and intersect with one another - for example, cultural values and social expectations often inform public policy, social capital, and perceptions (by employers) of a mother's human capital; (perceived) human capital and/or discrimination in the market, in turn, can also be shaped by the dynamic of formal and informal support around childcare. Together, these themes have been found to drive the heterogeneity of maternal workplace impacts on national and localized contexts.

Human Capital Theory, Lost Productivity, and Specialization

One of the most pervasive ways that researchers have examined the motherhood wage gap is through the lens of human capital theory (Becker, 1985). In this perspective, the negative career impacts attributable to motherhood reflect key labor market decisions made by working women each time they have a child. Throughout the world, it has been common for women

to leave the workforce, to change employment status from full-time to part-time, or to change employers or industries in search of work environments that are more accommodating or flexible for working mothers (Gough & Noonan, 2013). Where women stay in the workforce, their daily work lives may be impacted by an increased need for time off to take care of their young children (e.g., when children get sick and need to stay at home or seek medical care). In a 2019 survey conducted by Pew Research Center, working mothers were 22% more likely than working fathers (54 vs 44%) to say that they needed to reduce their work hours as a result of their parenting responsibilities (Barroso & Horowitz, 2021). Whether such choices are by personal choice or by necessity, these decisions can interrupt working mothers' career trajectory and development and reduce "productive value" as employees, thus leading to reduced career outcomes and wages in the long term (Becker, 1985).

Several studies dating back as early as 1979 (Hill, 1979) have found that human capital factors have accounted for a significant portion of the wage gap. In fact, a study by Gupta and Smith (2002) found that, after controlling for time-consistent variables (e.g., age, race, preferences for household work), mothers in a Danish longitudinal dataset were found to have no statistically significant pay gap; in this study, the authors concluded that such gaps were the result of reduced working experience and career development incurred by time off due to care-taking.

For married couples, decisions that make up the "human capital accumulation gap" are held up in part by the *household specialization dynamic.* Raising children is often costly and requires a re-allocation of time and monetary resources within a family unit. When child-rearing responsibilities fall solely to the parents (immediate family), this can often increase the likelihood of greater levels of household specialization, wherein one parent devotes comparatively more time and energy to income-generating (i.e., *"breadwinning"*) tasks while the other parent prioritizes more household management and childcare tasks (i.e., *"homemaking"*). Specialization is a pervasive practice among married couples with

children and was of interest when studying the motherhood penalty because prior research has found that within marriages and households, the 'homemaker' role is more likely to be transferred predominantly to the wife (Becker, 1981). When exploring the question of whether the differential maternal/paternal occupational outcomes have been due primarily to one's specialized role (i.e., which individual is 'assigned' to income-generating vs household work), researchers have found mixed results. While Budig and England (2001) and Budig and Hodges, 2010 found larger wage penalties for married mothers than for non-married mothers, Killewald and Gough (2013) found that specialization alone does not account for the gender gap for working parents, as the motherhood penalty was not augmented by marital status. When seeking to understand deviances from expectations, Cukrowska-Torzewska (2017) noted that single motherhood carries the penalty of less spousal help with childcare tasks, which can decrease workplace productivity and lead to even greater wage penalties.

Cultural Bias and Gender Discrimination

While human capital and worker productivity factors may explain a great deal of the wage and workplace impacts, it's important not to understate the impact of cultural-societal norms and expectations about how women should behave as parents and as workers. Per Blair-Loy 2005, a tension has emerged between the expectation that mothers devote the majority of their energy to their children and the perception that a 'good' or 'productive' employee prioritizes work above all else.

For example, the trends outlined in the previous section (i.e., that women disproportionately disrupt their career paths after having children and take on the "homemaker" role in heterosexual marriages) are in themselves the product of gendered expectations of how mothers and fathers respectively should behave within a household. Such expectations can be implicit or explicit, as family, friends, and peers behave in a way that seems to expect the mother to take on the larger share of household responsibilities. For example, Becker (1981) found that American men have not taken on a proportionate amount of household and

6

childcare responsibilities even as women (on average) have increased in income-generating workforce representation. Conversely, in a 2019 survey conducted by Pew Research Center, working mothers were 22% more likely than working fathers (54 vs 44%) to say that they needed to reduce their work hours as a result of their parenting responsibilities (Barroso & Horowitz, 2021). Under these role expectations, women's stagnation and wage penalty in the workplace are believed to be a 'self-fulfilling prophecy,' as mothers receive less alleviation of their caregiving burden from spouses and other family members. This is believed to be particularly true in families that subscribe more strongly to gender essentialist beliefs.

Cultural biases extend beyond informing the parents' decisions within the household. As an example, one of the most-cited works on the topic of maternal workplace outcomes, a quasi-experiment and audit conducted by Correll et al. (2007) found that under experimental settings, test subjects in the US asked to make hiring and offer decisions tended to view mothers as less productive and less competent (compared to childless women); subsequently, these subjects tended to offer lower levels of average pay and time off to mothers on average. After a resume audit published in the same paper (following the work of Bertrand and Mullainathan 2004), Correll et al. (2007) found that, given ceteris paribus, experimental applications sent out that alluded to motherhood were less likely to receive interviews in real-world job postings. No analogous findings were discovered for fathers Correll et al., 2007. Seeing that both the experiment and audit held the pseudo-'applicants' experience levels, education, and qualifications constant, the findings of this paper indicate the existence of employer bias and discrimination toward mothers in key decision-making around corporate hiring, promotion, and firing. This type of discriminatory view of women as 'mothers first' and subsequent behavior was also noted in Roth's study (2006) of gender inequality on Wall Street.

Given that gender conservatism and work culture vary widely across national, cultural, and racial contexts, it also follows that there would correspondingly exist a variety of outcomes for

working mothers. In a cross-national comparison of national- and individual-effect differences, Budig et al. (2012) noted that 'cultural attitudes can amplify, and even change the nature of, associations between parental leave, publicly funded childcare, and maternal earnings.' In other words, this paper found that welfare programs designed to encourage women's workplace participation are more effective in countries with more egalitarian gender cultures.

In short, as working mothers navigate the biases, and norms set by cultural beliefs about their dual roles as mothers and as professionals, they will continue to face challenges that will impact their career trajectory, as these cultural pressures and stereotypes will inform their workplace discrimination, support received, and societal pressures faced on a daily basis.

The Influence of Childcare[2]

Given the link between unequal childcare burden and the motherhood penalty, it follows that there is a good deal of interest in the linkages between childcare availability (particularly for young children) and maternal wage outcomes. The availability of accessible[3] childcare options (particularly for poorer working women) has often been proposed as influential to workplace participation. As alluded to in the above sections, Self (2005) summed it up best when he proposed that working mothers as a whole have been caught in an interdependence 'trap.' In this 'trap', mothers are often expected to provide child care themselves at the cost of their

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[2]Broadly speaking, childcare options discussed in this paper primarily fall under one of four categories:

1. Formal Childcare systems - include childcare centers, daycare centers, and preschools. This mode of child care has a third party (generally un-associated with the mother) who is often paid to take care of the child(ren).

2. Informal Childcare systems - include childcare provided by the parents' extended families (e.g., family-provided childcare) or social networks (e.g., neighbor-provided care). The primary informal childcare system noted here is family-provided or relative-provided childcare.

3. Mother provided childcare

4. Spousal childcare

These options will be discussed within this and the following sections of this report. Refer to **Appendix A** for details about re-coding and categorizing childcare within these broad categories.

[3]i.e., geographically, temporally (in terms of open hours), and financially accessible

own career development; otherwise, where third-party childcare (e.g., Formal Childcare) can be provided, facilities are often not cost-effective because there are not enough mothers using such options for economies of scale. One paper by Mason and Kuhlthau (1992) found that according to a survey in Detroit, nearly one-third of women with pre-school-aged children noted that childcare problems led to a constraint in their seeking employment.

