Essays on Female Self-Employment

by

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I dedicate my dissertation to my fiancé Ben Hopkins, whose loving support made the completion of this dissertation possible. Ben, thank you for the many hours you spent reading my work, listening to my presentations, cooking me dinner, and encouraging me through the ups and downs of my research. I feel blessed to have you as my partner.

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ABSTRACT

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This dissertation explores the determinants and consequences of self-employment among American women. In the first essay, I quantify the value of self-employment as a flexible work alternative for mothers with young children and estimate the impact of self-employment experience on women's future employment and earnings. Using data from the NLSY79, I incorporate self-employment into a life-cycle model of married women's fertility and employment decisions. I find that mothers with preschool-aged children value the package of flexible amenities in self-employment at around $7,400 annually. My model suggests that this additional flexibility encourages mothers to switch from wage and salary employment to self-employment, which lowers their lifetime earnings. Overall, the findings suggest that workplace flexibility is highly valued by mothers and that it is an important driver of their fertility and employment decisions. The second essay investigates the effect that young children have on women's likelihood of becoming self-employed. Using panel data from the Survey of Income and Program Participation, I show that the self-employment rate among women with a two year old child is 11-17 percent higher due to the birth of that child.

I analyze time use data to show that self-employed women appear to have more flexibility in their work location, hours, and schedule. My findings suggest that self-employment itself allows women to spend more time with their children. These results contribute to a deeper understanding of the varied work decisions of women with young children. The third essay, which is collaborative work with Katherine Michelmore, examines the effect of the Earned Income Tax Credit (EITC) on married women's decision to become self-employed. Using data from the Survey of Income and Program Participation, we find that increases in the EITC between 1990 and 2012 led to a 4 percentage point, or 50%, increase in married women's self-employment rates. We measure self-employment as working positive hours at a business, which provides evidence that this increase in self-employment is real work effort. Our results suggest that the EITC affects women's type of employment in addition to their overall labor force participation.

CHAPTER 1

Self-Employment, Workplace Flexibility, and Maternal Labor Supply: A Life-Cycle Model

This paper quantifies the value of self-employment as a flexible work alternative for mothers with young children and estimates how the additional flexibility affects women's long-term employment and fertility. On average, self-employed women have more control over their work schedule, hours and location than wage and salary employed women. I incorporate self-employment into a life-cycle model of married women's fertility and employment decisions and use data from the NLSY79 to estimate the value of self-employment flexibility for mothers. I find that mothers with preschool-aged children value the package of flexible amenities in self-employment at around $7,400 annually, which represents around 25% of their average wage and salary earnings. A partial equilibrium counterfactual exercise suggests that self-employment flexibility encourages some married women to switch from wage and salary employment to self-employment, lowering women's median lifetime earnings by 1.2%. Overall, my findings offer evidence that workplace flexibility is highly valued by mothers and that it is an important driver of their fertility and employment decisions.

1.1 Introduction

American mothers have increased their labor force participation substantially since the 1970s, but nearly a third of women still reduce their work hours or stop working altogether after having their first child (Laughlin (2011)). This decline in employment may harm women's future earning potential (Bertrand et al. (2010), Waldfogel (1998)). The fraction of women who are self-employed, however, does not decrease following the birth of a child.[1] These distinct employment patterns suggest that, for some mothers, self-employment is more compatible with the demands of caring for young children than wage and salary employment. Previous research suggests that self-employment provides greater flexibility in terms of work hours, schedule, and location (Devine (2001), Gurley-Calvez et al. (2009)). This flexibility may allow the self-employed to balance their work and family responsibilities and avoid a potentially costly gap in employment.

In this paper, I develop a life-cycle model of married women's fertility and labor supply to estimate the value of workplace flexibility in self-employment and to study the long-term effects of self-employment experience on earnings. In the model, having children can increase the costs of working, and this increase may vary between self-employment and wage and salary employment. The difference in the costs of working associated with children between the two types of employment captures the relative value of flexibility in self-employment. In addition to estimating how mothers value self-employment flexibility, this paper examines the long-term effects of this flexibility on earnings and employment. By studying women's self-employment experience within the broader career context, I am able to examine transitions between employment types and the returns to self-employment experience. This expands on the previous self-employment literature, which considers self-employment as a fixed characteristic (e.g. Devine (1994), Wellington (2006)). Estimating the returns to self-employment experience over a woman's career also provides more insight into its effect on the gender earnings gap, which increases with age (Goldin (2014)).

This is the first paper to include self-employment as a choice in a life-cycle model of women's decisions. A number of papers study the interaction between fertility and labor supply decisions ((Hotz and Miller (1998), Francesconi (2002), Adda et al. (2011), Keane and Wolpin (2010)), but they do not distinguish self-employment from wage and salary employment. Separating the two employment types allows me to estimate differences in their returns to experience and costs of working.

By developing a dynamic model of women's decisions, I address several difficulties in the existing self-employment literature. First, the model allows for unobserved hetero-

[1] See Lim (2016) for evidence on the relationship between female self-employment and fertility.

geneity in earning ability and preferences for children to account for selection into self-employment based on unobserved characteristics. Second, it can account for the forward-looking nature of employment and fertility decisions and exploit revealed preferences to uncover the value of self-employment flexibility. Finally, by examining the workplace flexibility of self-employment, my paper adds to the compensating differentials literature and builds on papers estimating the non-pecuniary benefits of self-employment.[2]

My estimates suggest that, while wage and salary experience has the highest return for future lifetime earnings, time spent in self-employment is better for future earnings than time spent not working. Estimates of women's utility functions reveal that the net utility cost of working is higher in self-employment than in wage and salary employment. This may reflect the stress and risk involved with being self-employed as well as a potential loss of fringe benefits. It may also explain why self-employment rates are low even though 55% of US workers state a preference for self-employment (The Gallup Organization (2010)). I find that mothers with young children face additional utility costs of working in either type of employment. However, this additional cost is about $7,400 larger for wage and salary employment. I interpret this difference as the value of self-employment flexibility for mothers. It represents around 25% of average wage and salary earnings, which suggests that mothers value workplace flexibility highly.

I use the estimates of my model to perform three partial equilibrium counterfactual exercises. First, I simulate a version of the model where self-employment is as inflexible for mothers as wage and salary employment to estimate the effect of self-employment flexibility. My simulations imply that self-employment flexibility raises women's fertility by 3.0% by lowering the costs of working while they have young children. I find that women's median lifetime earnings are 1.2% lower with flexible self-employment because it encourages women to work in relatively lower paying self-employment rather than in wage and salary employment. In a second counterfactual exercise, I consider the effect of increasing flexibility for mothers in wage and salary employment to equal the flexibility provided in self-employment.[3] I find that increasing wage and salary flexibility raises women's fertility, increases their overall work experience, and increases their median lifetime earnings

[2]See Hurst and Pugsley (2014) and Hamilton (2000) on the non-pecuniary benefits of self-employment. There is a large literature on compensating differentials including work on the impact of fatality risk (e.g. Viscusi and Aldy (2003) and Dorman and Hagstrom (1998)), income risk (e.g. Hammermesh and Wolfe (1990) and Dillon (2015)), and fringe benefits (e.g. Lehrer and Pereira (2007)) on compensation.

[3]This exercise does not include a wage adjustment to compensate firms for the costs of implementing flexible work policies for mothers, and therefore the estimates likely overstate the effect of these policies. The counterfactual makes wage and salary employment as flexible for mothers as self-employment, however, some flexible work policies could make wage and salary employment more flexible for all workers. This could yield additional benefits to women without young children and men who may also value workplace flexibility.

by 12.5%. My third counterfactual models the effect of policies to promote female self-employment by lowering the entry costs to self-employment. I find that lowering entry costs by 10% raises self-employment rates substantially, but decreases women's median earnings by 0.9% because it encourages women to switch from wage and salary employment to self-employment. Although it makes the flexible work alternative less costly, I find that reducing the entry costs to self-employment has only a small positive effect on fertility.