As such, in the realm of public policy, there has been a long-standing theory that public funding for childcare[4] would increase workplace participation, reduce disruptions for mothers' careers, and reduce the maternal wage gap. Within the literature, several studies (primarily examining European countries) have found that widespread availability of publicly provided or government-subsidized childcare has been correlated with a reduction in the 'childcare burden' from the working mother's decision-making process and thus with better workplace outcomes (e.g., the proportion of mothers seeking full-time work) for mothers in the aggregate (Pettit & Hook, 2005; Cukrowska-Torzewska, 2017; Halldén et al., 2015). At a disaggregated level, these findings are a bit more complex: for example, Mandel and Shalev (2009) noted that in Scandinavian countries with widely available state-provided childcare, women with higher education may be disincentivized to seek high skilled work (as publicly funded childcare is more subsidized for individuals in lower-income brackets). Vuri (2016) similarly found mixed results, and the author proposes that in countries with preexisting high labor participation rates and hours worked (i.e., by working mothers), subsidies in childcare would not substantially increase participation.

Overall, these findings do not conclusively indicate that increased access to formal childcare options will unilaterally increase participation rates, work continuation, and wages over time. While the United States currently has very low levels of centralized state-subsidized childcare, it could be inferred based on results from international findings and based on American results from the 1970s that such policies expanding affordable childcare will similarly return mixed results on maternal participation and income in the workforce.

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[4]e.g., by providing state-funded low-cost facilities or by giving low-income mothers a childcare stipend

The Impact of Informal, Relative-Based Childcare Systems

In addition to the formalized framework of childcare provision, for many families around the world, community-based and multi-generational support networks have allowed for (Informal) shared childcare and household responsibilities. Such options are less structured than third-party or 'Formal' childcare outcomes, and are often available for free or at a lower cost. It has often been speculated that multi-generational or family-based childcare arrangements would result in some level of relief from the household and childcare burden for the mother, ultimately reducing interruption from her professional development and reducing her experience of the 'motherhood penalty.'

Currently, a majority of studies surrounding maternal outcomes and multi-generational or communal (informal) child care have emerged from Asian and South American countries, and appear to point to a higher level of complexity in terms of how these dependencies reflect on the working mother's household and care-taking work burden. While some studies have confirmed the finding that the presence of grandparents within the household can reduce the childcare burden from the mother (Ma et al., 2013), a more recent study by Yu and Xie (2018) found that women suffered larger motherhood wage penalties when living with their husband's parents (comparatively to when they live alone). While this finding appears counter-intuitive, Yu and Xie (2018) speculated that such findings were not unreasonable, as 'patrilocal co-residence' has traditionally been associated with 'filial piety' and traditionalist beliefs regarding gender roles in China. Thus, in this case, one may consider the existence of spurious relationships due to cultural values, as traditionalist homes in China (with patrilocal multi-generational cohabitation) could also indicate societal pressure for women to prioritize unpaid household responsibilities over paid work. The findings of this study are very interesting because they indicate that family-based availability and childcare provision, where it indicates support for the working mother's career, can reduce maternal wage gaps.

In alignment with these findings, Craig and Churchill (2018) found that while formal childcare

use in the United States corresponded with increased parental stress, informal childcare (specifically, childcare provided by relatives) corresponded with decreased parental stress. This suggests once more that some form of caregiving burden is reduced when parents of young children are provided with the security and flexibility of having their child cared for by their own families.

Even more potentially indicative of the power of informal support networks were the findings of Pessin et al. (2022). Using SIPP data, Pessin et al. (2022) found that adult daughters made fertility decisions corresponding to the receipt of support in time or money; moreover, Pessin et al. (2022) found that daughters were particularly receptive to emotional support from their own mothers, indicating once more the importance of social support and social availability within one's family.

To date, papers comparing formal and informal childcare availability and the impact on maternal workplace outcomes have largely focused on 'replaceability'. Vuri (2016) found that publicly subsidized formal childcare may lead to mothers choosing formal over informal childcare options. This has also reflected a concern voiced by Grimshaw and Rubery (2015). While Vuri (2016) noted that the 'choices' between childcare arrangements (where more than one is available to the mothers) are often dictated by personal preferences rather than mere accessibility and availability, there still remains relatively sparse understanding in the west about how the different options of childcare affect the degree to which working mothers ultimately are impacted by the 'motherhood penalty' (or in other words how mothers' wages are impacted by using one mode of childcare over another).

Similarly, while there has been some research (primarily qualitative) about multi-generational families and the impact on maternal career interruptions and wage differentials (relative to working women without children), this research has been performed more extensively in more family-based regions such as Asia and Latin America, with limited analogous studies done in the United States (and limited literature around this topic incorporating network factors

such as the strength of ties and non-familial relationships).

The paucity of literature about informal childcare provision by the parents' network and the impact on maternal workplace outcomes may be due in part to historically insufficient data sets and historically lower levels of multi-generational co-residence in the United States. As multi-generational households have become steadily more popular (rising to 20% as of 2016 per Cohn and Passel 2020) in the US, this topic, in particular, has become increasingly relevant.

This paper adds to the emerging topic of relative-provided care by exploring the relationship between the availability and use of family-provided childcare and the relative impact on maternal wages over time. Using the National Longitudinal Survey of Youth (NLSY97), I will be looking at the impact of the wage impact of using family-provided support over other modes of childcare (excluding mother-provided or spousal childcare). Given that family-provided childcare and support are low cost, flexible, and seem to correspond with reduced stress and increased level of perceived emotional support and security, I expect that women using or able to access family-provided childcare options will experience lower wage penalties (i.e., higher wages) over time.

III. METHODOLOGY

Hypotheses

Hypothesis 1: Working mothers using relative-provided childcare as a primary childcare option will be more likely to experience lower wage disparities over time compared to working mothers using other forms of childcare.

In alignment with the literature about informal childcare outcomes, I hypothesize that because relative-provided childcare is low-cost, often time-flexible, and a signal to the working

mother of career and caregiving support within her familial network, women will experience comparatively higher wages over time than women with young children using other forms of childcare.

Hypothesis 2: Working mothers with relatives in closer proximity (e.g., 15 minutes or fewer) will be more likely to experience lower wage disparities over time

The accessibility of relative-provided household and childcare support can reduce the maternal childcare burden and allow working women to focus more in the workplace. This hypothesis follows similar logic to the preemptive models of Pessin et al. (2022), which looked at past financial transfers and support as an indicator of future decisions (i.e., that of fertility). In this case, I assume that if working mothers are aware that they have easily accessible relatives (even if not using these relatives as primary childcare providers), they will feel lower levels of childcare burdens and preemptively make decisions over time that will help them to make higher wages over time.

Data

I use the NLSY97, a longitudinal panel dataset compiled by the Bureau of Labor Statistics with coverage over topics such as demographic, education, and employment statistics, as well as some questions covering factors such as health, family, and attitudes. Respondents to this data set were 12 - 16 years of age as of December 1996, and the survey has been conducted annually up to 2011 (and subsequently biannually).

For the purposes of this study, I look at women with only one child in the household [5] while

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[5]For our main models, this is to control for variances (e.g., sibling care, additional costs for formal care / any difference in the availability of informal and relative-based care, mother's experience level) that can exist amongst respondents when there are more children within a household while the first child is under 6.

the child is under 6 years of age [6] in their early- to mid- 20s (i.e., 2005 and after) [7]. I will also filter for women with at least a high school education, with at least part-time hours.[8] [9] Within this dataset, I will be most interested in the respondents' income over time and their Relative-Provided Childcare in terms of (1) designation of relative-based childcare as a primary childcare option (*FAMILY_CARE*) and (2) availability of relatives within 15 minutes of the respondent (*RELATIVE_15_MINUTES*). My response variable across my models will be *INCOME_LOG* of the respondent.

I will control for human capital with a binary variable indicating higher education degree attainment (*BA_ABOVE*). To control for the respondent's socioeconomic status, household income, and family structure, I further include a variable for spousal income (*SPOUSAL_INCOME_LOG*)[10] and for marital status (*MARRIED_COHABITATING*)[11]. For models requiring time-invariant variables, I also included the age of respondents when their first child was born (*MOTHER_AGE_FIRST_CHILD*) as a control variable.[12]

`Table 1` includes descriptive variables for the dataset filtered for our models. I present the mean and standard deviation values for (1) All mothers as filtered for part-time + hours, and one child under 6; (2) Mothers using Relative-Provided Childcare.