While all three counterfactuals suggest that increased access to flexible work raises women's employment, only increasing the flexibility of wage and salary employment diminishes the overall gender earnings gap. In general, increasing flexibility for mothers raises women's lifetime work experience and earnings by encouraging them to work while they have young children. However, increasing flexibility or access to self-employment encourages women to switch to self-employment, where women's earnings are around 30% less than in wage and salary employment. In addition, increases in flexibility encourage relatively lower-earning women to work, which decreases the average earnings among employed women. In my counterfactual exercise with increased wage and salary flexibility, I find that the effect of additional work experience and shifts from self-employment to wage and salary employment outweigh the selection of lower-earning women into employment. In contrast, I estimate that the flexibility provided by self-employment and policies to lower the entry costs to self-employment exacerbate the gender earnings gap by lowering employed women's earnings. Nevertheless, the flexibility of self-employment makes women better off. This highlights the importance of considering non-pecuniary benefits and labor force participation in addition to the earnings of employed women.

My results offer additional evidence that workplace flexibility decreases employment gaps during the childbearing years, complementing previous work by Goldin (2014), Herr and Wolfram (2012), and others. This paper takes a different approach by using self-employment to study workplace flexibility, but reaches the same conclusion: a lack of workplace flexibility causes some mothers to leave the labor force. Many of the aspects of self-employment flexibility can be seen in the existing policies of some firms. Policies like flextime mimic the ability to choose different work hours, while telecommuting allows employees to work from home. My model provides a monetary estimate for the value of the flexibility offered by self-employment, which can be compared to firms' costs when evaluating whether to implement these policies. While these results show that self-employment is one way that mothers gain flexibility, I also estimate substantial costs associated with self-employment. This suggests that self-employment is not for everyone and highlights the potential value of more flexible work alternatives within wage and salary employment.

The remainder of the paper is structured as follows. Section 2 provides some back-

ground on female self-employment. Section 3 describes the model of fertility and labor supply and discusses identification of the model parameters. Section 4 describes the data I use to estimate the model. In section 5, I discuss the parameter estimates from the model, with a particular focus on women's earnings and utility parameters. Section 6 describes the results from the three counterfactual exercises. In section 7, I discuss the interpretation and robustness of the estimates and section 8 concludes.

1.2 Background: Self-Employment and Flexibility

1.2.1 Female Self-Employment and Children

Previous research has found that women with young children are more likely to be self-employed than women without young kids. A number of papers have shown that women's self-employment is positively associated with both marriage and children (Devine (2001), Lombard (2001), Wellington (2006)). In other work, I have studied how self-employment behavior changes with the age of a woman's youngest child (Lim (2016)). I find that the presence of a child between the ages of one and six has a positive effect on a woman's self-employment propensity that is both substantively and statistically significant. This association follows an inverted U-shape with respect to the age of a woman's youngest child; the effect is strongest when the youngest child is two years of age. The shape of this relationship is consistent with the hypothesis that self-employment provides a means to work while caring for children during the years when they require the most attention.

Because the empirical evidence suggests that the decision to be self-employed and the decision to have children are interrelated, I model them as a joint decision. My model allows the presence of children to affect the decision to become self-employed and for the option of self-employment to influence fertility, something that previous work has been unable to address.[4]

1.2.2 Workplace Flexibility and Female Self-Employment

Researchers have focused on workplace flexibility as a primary explanation for the positive relationship between female self-employment and children. They have identified the ability to work from home, the ability to work fewer hours, and control over work load and schedule as primary factors that explain why mothers with young children are more likely to be self-employed. The characteristics of work look quite different between self-employed

[4]The one exception is Noseleit (2014) who uses the sibling-sex composition as an instrument for fertility and the share of local employees working in small businesses as an instrument for self-employment.

mothers and wage and salary employed mothers. While 5% of wage and salary employed mothers with young children work from home, around 25% of self-employed mothers do all of their work at home (Lim (2016)). Time use analyses find that self-employed mothers spend more time with their children, work fewer hours, and spend more time on housework (Gurley-Calvez et al. (2009), Hundley (2000), Lim (2016)). The self-employed have more varied usual work hours than the wage and salary employed and are more likely to change their work hours throughout the year [5] The evidence suggests that self-employment allows mothers additional control over some aspects of their work arrangements.

Although self-employment provides a more flexible work environment, there are many reasons why only 5% of married women are self-employed. First, the ability to be self-employed and the flexibility of self-employment varies across occupations. As Figure 1.1 shows, the most common occupations among the self-employed are child care workers, administrative workers, managers, and sales workers.[6] The level and type of flexibility that each occupation achieves in self-employment can differ and may be less flexible in some ways than working a similar job in wage and salary employment.[7] Second, becoming self-employed can be financially risky and require startup capital. It can also result in the loss of fringe benefits such as employer retirement contributions and employer-sponsored health insurance.

Although only a small fraction of women are self-employed at any given time, nearly 30% of women are self-employed at some point in their career.[8] Very few women, however, spend the majority of their working lives in self-employment, making the question of how self-employment experience affects future earning potential in wage and salary employment relevant.

1.2.3 Workplace Flexibility: Access and Impacts

Many of the features of general flexible work arrangements are incorporated in self-employment, but many workers do not have access to these types of flexibility within wage and salary

[5] See Lim (2016) for evidence on differences in the distributions of work hours between the self-employed and wage and salary employed. See Devine (2001) for evidence that self-employed women are more likely to change their work hours throughout the year. There is little evidence that changes in hours in self-employment are due to slack demand. Devine (2001) finds that temporary part-time work among the self-employed is involuntary only 3% of the time compared to 10% of the time for wage and salary employed women.

[6] These tabulations are for my sample of NLSY79 married, white women. For a more comprehensive look at the top occupations among all self-employed American women over time see Table A.1.

[7] For example, Goldin and Katz (2012) argue that pharmacists represent an occupation that is less flexible in self-employment.

[8] Author's tabulations from NLSY79 data.

employment.[9] In 2011, 56% of US wage and salary employees had the ability to vary their schedule or the location of their work (Council of Economic Advisors (2014)). Although the majority of employers offer flexible work policies for some employees, relatively few offer the programs to all or most of their employees (Matos and Galinsky (2014)). Individual-level data suggest that workers with a Bachelor's degree are more likely to have access to flexibility in their schedules and place of work than less educated employees (Golden (2001), Council of Economic Advisors (2014)). Overall, the evidence suggests that a sizable share workers do not have access to a flexible work environment at their current employer.

There is some research suggesting that workplace flexibility is an important determinant of mothers' employment decisions. Much of the work has focused on the effect of maternity leave. Paid leave seems to be more effective than unpaid leave in encouraging employment among mothers. Both Rossin-Slater et al. (2013) and Byker (2014) find that paid leave in California raised women's employment, while Han et al. (2009) find no relationship between employment and the short and unpaid maternity leave provided by the 1993 Family and Medical Leave Act, although the effect is relatively imprecisely estimated. Other papers have focused on measuring the flexibility within an occupation and estimating its impact on women's choices. Herr and Wolfram (2012) find that among Harvard graduates, women in flexible jobs are 5-6 percentage points less likely to stop working after having children. Goldin (2014) provides some evidence that the most flexible occupations have the smallest gender earnings gaps. This paper estimates the effect of the package of flexible amenities self-employment provides on women's short and long-term employment decisions.

1.3 Model

In this section, I describe my model of the employment and fertility decisions of married white women over their working lives. I study married women for two reasons. Empirically, the effect of young children on self-employment rates is largest for this group, making it a relevant population to study (Lim (2016)). Additionally, self-employment rates among married women are around 9% compared to 3% for never married women (Roche (2014)). Second, single women face different constraints in making employment and fertility decisions than married women. Because the model takes husbands' employment as exogenous and does not include household bargaining over child care and home production, I limit the

[9] See www.workplaceflexibility2010.org at Georgetown Law for details on a variety of flexible work policies.

scope of the analysis to married women. I focus on white women in order to reduce the number of estimated parameters by focusing on a relatively homogenous sample.[10] Additionally this sample selection allows me to compare my results to previous work on married white women.[11]