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[6]As noted in **Appendix A**, this is the cutoff year for certain childcare questions.

[7]As of 2005, respondents will be 20-24; this is a point at which most respondents will have graduated high school and many will have attained their first higher-level (i.e., Bachelor's) degree, and many have entered the workforce as professionals

[8]While the Bureau of Labor Statistics currently defines part-time work as 1-34 hours per week, this study will be following the generally accepted minimum of 20 hours, in alignment with the Glassdoor Team (2021)

[9]To filter for this characteristic, I used the variable for hours that the mother worked, traveled to/from work or attended class without their child. Thus, this variable is not a perfect proxy for hours worked overall.

[10]Generally, the assumption is that in a financially independent household, the socioeconomic status should be the sum of *INCOME_LOG* and *SPOUSAL_INCOME_LOG*; moreover, the variable of spouse's income presents a measure for alternative wages that may remove the necessity of women participating in the paid labor market after childbirth

[11]Consistent with the earlier discussion of household specialization, married and cohabitating families may experience higher levels of specialization wherein women may prioritize household tasks and caregiving over 'breadwinning'.

[12]Several papers have identified a positive wage effect of 'postponing' the age when working women have their first child. For example, Miller (2011) found that 'each year delayed' in motherhood corresponded with an average of 9% higher average career earnings . Herr (2016) similarly found a 3% annual higher earnings for each year of delay when also controlling for year entering into the paid labor force.

Table 1: Basic Descriptives

	All Mothers (Part Time +, ONE child under 6)			Mothers using Relative-Provided Childcare		
	n	mean	standard deviation	n	mean	standard deviation
INCOME_LOG	2520	$31,177.23	$25,777.24	1470	$27,608.98	$21,564.32
MARRIED_OR _COHABITATING	2511	0.65	0.48	1466	0.62	0.49
CV_HGC _EVER_EDT*	2520	14.58	2.34	1470	14.29	2.22
SPOUSAL _INCOME_LOG	2520	$24,926.01	$31,136.08	1470	$21,602.96	$26,368.95
MOTHER_AGE _FIRST _CHILD	2520	25.27	3.87	1470	24.91	3.57
RELATIVE _15_MINUTES	309	0.71	0.46	143	0.8	0.4
WORK _EDU_HRS**	2520	43.89	19.46	1470	43.83	19.49

* *CV_HGC_EVER_EDT* is highest educational attainment, which is used to generate the variable *BA_ABOVE* in later models
** *WORK_EDU_HRS* is hours of work, education, training, or travel. This was used to generate variables *PART_TIME* and *FULL_TIME*.

When looking at the basic descriptives, one can immediately see that mothers using relative-provided childcare tend to have comparatively lower income, lower spousal income, and lower educational attainment. It also appears that mothers who use relative-provided childcare tend to have children at a younger age. Outside of these observations, it does appear that the overall mean household income (if we add the mean *INCOME_LOG* and the mean *SPOUSAL_INCOME_LOG*) is at the lower end of the middle class (per Pew Research, the middle-class income ranged between $48,500 and $145,500 as of 2018).

We also can see that the average respondent who works over 20 hours tends to work 40+ hours (both within the filtered dataset of respondents and within the subset of mothers who used relative-based childcare at any point in time).

I will now present a selection of descriptive visuals and trends for the variables of interest.

Income Over Time

As the NLSY is panel data, it's reasonable to see income rise at a somewhat constant rate each year. Of all women in our panel with high school degrees, there exists a relatively steady increase in mean annual income. As shown in `Figure 1`, there is a differentiation over time between the mean income of women with one or more children and the mean income of women with no children. This is in part due to an increase in labor participation by respondents graduating with bachelor's degrees between approximately 2005 and 2008.

Figure 1: Mean Annual Income
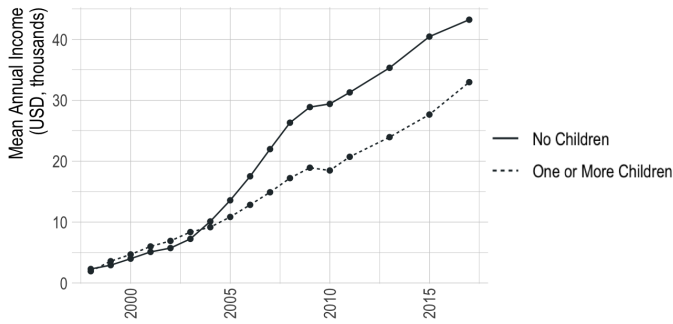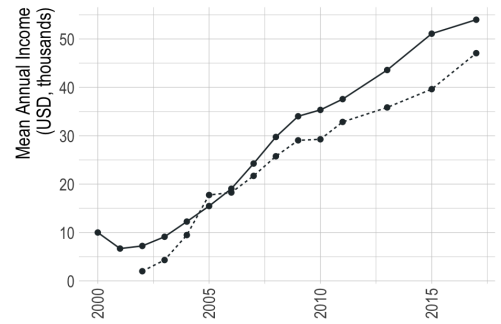
(a) Women (HS+)   **(b)** Women (BA+)

Within the respondents with BA+ degrees (i.e., wherein a substantial portion of the respondent subgroup have completed their terminal degrees and entered the workforce long-term), we see that women with children have increased their income at lower rates than women with no children during the surveyed period.

Overall, during the period (2005-2015), women with children increased in average annual

income from just over \$10K to over \$30K (and from over \$15K to over \$40K for BA+).

Childcare Options and Family-Provided Childcare

Within the NLSY, questions about the use of Family-Provided Childcare fall within questions about the Primary Childcare option(s) used. Refer to **Appendix A** for details about the location and general assignment of these responses.

Figure 2: Primary Childcare Option Proportions for each Survey Wave
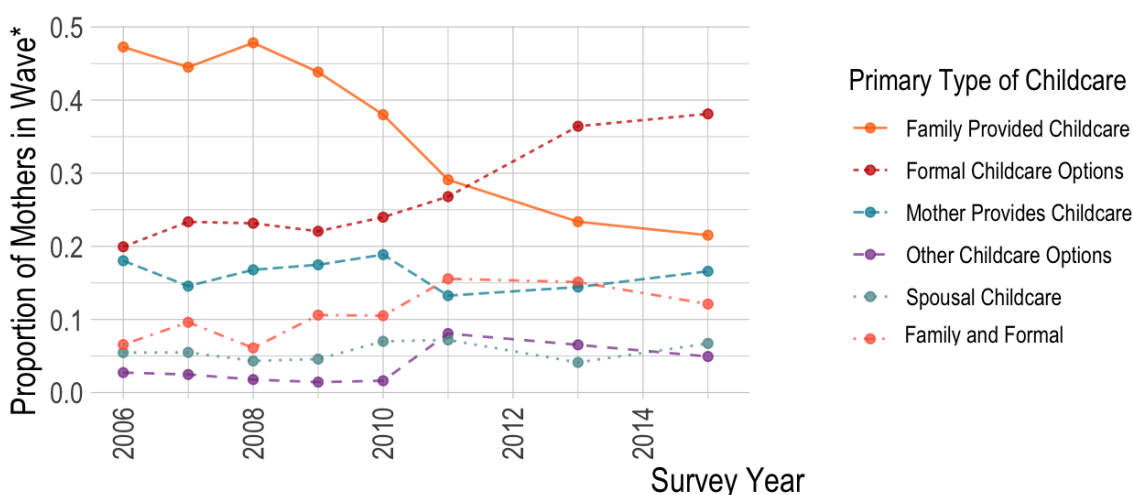
*Each year's aggregated group includes mothers with only one child under 6 years of age.

As can be seen in `Figure 2`, Family-Provided Childcare consisted of over 50% of the respondents' primary childcare options (when including the Family and Formal Childcare category) in 2006. By 2015, this proportion had declined to approximately 33% of the respondents' primary childcare options (when including the Family and Formal Childcare category). These numbers are in reasonable, in alignment with findings from Susman-Stillman and Banghart (2008), which noted 33-53% families with children under 5 using "Family, Friend, and Neighbor" care.

The second-largest childcare category is 'Formal', which includes paid daycares, preschools, etc. This category has increased in proportion over the years. Maternal-provided childcare

(i.e., the respondent generally stays with the child all day) has remained somewhat consistently at just under 20% of the responses each wave. Finally, Spousal and Other (e.g., Neighbors caring for a child) Childcare options have remained the lowest in proportion of each survey wave.

Within the results and discussion, maternal-provided childcare will be excluded from models as we are looking at women working at least part-time without their children. Thus, women using family-provided childcare options are compared to those designating formal, neighbor, and spousal childcare as primary childcare options.

Figure 3: Average Maternal Age when First Child Born
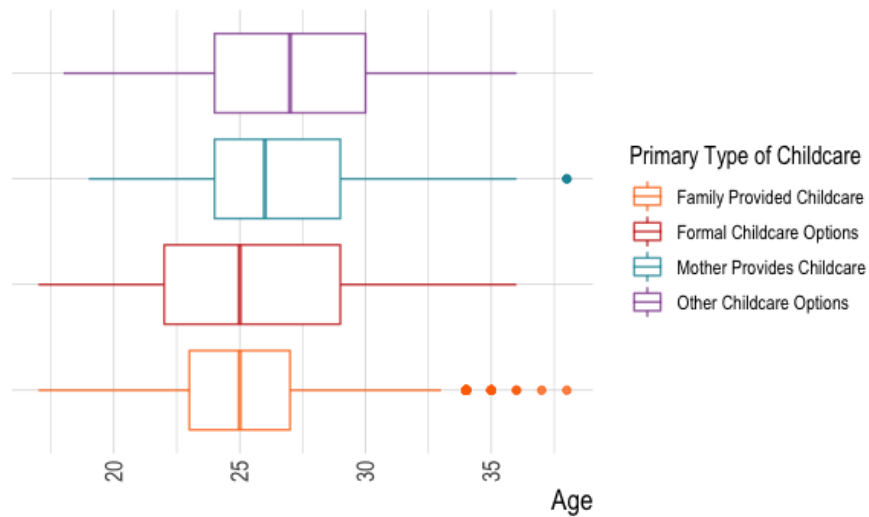
Figure 3, which shows the distribution of the mothers' age when the first child is born, shows that women in our sample designating Family-Provided Childcare as a Primary Childcare category exhibit one of the lowest mean ages, closely followed by women identifying Formal Childcare options as a primary category for childcare.

Mothers with no other childcare options are older on average, as well as mothers using other (in this case, spousal and neighbor care) options.

Figure 4: Childcare Options by Socioeconomic Class
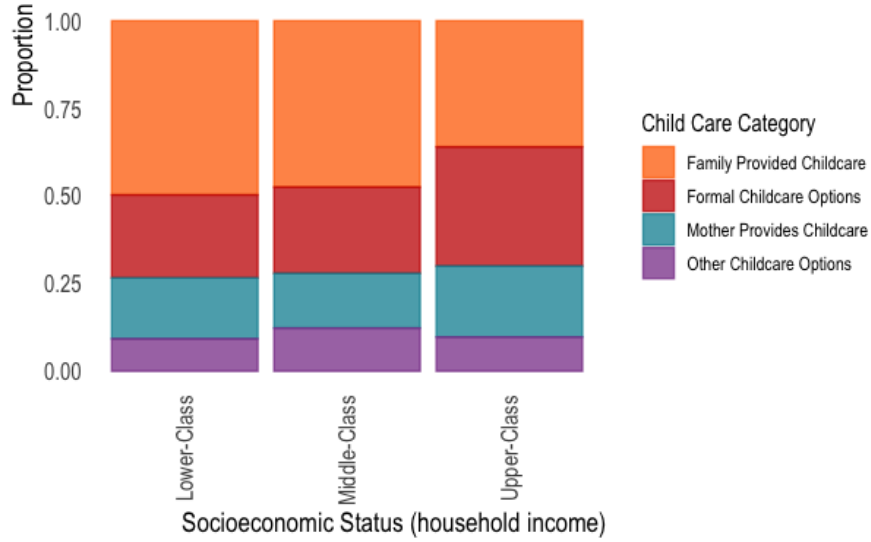
Finally, when looking at the socioeconomic status and childcare options used, we do see that upper-class women have higher proportions of women who use Formal childcare options compared to middle- and lower-class women.

These relationships are important to consider when adding control variables in the models, as it is clear that individuals using the different childcare categories also exhibit differing individual characteristics on average.

Relatives in Close Proximity

Additionally, I look at the variable for 'Relatives being within 15 miles' (*RELATIVE_15_MINUTES*) of the respondent. This variable is only available in the long form of the NLSY, and has approximately 100-200 observations per year for the years 2004, 2008, 2012, and 2018.

Of these observations, one can see that individuals with relatives within 15 miles have a higher proportion of individuals who designate Relative care as a primary source of childcare. The Pearson correlation between the two variables (*RELATIVE_15_MINUTES* and *FAMILY_CARE*) is 0.2, meaning that while these variables are related, they are not

19

measuring the same phenomenon.
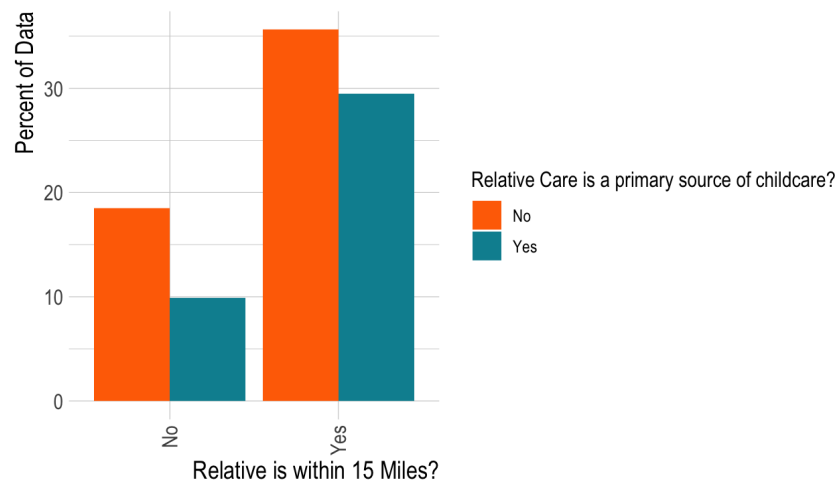
Figure 5: Relatives within 15 Miles vs Use of Relative-Provided Care

Overall Correlation between Model Variables

To check for collinearity between planned model variables, I ran Pearson correlations between all variables to be used in models looking at Family-Provided Childcare and Income (refer to **Appendix B**. Based on the Pearson scores, many variables were moderately correlated and are somewhat collinear. Relationships with relatively high correlation include Highest Education Level (*CV_HGC_EVER_EDT*) and *INCOME_LOG* (Pearson Correlation of 0.45), as well as *MOTHER_AGE_FIRST_CHILD* and *INCOME_LOG* (Pearson Correlation of 0.49). These correlations are consistent with literature about human capital and the impact of the motherhood penalty specifically. In planning the models that I will run, I determined that such variables will provide important and relevant controls for the models, such that the additional information provided by such variables will outweigh the costs of potential collinearity.

Changing Childcare Options

Finally, I generate a descriptive results table looking at the dataset to look at the subgroup means for the following population subgroups:

1. Respondents who have maintained a consistent primary source of childcare throughout the survey period

2. Respondents who have changed from another source of childcare to relative-provided at any point during the survey period

3. Respondents who have changed from another source of childcare to formally provided childcare at any point during the survey period.