Figure 1.2 depicts the overall timeline of the model. The model begins at age A_0, which is individual specific and is defined as the first year when all three of the following events have occurred: the woman is at least 18 years of age, she is married, and she has been out of school for at least two years. The estimation begins after almost all schooling has been completed because I am not modeling education decisions.[12] Similarly the estimation begins after women marry because the model abstracts from the marriage decision and does not allow for divorce.[13] In each year between ages A_0 and 50, women decide between wage and salary employment, self-employment, or non-employment. If the woman has fewer than four children and is under the age of 40, she also chooses whether to have a child that year.[14] In years when women make both an employment decision and a fertility decision they choose from six alternatives, and in years with only an employment decision they choose from three. At age 51, women receive the continuation value from all of their previous choices. This value is equal to the utility their would receive from making a static optimal employment decision each year through age 65 given the values of their state variables at age 50. At age 65, women retire and the model ends.[15]

The model incorporates two dynamic considerations: human capital accumulation through work experience and children. When women decide whether to be employed, they consider the effect of the decision on their future earning potential. Likewise, when women have children they fully anticipate the need to care for the child and the benefits of having children. In the remainder of this section, I discuss the empirical specification of the model, describe the estimation procedure, and discuss the identification of key parameters.

[10] Black and Hispanic women have different self-employment rates, may face different earnings processes or have differing preferences over children and work, which would require estimating separate parameters by race. In the data, I do not have the sample size to run a separate model for Blacks and Hispanics.

[11] For example Francesconi (2002) and Eckstein and Wolpin (1989).

[12] In the data, I consider the beginning of the first two consecutive years out of school as the beginning of the eligible sample period. Women remain in the sample even if they return to school later.

[13] In the data, I focus on women who do not divorce during the survey period. Incorporating the decision to divorce greatly complicates the model, and I leave this extension to future work.

[14] This maximum was set to ease computation. Around 2.1% of women in my sample have more than 4 children and 2.8% have children after age 40. I assume perfect control over fertility, but unexpected pregnancies will be captured in the model by a large positive fertility shock.

[15] Women may receive utility in retirement but it must be unrelated to any state variables in the model such as number of children, work experience, and demographics. This implies that earlier employment and fertility decisions are not motivated by a desire for grandkids or large retirement savings. These considerations are beyond the scope of my model.

1.3.1 Utility Function

Women make decisions to maximize the present value of their expected utility:

$$E_t\big[\sum_{\tau=t}^{65}\delta^{\tau-t}U(c_\tau, d_\tau^j, N_\tau, a_\tau, \epsilon_\tau^{jn})\big] \tag{1.1}$$

where δ is the discount factor, c_τ is the woman's consumption in year τ, d_τ^j is a vector of indicators for the employment choice where $j \in \{ws, se, ne\}$ for wage and salary, self-employment, and non-employed respectively. N_τ is the total number of children a woman has (including a child born in period τ), n is an indicator for a birth, and a_τ is the age of the woman's youngest child. In each year, women receive utility from consumption, their children, and leisure. Leisure is not explicitly modeled, but the loss of leisure from working is reflected in the cost of employment. Women's period-specific utility is specified as follows:

$$U_t = \begin{cases} \beta_1^j c_t + \beta_2^j + \beta_3^j \mathbb{1}(a_t \in [0,5]) + \beta_4^j \mathbb{1}(a_t \in [6,9]) + \beta_5^{se}\mathbb{1}(D_t^{se}=0) \\ \qquad +\beta_6 N_t + \beta_7 (N_t)^2 + \epsilon_t^{jn} & \text{if j} \in \{\text{ws,se}\} \\ c_t + \beta_6 N_t + \beta_7 (N_t)^2 + \epsilon_t^{jn} & \text{if } j = ne \end{cases} \tag{1.2}$$

The first part of the equation describes women's utility if they work and the second describes their utility when they are not employed. Parameters and variables with j superscripts vary by the employment choice, while those with n superscripts vary with the fertility decision. The vector D_t^j represents the stock of type j employment experience.