Table 2: Subgroup Means and Changes in Primary Childcare

	Consistent Childcare	Changed to Relative-Provided Childcare	Changed to Formal
AGE	29.25	26.59	27.24
CV_HGC_EVER_EDT	16.1	14.2	14.3
CV_INCOME_LOG_FAMILY	$97,917.56	$61,993.62	$71,569.46
WORK_EDU_HRS	44.59	44.67	44.82
N	122	254	863

CV_HGC_EVER_EDT is highest educational attainment, which is used to generate the variable *BA_ABOVE* in later models
WORK_EDU_HRS is hours of work, education, training, or travel. This was used to generate variables *PART_TIME* and *FULL_TIME*.
CV_INCOME_LOG_FAMILY is annual income for the family, and gives us a view of socioeconomic status of the household as a whole.

The results of `Table 2` indicate that respondents who were able to maintain consistent primary sources of childcare throughout the tested period were the smallest subgroup, and consisted of women who were older on average, had completed more years of formal

education, and had higher levels of family income compared to other subgroups. On the other end, respondents who have changed from other sources of childcare to relative-provided childcare were younger, had less formal education, and had lower levels of annual family income on average compared to the other two subgroups. Mean demographics for respondents who had changed to formal options were closer generally to the mean demographics for respondents who had changed to relative-provided care. This latter subgroup of individuals who changed from other childcare options to formal is also the largest (N = 863).

Methods

All of the main models run for this paper use the respondent's annual Income[13] as the response variable.

To model the relationship between the use of family-provided childcare as a primary option and wage outcomes over time, I use Models 1, 2, and 3.

$$INCOME\_LOG_{it} = \beta_0 + \beta_1 FAMILY\_CARE_{it} + \beta_2 MARRIED\_COHABITATING_{it} +$$
$$\beta_3 SPOUSAL\_INCOME\_LOG_{it} + \beta_4 BA\_ABOVE_{it} + u_i + v_t + \varepsilon_{it}$$
$$(1)$$

Following the methodologies of previous papers,[14] this study primarily will be using a fixed effects, two-way model, as this method controls for individual heterogeneity between respondents and for variance in time (Model 1).

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[13]Note: All income variables used within this paper are logged; to keep observations with $0.00 in Spousal Income, I add $1.00 to income variables prior to the log transformation.

[14]Per Gough and Noonan (2013), researchers as of 2013 have primarily relied on fixed effects, OLS, and first-difference models. More recent papers have also attempted to correct for self-selection bias through the addition of instrumental variables, for example using variables such as miscarriage. Due to data limitations, I do not include such variables in the models below.

$$INCOME\_LOG_{it} - \lambda\bar{y} = \beta_0(1-\lambda) + \beta_1(FAMILY\_CARE_{it1} - \lambda\bar{x}_{t1}) +$$

$$\beta_2(MARRIED\_COHABITATING_{it2} - \lambda\bar{x}_{t2}) +$$

$$\beta_3(SPOUSAL\_INCOME\_LOG_{it3} - \lambda\bar{x}_{t3}) + \beta_4(BA\_ABOVE_{it4} - \lambda\bar{x}_{t4}) +$$

$$\beta_5(MOTHER\_AGE\_FIRST\_CHILD_{it5} - \lambda\bar{x}_{t5}) + (\nu it - \lambda\bar{\nu}_i) \qquad (2)$$

`Model 2` is a random effects model, which adjusts from fixed effects in that it assumes some correlations between the observations.[15] This model incorporates the same explanatory, response and control variables, and additionally controls for the age of the respondent when they had their first child ($MOTHER\_AGE\_FIRST\_CHILD$).

$$INCOME\_LOGit = \beta_0 + \beta_1 FAMILY\_CARE_{it} + \beta_2 MARRIED\_COHABITATING_{it} +$$

$$\beta_3 SPOUSAL\_INCOME\_LOG_{it} + \beta_4 BA\_ABOVE_{it} +$$

$$\beta_5 MOTHER\_AGE\_FIRST\_CHILD_{it} + \gamma X_{it} + \varepsilon_{it} \qquad (3)$$

`Model 3` is a Pooled Ordinary Least Squares (OLS) model, incorporating the same variables as `Model 2`. This model will be interesting if there is somewhat limited 'within' variation in the fixed effects model.

To model the relationship between relatives' proximity and Income, we turn to the pooled model specified by `Model 4`.[16]

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[15]Refer to **Appendix B** for results of the Hausman test; note that these results support the use of Fixed over random effects model for this relationship. We will include and discuss the random effects model results somewhat sparingly.

[16]The question for whether any relatives live within 15 minutes of the home ($YCCAL\text{-}6800$), is only available in the long-form survey issued to the slightly younger sub-cohort, and across 3 waves. After applying the filters specified in the Data subsection of this paper and filtering for non-null values within our dataset, each wave consists of approximately 200-300 valid responses. As the ideal sample size with a 95% confidence interval and 5% margin of error for 8.471 million working mothers with children under age 6 per the Bureau of Labor Statistics "Employment characteristics of families summary - 2021 A01 results" (2022), this sample size is not sufficient to be representative if run without pooling.

$$INCOME\_LOG_{it} = \beta_0 + \beta_1 RELATIVE\_15\_MINUTESit+$$

$$\beta_2 MARRIED\_COHABITATING_{it} + \beta_3 SPOUSAL\_INCOME\_LOG_{it}+ \quad (4)$$

$$\beta_4 BA\_ABOVE_{it} + \beta_5 MOTHER\_AGE\_FIRST\_CHILD_{it} + \gamma X_{it} + \varepsilon_{it}$$

Note that the only difference from `Model 3` is the explanatory variable (*RELA-TIVE_15_MINUTES*), as the same respondents will include controls for the same factors noted in the previous models.

IV. RESULTS

Impact of Relative-Provided Childcare

`Table 3` includes the initial results of `Models 1, 2,` and `3`, which look at the relationship between the use of family-based childcare as a primary childcare option and women's workplace impacts as it pertains to wages.

Fixed Effects Model

Per the results of the fixed effects model, working women (with one child under 6 years of age) changing from other sources of childcare to family-provided childcare experience a 5.7% increase in income on average, net of changes in other factors, across the years 2006-2017.

However, this finding was not statistically significant. Further, I found that the Adjusted R^2 is negative, indicating that this model as is does not explain enough variance in the model. As this result can occur when the dataset is insufficient in size, I also tried to rerun this model (1) on Part-Time Mothers with ANY Children under 6 years of age - rather than Part-Time Mothers with only ONE child under 6 years of age (Refer to **Appendix E.1**) and (2) On mothers generating ANY amount of income (Refer to **Appendix E.2**). For both

Table 3: Family-Provided Childcare vs. Annual Income (log)

| | INCOME_LOG | | |
	Fixed Effects	Random Effects	Pooled
FAMILY_CARE	0.056	0.003	−0.066**
	(0.036)	(0.030)	(0.032)
MARRIED_OR_COHABITATING	0.096*	0.121***	0.100**
	(0.049)	(0.040)	(0.044)
BA_ABOVE	0.039	0.367***	0.348***
	(0.107)	(0.046)	(0.036)
SPOUSAL_INCOME_LOG	0.003	0.012***	0.018***
	(0.004)	(0.004)	(0.004)
MOTHER_AGE_FIRST_CHILD		−0.037***	−0.052***
		(0.008)	(0.008)
Observations	2,511	2,511	2,511
R^2	0.110	0.812	0.271
Adjusted R^2	-0.715	0.811	0.267
F Statistic	12.439*** (df = 13; 1302)	732.479***	66.146*** (df = 14; 2496)

Note: *p<0.1; **p<0.05; ***p<0.01

results, we found that while the number of observations increased, the relationship between Family-Provided childcare and Income remained statistically insignificant and the Adjusted R^2 remained negative.

Random Effects Model

The random effects model similarly found that part-time and above working women changing to family-provided childcare as their primary childcare have not experienced any statistically significant differential change in income, net of other variables, and adjusting for the fact that the same person is responding to the same survey.

Pooled OLS Model

With the pooled OLS, it was found that for working women (part-time and above) with one child changing to family childcare (from non-family childcare), net of marital status, completion of bachelor's degree, spouse's income, and the respondent's age when they had

their first child, there is a 6.6% negative change in income on average, net of time. This coefficient is in the opposite direction from the hypothesized *positive* relationship between family childcare as a primary childcare source and wages over time.

When including all income-generating women with one child under the age of 6 (**Appendix E.2**) the results are positive, showing that women with one child above changing to family-based (from non-family-based) childcare exhibit an average change in income of 11.8%, net of time and controlled factors. This coefficient is now in the direction hypothesized.

Relative-Provided Childcare and Full-Time

When looking at the workplace impact of designating Relative-Provided childcare, I also ran a logit model examining the relationship between Relative-Provided Childcare and the odds that the respondent will have full-time work (35+ hours of work).[17] Based on the results, the odds of the respondent working full-time are 13% lower for mothers using family-provided childcare than for mothers not using family-provided childcare, net of other factors. However, this finding is not statistically significant.

Comparative Models: Formal Childcare Models

In addition to these primary models, I reran the two-way fixed effects (`Model 1`) and pooled OLS (`Model 3`) models with Formal Childcare (i.e., Respondent using Formal Childcare as a primary mode of childcare) as the explanatory variable, for high-level comparison with the Relative-Provided Childcare models. Refer to table in **Appendix F** for results of the models.

Based on the model outputs, the fixed effects and pooled OLS coefficients for Formal Childcare were in the reverse direction of the same coefficients for Relative-Provided; further, statistical significance for the two models are reversed from `Model 1` and `Model 3`. The fixed effects results showed that women changing from other sources of childcare to formal childcare

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[17]Refer to **Appendix D.1** for results table of the logit model looking at Relative-Provided Childcare and Full-Time work.)

systems experience a negative, statistically significant change in income (on average, net of factors, and across surveyed period). The pooled OLS showed that women with one child using formal-childcare options exhibit a positive but statistically insignificant change in income, net of time, and controlled factors.

Summary

Based on the results, we can see that even when controlling for human capital (education - level), socioeconomic factors, marital status, and the respondents' age when they had their first child, the relationship between Family-Provided Childcare and wages is negative or statistically insignificant, indicating that a change in from non-relative to relative-based childcare options will have a negligible (or even negative) impact on working women's income over time.

Impact of Relatives' Proximity

Table 4: Relatives within 15 Minutes vs. Annual Income (log)

	INCOME_LOG
RELATIVE_15_MINUTES	−0.017
	(0.100)
MARRIED_OR_COHABITATING	0.243**
	(0.123)
BA_ABOVE	0.105
	(0.118)
MOTHER_AGE_FIRST_CHILD	0.072**
	(0.029)
SPOUSAL_INCOME_LOG	0.015
	(0.012)
Observations	308
R^2	0.315
Adjusted R^2	0.297
F Statistic	17.221*** (df = 8; 299)
Note:	*p<0.1; **p<0.05; ***p<0.01

Per the results of the pooled OLS model (`Table 4`), women working at least part-time with relatives living 15 minutes away (net of marital status, spousal income, bachelor's degree, and age with first child) experience a 1.7% negative change in income on average (net of time), which is the opposite direction from hypothesized. The results, moreover, were not statistically significant.

V. DISCUSSION

Based on the results of the previous section, we can infer overall that neither the use of nor the availability of Relative-Provided Childcare options have a significant differential positive relationship with wages for working women with children under 6 years of age.

Insignificant or Negative Relationship between Family-Provided Childcare and Income

Based on the overall fixed and random effects model results presented in `Tables 3` and 4, I was unable to reject the null hypothesis for **Hypothesis 1** that a change from other childcare options to Relative-provided Childcare would have no effect on Income for mothers. Similarly, the logit model (**Appendix D.1**) indicated that a change to Relative-provided childcare had no statistically significant impact on the working mothers' odds of working full time rather than part-time.

Furthermore, the findings from the pooled OLS models for Relative-Provided Childcare (`Model 3`) and the Formal Childcare systems (**Appendix F.1**) respectively seem to indicate that *net* of time, respondents using formal systems of childcare tended to exhibit higher wages (net of other factors) than respondents using non-formal childcare systems; however, respondents using relative-provided childcare exhibited the opposite relationship.

Simply put, the results of the models run on primary childcare and wages indicate that

working mothers primarily using and/or switching to relative-provided childcare systems tend to experience negative or insignificant effects in workplace outcomes on average.

Proximal Relative Availability does not substantially impact Respondents' Income Over Time

As discussed in the results section, there was no statistically significant relationship between income over time and the availability of relatives living within 15 minutes of the respondent, leading to another failure in rejecting the null hypothesis for **Hypothesis 2**. In this case, the results can be simply indicative of a nonexistent relationship between relatives' availability and wage outcomes. Such a result is not unreasonable; for example, the accessibility of relatives through geographic proximity should not necessarily presuppose that such relatives would be willing or able to provide support and/or childcare as needed for the respondent.

However, it must be noted that of the remaining model variables in the results at `Table 4`, the only statistically significant coefficients in the model correspond to whether the individual is married and the mother's age when their first child was born. Comparatively, pooled OLS results in other models such as `Model 3` exhibit statistically significant relationships with all controlled variables. Given the 'N' value and the statistical insignificance of control variable coefficients, it is still possible that this model includes an insufficient sample size.

Spurious Relationships, Unaccounted Factors, and Temporal Considerations

Given the filtered population consists of ONLY mothers of children under 6 working part-time with some form of childcare other than self-provided, the outcomes here are not unreasonable. It's possible that the main change of importance is the provision of any childcare (rather than the mode of childcare used), and that changes in childcare mode will not substantially impact mothers' workplace outcomes.

When combining the models' findings with the descriptive statistics of the respondent subgroups who changed their primary childcare, we may begin to form some additional

29

theories about these outcomes. Because those who do not change childcare arrangements are older, more educated, and have higher socioeconomic status, there could be an indication of hitherto unaccounted for factors to be added to future models. For example, individuals who maintain consistent childcare across survey waves may disproportionately work within industries with higher promotion or wage increase rates, as individuals in this subgroup also appear to exhibit higher levels of formal educational attainment.

When interpreting pooled OLS models, it may also be important to think about the direction of the relationships within the models. For example, it is possible that as a mother encounters workplace success (e.g., raises and promotions), she may in turn choose to spend the additional funds on formal childcare options (e.g., paying tuition for a preschool, after-school program, or daycare). In such cases, the pooled OLS model may not be able to capture the sequence and order that events occurred.

It is also noteworthy that despite the large sample size within each panel, there were only approximately 200 individuals (as grouped by unique identifier) who have ever changed from other childcare options to relative-provided childcare. This could account for part of the negative adjusted R^2 across fixed effects models.

VI. CONCLUSION

When deconstructing the factors around the motherhood pay gap, the topic of childcare provision has become increasingly pertinent, informing policy and helping to shape understanding about the decisions and solutions to mitigate career path disruption and wage differences for working mothers. A fuller understanding of the relationship between childcare and maternal workplace outcomes can help to inform us about mothers' employment and childcare decisions and preferences. This in turn can ultimately help us to understand the potential efficacy of policies designed to promote equity for working mothers.

This paper adds to the recent scholarship on the topic of the relationship between maternal career outcomes and informal, relative-provided childcare availability and use - a topic that has recently begun to be explored, with relatively sparse coverage in the United States. In this paper, I begin to fill this gap by looking at the comparative wage impact on working mothers corresponding to relative-provided informal childcare arrangements. Using a fixed effects model on panel data, I find a positive but insignificant relationship between a change to relative-provided arrangements (i.e., from other childcare arrangements outside of maternal caregiving) and wages over time. I further find no significant relationship between the availability of nearby relatives (i.e., within 15 minutes) and wages over time. While these results are statistically insignificant, they are noteworthy as they indicate that relative-provided childcare in the United States does not have a differential impact on wages net of time and other factors.

While this study is one of the first in presenting findings of childcare arrangements and maternal wage impacts, it's important to acknowledge some limitations of the study and note some future steps that can be taken to better understand the relationships between childcare options and employment outcomes for working mothers in the US.