The marginal utility of consumption, β_1^j, can differ by employment status, which allows for husband's earnings to affect women's decisions.[16] An estimate of β_1^j that is less than 1 suggests that, all else equal, women with wealthier husbands are less likely to work in that employment type than to not work. An estimate greater than 1 implies that women with high earning spouses are more likely to work in that employment type relative to not working.

The utility costs of working may vary by employment type and the presence of young children. The net utility costs of working in either self-employment or wage and salary employment are given by β_2^j. These costs are modified by the presence of young children through β_3^j and β_4^j. Specifically, β_3^j describes the additional psychic costs of working when

[16] My model only includes the wife's employment decision, and I model the husband's earnings as an exogenous process. I assume a unitary household model, where income is pooled and not bargained over. This simplifies the analysis, but it implies that the model does not incorporate considerations such as bargaining power in determining women's employment decisions.

a woman's youngest child is between the ages of 0 and 5. Similarly, β_4^j represents the additional utility cost of working associated with having a youngest child aged 6 to 9. I allow for different effects for preschool-aged children and older children because schools may provide care that makes it easier for women to work.[17] I interpret the differences $\beta_3^{se} - \beta_3^{ws}$ and $\beta_4^{se} - \beta_4^{ws}$ as the value of self-employment flexibility for mothers with young children. The overall benefit of self-employment flexibility that all workers enjoy will be captured in the β_2^{se} term. This particular specification assumes that women with no children and women with a youngest child 10 years of age or older face the same utility costs of working. This specification is motivated by my previous work showing that employment rates among mothers with children older than 10 are similar to those without children. It also reduces the computational requirements of the model because I only follow the youngest child through age 9.[18] Finally, β_5^{se} represents a fixed cost paid the first time a woman becomes self-employed. This cost represents any extra effort spent moving into self-employment for the first time including time spent learning about how to start a business and time spent securing financing and proper licensing for the business.[19]

I allow the number of children a woman has to affect her utility directly. I assume that children arrive in the same year that women decide to have a child. The utility from children is modeled as a quadratic in the number of children. Women receive this utility from children regardless of their employment choice.

For each of the six possible choices in each year, there is a choice-specific random utility shock, ϵ_t^{nt}. These shocks are assumed to be serially uncorrelated, and independent and identically distributed according to a type 1 extreme value distribution with variance $\rho^2 \frac{\pi^2}{6}$ where ρ is an estimated parameter. This error structure greatly reduces the computational burden associated with estimating the model, but has a number of strong implications. First, the variance of the shocks to self-employment and wage and salary employment are equal, ruling out different second moments for the earnings in each employment type.[20] Second, the shock to utility in each employment type with a birth is uncorrelated with the

[17] My model includes estimates of expected child care costs, which will reflect the lower monetary costs of child care as children age. The disutility parameters β_3 and β_4 should be interpreted as non-pecuniary costs of working with children such as less time spent with children.

[18] See Lim (2016) for patterns of employment and self-employment as a function of the age of a woman's youngest child. For computational reasons, I only keep track of the youngest child's age through 9.

[19] This specification does not include a switching cost for moving in and out of self-employment. These costs might be minimal if the woman re-starts a business in a similar occupation or large if the woman moves into a different occupation. I do not model occupational choice so I chose to have a one time fixed cost of becoming self-employed for the first time.

[20] Although ϵ is a utility shock, a transformation of the shock could instead be added to wages and interpreted as a wage shock. Given the risk neutral utility function, this assumption is not as restrictive as it would be if the utility function had curvature.

shock to utility in that same employment type with no birth. Likewise the shocks to utility across the employment types with a birth are uncorrelated. Third, this specification rules out persistent shocks by assuming that the errors are uncorrelated over time.[21]

1.3.2 Budget Constraint

The budget constraint determines women's consumption levels each year. Consumption is equal to the sum of the woman's earnings, m_t^j, and her husband's expected income, y_t, less the family's predicted child care costs, CC_t^j:

$$c_t^j = m_t^j + y_t - CC_t^j \tag{1.3}$$

There is no saving or borrowing in the model, so women consume their full net income each year.[22]

I assume that the husband's expected earnings, y_t, are exogenous to their decisions, but they are modeled as a function of the wife's characteristics (Francesconi (2002), Van der Klaauw (1996)). I assume that the husband's earnings in each year are realized after the wife makes her employment and fertility decisions, so women make decisions based on the expected earnings of their husbands. The husband's log income is modeled as a function of the wife's age interacted with whether or not she is college educated. This allows for his earnings to grow over time at a different rate depending on the wife's education level. I also control for the unemployment rate and an individual level fixed effect, which captures fixed characteristics that determine a husband's average lifetime earning levels. These characteristics could include his education level, college major, or unobserved ability.

Women's earnings when employed depend on their previous experience in each type of employment, D_t^{ws} and D_t^{se}, and the cumulative number of years spent not employed, D_t^{ne}. Earnings also depend on the national unemployment rate, u_t, and the woman's education level, $Educ_i$, both of which are assumed to be exogenously determined outside of the model. I assume that women have no earnings if they choose not to work: $m_t^{ne} = 0$. Log annual earnings in each employment type are specified by the following earnings equation:

$$\ln(m_t^j) = \gamma_0^j + \gamma_1^j u_t + f^j(D_t^{ws}, D_t^{se}, D_t^{ne}) + \boldsymbol{\gamma^j} Educ_i + \xi_t^j;\ j = ws, se \tag{1.4}$$

[21] As described below, I allow women to have fixed unobserved characteristics so the ϵ terms must be serially uncorrelated conditional on the woman's unobserved type.

[22] This assumption is made for tractability reasons and is common in the literature (see Van der Klaauw (1996), Francesconi (2002), Keane and Wolpin (2010)). A savings decision represents a continuous choice that would greatly increase the computational burden of solving the model. With linear utility and no savings the problem is equivalent to a lifetime wealth maximization problem modified by the non-pecuniary costs and benefits of children and work.

The functions f^j are piece-wise linear functions that capture how log earnings in each employment type vary with years of experience and years spent not employed. The functions include a top experience category after which additional years of experience no longer contribute to changes in earnings. I model log earnings this way because it provides a better fit to the data than a quadratic function. Additionally, the model requires extrapolation outside of the empirical support of the experience distribution for predicting earnings at high levels of self-employment experience, which was particularly problematic using a quadratic function. This specification flexibly allows the returns to each type of employment experience to vary between wage and salary employment and self-employment. I include time spent not employed in the earnings equation to allow for an earning penalty for breaks in employment. Previous research suggests that both the length of time spent not-employed as well as how recent the time out was matter (e.g. Jacobsen and Levin (1995), Hotchkiss and Pitts (2007)). While this specification does not capture the timing of the employment gap, it will represent the average penalty to earnings over many years associated with an employment gap.

In order to accurately model mothers' employment decisions, I explicitly estimate expected child care costs. Previous research has found that the labor supply of married women is sensitive to the cost of child care (Ribar (1992), Connelly and Kimmel (2003), Heeb and Kilburn (2004), Haeck et al. (2015)). Ideally, I would model women's child care decision using data on child care options and prices. Unfortunately these data were unavailable, so I use data on child care expenditures to estimate women's expected child care costs under each employment and fertility decision.

I predict women's child care expenditures as a function of the mother's characteristics, the age of her youngest child, the number of children in her family, and her employment type. The expected child care expenditure is the product of the probability that a working married mother pays a positive amount for child care and the expected amount paid conditional on positive payment.[23] Around 55% of working mothers with children under 10 do not make a monetary payment for child care services, so zero payments are empirically important for estimating the expected child care cost. The probability of a positive payment is described by the following equation:

[23]This is a reduced form model to predict the monetary costs that women can expect to pay in each employment type. If women who do not work are systematically different on unobserved dimensions that influence their cost of child care, this procedure may overestimate or underestimate their expected child care costs. For example, suppose women who do not work tend to not live nearby a grandparent and therefore would have a higher probability of having to pay for child care costs than those who do work. Child care costs would be underestimated for these women, and the disutility of work would be overestimated.