Firstly, similar fixed and random effects models can be run on later waves of data in a continuation analysis, or conversely on earlier panel datasets with comparable measures. This paper used the NLSY97 in part because many of the female respondents will have recently become first-time mothers within the survey periods examined, such that the models would more closely reflect recent trends. As shown in `Table 2`, the average age of our sample population across survey waves was 25.56. However, the mean age of new mothers has been increasing steadily within the past decade - per Mathews and Hamilton (2016), the mean age of first birth had increased to 26.3 by 2014. With this in mind, models may be more representative and may allow for the modeling of longer-term effects for working mothers in the US if an earlier panel (e.g., NLSY79) or a dataset with later years' observations was used

31

to build the models within this report. Given that some of the results within this paper are indicative of insufficient sample size or small sub-samples for our explanatory variables, the use of new data to run similar models can be doubly useful in solidifying the validity of the results of this paper.

The use of the NLSY97 also comes with challenges stemming from the survey design. Certain measures necessitated an understanding of and adjustment for the sequential nature of the NLSY97 questions, wherein specific responses to previous survey questions are required for a non-null value. As one important example of this, the variable for Primary Childcare necessitated positive responses to other questions such as a non-zero number of hours worked, commuting, training, or learning without the child (*WORK_EDU_HRS*, see **Appendix B**). In this example, when *WORK_EDU_HRS* is 0, it would be difficult to fully determine whether the observation consists of the mother devoting all of their time to their care-taking role or if the observation represents the respondent working from home. For the purposes of this report, observations of '0' (in *WORK_EDU_HOURS*) were interpreted as 'Mother Providing childcare' within the descriptive statistics; however, these observations were not included in subsequent models and results due to such difficulties of interpretation. Future work could include these '0' *WORK_EDU_HRS* observations within fixed effects models as 'mother providing childcare' to see whether model values change when we are looking at a change to 'relative-provided care' to other options *inclusive* of changes to 'relative care' from 'mother providing childcare'.

Later work exploring childcare and wages can be done to look at previously uncaptured characteristic differences between individuals changing from one childcare category to another. For example, it is typical in models about maternal wage outcomes to control for a measure of 'work experience.' Work experience is an important human capital measure that can impact wages over time and would improve the existing models. Other variables that could be included in future models include ethnic/racial background, geographic characteristics (e.g.,

metropolitan vs rural area), industry(ies) that the respondent has worked in, and number of the consecutive year(s) that a certain mode of childcare is used with consistency.

Finally, in modeling the workplace impacts (wages, full-time status, etc.), current models could be modified to better capture the temporal nature of the events being modeled. This can be done by adding lagged models, wherein a change in the explanatory variable *t-1* can be regressed against changes in the response variable at time *t*.

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Appendix

Appendix A: Childcare Variable Preprocessing

Variable Structure

The variable of 'PRIMARY CHILD CARE ARRANGEMENT' looks at the primary childcare arrangement for each child 13 and under (YCCA-1100) or 7 and under (YCCAL-1100).

The childcare options are outlined in `Figure A.1` -

1. Spousal or Partner Care

2. Relative Care

3. Sibling Care

4. Self-Care (i.e., child takes care of themselves)

5. Non-relative Care

6. Family Day Care (i.e., drop off child with an extended family member for child care).[18]

7. Child Care Center

8. Formal Schooling

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[18]Family Day Care variable is not an option in 2011 and 2015 for YCCAL respondents and instead is part of Relative Care variable.

As shown in `Figure A.1`, the primary childcare question is only posed to females with resident child/ren age <13 (or <6 years) at the time of the survey, either working for pay or attending school without their child for *any* amount of time greater than 0. In this thread, women who are purely stay-at-home mothers are not included in the valid observations of this variable.

Figure A.1 - YCCA/YCCAL-1100 Question Lead-Ins for NLSY-97
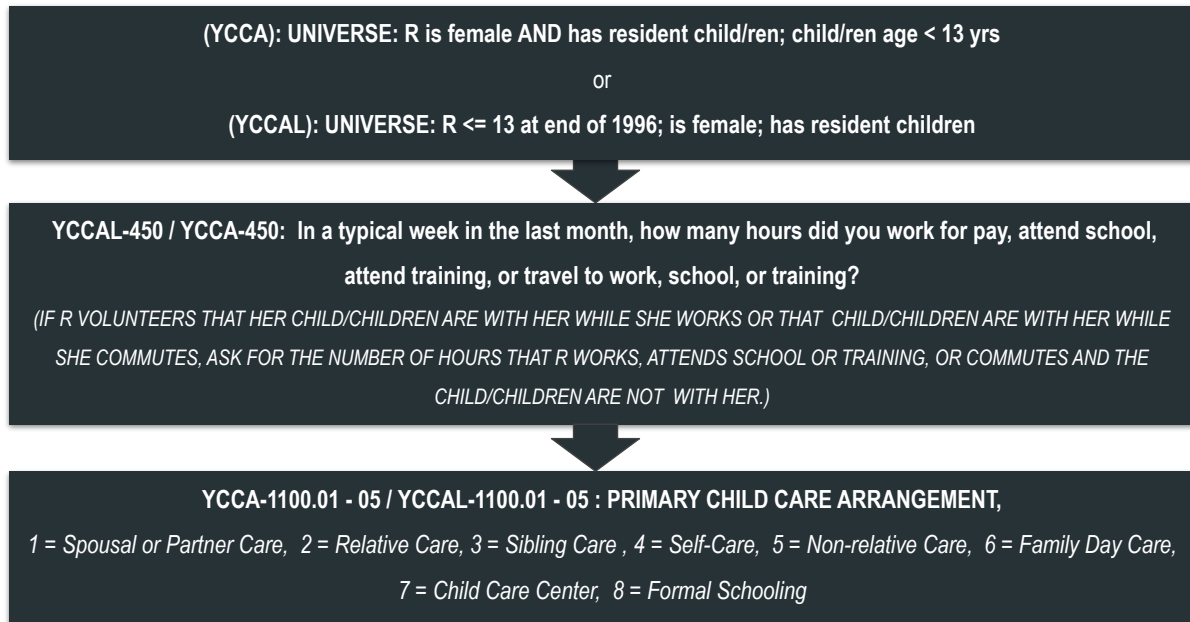
In the raw data, the variable 'Primary Child Care Arrangement' is split into YCCA-1100 and YCCAL-1100 variables, respectively. This data spanned 2002-2017; however, per Steve McKlaskie from the NLS User Services, "in survey years 2005, 2008, 2011, and 2015 (rounds 9, 12, 15, and 17), the YCCAL questions were added and limited to females born in 1983 and 1984. The older females (born 1980, 1981, 1982) go through the YCCA questions." Thus, in the listed rounds, we will need to look at both YCCA-1100A and YCCAL-1100A.

Finally, the questions YCCA-1100 and YCCAL-1100 are asked of respondents for each child they have under the age threshold(s); that is, for women with multiple children close in age, this variable will be measured for each child.

Preprocessing

Given the variable data structure, I did the following to arrive at my childcare variables:

- Where YCCAL-1100 observation was NA, I imputed YCCA 1100 (for each observation).

- For consistency across YCCA-110 and YCCAL-1100 (and because these are the years most relevant for my research) I filtered for people with children under 6 years old in their households.

- For models looking at mothers not working/needing childcare at all, I treated YCCAL-450/YCCA-450 == 0 as 'Maternal Childcare' (because these observations indicate the mother takes the child everywhere and thus is the primary 'child care' source.

- I dropped observations indicating 'self-care' as the primary childcare source.

- I categorized 'Relative Care' to include 'Relative Care' and 'Family Day Care'. Where I run models with more than one child, I also include sibling care.

- 'Informal Childcare' includes 'Family Day Care'

- 'Non-relative care', 'Formal Childcare' includes Child Care Center and Formal Schooling.

Appendix B: Pearson Statistics

Figure B.1 - Pearson Correlation Table - Primary Childcare Options vs Income

	CV_HGC_ EVER_ EDT	WORK_ EDU_ HRS	MARRIED_ OR_ COHABI TATING	MOTHER_ AGE_ FIRST_ CHILD	INCOME_LOG	SPOUSAL_ INCOME_LOG	FAMILY_ CARE	FORMAL_ CHILD CARE
CV_HGC_ EVER_ EDT	1.00	0	0.24	0.49	0.45	0.31	-0.15	0.08
WORK_ EDU_ HRS	0	1.00	-0.05	-0.05	0.07	-0.05	0	0.03
MARRIED_ OR_ COHABI TATING	0.24	-0.05	1.00	0.27	0.23	0.48	-0.09	-0.07
MOTHER_ AGE_ FIRST_ CHILD	0.49	-0.05	0.27	1.00	0.49	0.39	-0.11	0.03
INCOME_LOG	0.45	0.07	0.23	0.49	1.00	0.4	-0.16	0.07
SPOUSAL_ INCOME_LOG	0.31	-0.05	0.48	0.39	0.4	1.00	-0.13	0.04
FAMILY_ CARE	-0.15	0	-0.09	-0.11	-0.16	-0.13	1.00	-0.54
FORMAL_ CHILD CARE	0.08	0.03	-0.07	0.03	0.07	0.04	-0.54	1.00

CV_HGC_EVER_EDT is highest educational attainment, which is used to generate the variable BA_ABOVE. *WORK_EDU_HRS* is hours of work, education, training, or travel. This was used to generate variables PART_TIME and FULL_TIME.

Figure B.2 - Pearson Correlation Table - Relative_15_Minutes and Income

	INCOME_LOG	MARRIED_ OR_CO HABIT ATING	BA_ ABOVE	SPOUSAL_ INCOME_LOG	MOTHER_ AGE_ FIRST_ CHILD	RELATIVE_ 15_Min	FAMILY _CARE
INCOME_LOG	1	0.31	0.44	0.51	0.56	-0.15	-0.29
MARRIED_ OR_CO HABIT ATING	0.31	1	0.25	0.52	0.33	-0.12	-0.16
BA_ ABOVE	0.44	0.25	1	0.35	0.54	-0.12	-0.36
SPOUSAL_ INCOME_LOG	0.51	0.52	0.35	1	0.47	-0.11	-0.23
MOTHER_ AGE_ FIRST_ CHILD	0.56	0.33	0.54	0.47	1	-0.17	-0.44
RELATIVE_ 15_Min	-0.15	-0.12	-0.12	-0.11	-0.17	1	0.2
FAMILY _CARE	-0.29	-0.16	-0.36	-0.23	-0.44	0.2	1

Appendix C: Hausman Test

The following is the Hausman Test, run on `Model 1` and `Model 2`. The purpose of this test is to compare the coefficients of the Fixed and random effects. The null hypothesis here is that the two models are essentially the same.

```
Hausman Test

data:  INCOME\_LOG_LOG ~ FAMILY_CARE + MARRIED_OR_COHABITATING + BA_ABOVE +  ...
chisq = 72.033, df = 13, p-value = 3.384e-10
alternative hypothesis: one model is inconsistent
```

Based on the output p-value, we find that the two models are not showing consistent results. In such cases, it is generally best to use the fixed effects model.

Appendix D: Full Time vs. Part Time

$$log((p_{full\_time})/(1 - p_{full\_time})) = \beta_0 + \beta_1 FAMILY\_CARE +$$

$$\beta_2 MARRIED\_COHABITATING + \beta_3 SPOUSAL\_INCOME\_LOG + \quad (5)$$

$$\beta_4 BA\_ABOVE + \varepsilon$$

Below are the results of the logit model run on the dataset of mothers (HS+) working part-time, looking at the relationship between family-based childcare and the log-odds that the individual changes from part-time (20-34 hours of work per week) to full-time (35+ hours of work per week).

D.1: Logit Model: Family-Provided Childcare vs. Full-Time Work

	INCOME_LOG
FAMILY_CARE	−0.140
	(0.129)
MARRIED_OR_COHABITATING	−0.182
	(0.176)
BA_ABOVE	0.311**
	(0.147)
SPOUSAL_INCOME_LOG	−0.021
	(0.016)
MATERNAL_AGE	0.103**
	(0.045)
Observations	2,511
Log Likelihood	-922.979
Akaike Inf. Crit.	1,875.959

Note: $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

Appendix E: Alternative Models

Part-Time Mothers with ANY Child Under 6

The results below consist of `Model 1`, as run on part-time mothers with *any* number of children under 6 years of age. Note that as we are now including observations of women with multiple children, I will also be controlling for N_CHILDREN (i.e., number of children within the respondent's household).

E.1: Family-Provided Childcare vs. Annual Income (log) - Part-Time Mothers of ANY Children Under 6 Years of Age

	INCOME_LOG Fixed Effects
FAMILY_CARE	−0.005
	(0.035)
MARRIED_OR_COHABITATING	0.069
	(0.051)
BA_ABOVE	0.005
	(0.113)
SPOUSAL_INCOME_LOG	0.002
	(0.005)
Observations	3,207
R^2	0.051
Adjusted R^2	-0.765
F Statistic	7.095*** (df = 13; 1724)
Note:	*p<0.1; **p<0.05; ***p<0.01

For this model, we do see that there is a substantially larger pool of observations (3,918 rather than 2,511). While the direction of the fixed effects and pooled models are now consistently negative, showing that a change from other forms of childcare to family-provided care corresponded with a lower level of wages,

Mothers of ONE Child under 6 years of age Working ANY Number of Hours

In our initial models, I only include women working at least part-time (20 hours). This was because I wanted to control somewhat for the hours worked. However, to filter for part-time workers, I needed to use data showing the number of hours worked without their child. These models add back the respondents who have worked/attended a class / traveled to and from work for fewer than 20 hours, which increases our sample size, adds back potential respondents who may have worked from home prior to 2018, and helps us to broadly understand whether the use of Family-Based Childcare (rather than other childcare options) corresponds with higher wages over time. Note that this model once more only looks at mothers with only ONE child, so that we can compare with the main models `Model 1, 2,` and `3` with only one model characteristic changed.

E.2: Family-Provided Childcare vs. Annual Income (log) - Mothers of ONE Child Under 6 Working ANY number of hours

| | INCOME_LOG | |
	Fixed Effects	Pooled
FAMILY_CARE	−0.005	0.118***
	(0.035)	(0.033)
MARRIED_OR_COHABITATING	0.069	0.024
	(0.051)	(0.045)
BA_ABOVE	0.005	0.358***
	(0.113)	(0.038)
MOTHER_AGE_FIRST_CHILD		0.044***
		(0.008)
SPOUSAL_INCOME_LOG	0.002	0.020***
	(0.005)	(0.004)
Observations	3,207	3,207
R^2	0.051	0.208
Adjusted R^2	-0.765	0.204
F Statistic	7.095*** (df = 13; 1724)	59.752*** (df = 14; 3192)

Note:	*p<0.1; **p<0.05; ***p<0.01

Appendix F: Formal Childcare Models

The results below are Two-Way fixed effects and Pooled OLS Models (`Model 1` and `Model 3`) run with Formal Childcare as the explanatory variable. I use the same filtered data, response variable, and control variables, and only changed the explanatory variable from *FAMILY* to *FORMAL* childcare options.

F.1: Formal Childcare vs. Annual Income (log)

	Income	
	Fixed Effects	pooled
FORMAL_CHILDCARE	−0.077**	0.034
	(0.038)	(0.033)
MARRIED_OR_COHABITATING	0.087*	0.106**
	(0.049)	(0.044)
BA_ABOVE	0.024	0.353***
	(0.107)	(0.036)
SPOUSAL_INCOME_LOG	0.003	0.018***
	(0.004)	(0.004)
MOTHER_AGE_FIRST_CHILD		0.052***
		(0.008)
Observations	2,511	2,511
R^2	0.112	0.270
Adjusted R^2	-0.712	0.266
F Statistic	12.592*** (df = 13; 1302)	65.840*** (df = 14; 2496)

Note: *p<0.1; **p<0.05; ***p<0.01