$$Pr(Payment_t^j) = \sum_{l=1}^{3+} \nu_l \mathbb{1}(N_t = l) + \nu_4 \mathbb{1}(d_t^{se}) + \nu_5 \mathbb{1}(a_t \in \{0,1\}) \tag{1.5}$$

$$+ \nu_6 \mathbb{1}(a_t \in [2,5]) + \nu_7 year_t + \boldsymbol{\nu X_t};\ j = ws, se \tag{1.6}$$

The expected amount paid conditional on positive payment takes the exact same functional form:

$$E(Cost_t^j | Payment_t^j) = \sum_{l=1}^{3+} \phi_l \mathbb{1}(N_t = l) + \phi_4 \mathbb{1}(d_t^{se}) + \phi_5 \mathbb{1}(a_t \in \{0,1\}) \tag{1.7}$$

$$+ \phi_6 \mathbb{1}(a_t \in [2,5]) + \phi_7 year_t + \boldsymbol{\phi X_t};\ j = ws, se \tag{1.8}$$

Then the expected child care cost is:

$$CC_t^j = Pr(Payment_t^j) * E(Cost_t^j | Payment_t^j);\ j = ws, se \tag{1.9}$$

This specification takes into account that most daycares charge more for infants than preschool or school-age children. It also implicitly allows for differences in the number of hours of care purchased for school-age children relative to preschoolers. I assume that there are no child care costs for women whose youngest child is 10 or older and for those who are not employed.[24] The vector of individual level characteristics, $\boldsymbol{X_t}$, includes education level and a quadratic in the mother's age. This accounts for differences across education levels and age in the decision to use child care and the type and quality of care selected. A linear time trend is included to pick up changes over time in real child care prices.[25]

I allow child care costs to differ for self-employed mothers because my previous research suggests that they are more likely to work from home and spend more time supervising their children (Lim (2016)). They also may have an easier time rearranging their work schedules allowing them to coordinate child care with their husbands. By allowing child care costs to be lower for self-employed women, I am in some sense controlling for some of the benefits of self-employment flexibility. I will interpret my results on self-

[24] In the Survey of Income and Program Participation child care data, around 5.6% of working married mothers with a youngest child 10-14 have positive child care expenditures and the unconditional average expenditure is only $2 per week.

[25] The time trend will pick up average changes in prices arising both from changes in the underlying costs of providing the same quality care as well as changes in the average quality of care utilized. See Laughlin (2011) for trends in real child care costs over time.

employment flexibility as net of child care expenses because these costs are already taken out of women's consumption. This approach biases my estimates of the additional flexibility in self-employment downward so I choose to explicitly account for lower child care costs and discuss them as an additional benefit of self-employment for mothers.

1.3.3 Unobserved Types

Women may vary in their preferences and their earning abilities due to factors that are unobserved to the researcher. In order to allow for unobserved traits to affect women's choices, I allow for three latent types of women indexed by k.[26] The types are represented as discrete mass points as in Heckman and Singer (1984) and the proportions of each type, μ_k are estimated parameters. These latent types are unknown to the researcher but are known to each woman. I allow women's preferences for children to reflect underlying differences across the population in the desire to have children. This modifies the utility equation, (1.2), by allowing the parameters on the utility of children to vary by type: β_6^k and β_7^k. I also allow women to vary in their abilities in both wage and salary employment and self-employment to account for selection on unobserved traits in the earnings equations. The women's earning equation, (1.4), is modified to have an intercept term that can vary by type: γ_0^{jk}. These intercept differences will reflect differences in preferences for part-time work or for work in low paying occupations in addition to differences in underlying abilities. Any of these three underlying reasons could explain why women have relatively low or high earnings throughout their life.

1.3.4 State Space Evolution

Women's decisions depend on their previous fertility and employment choices, the values of the exogenous variables that affect utility, and the realizations of their choice specific utility shocks. The relevant state space that determines their optimal choice includes $y_t, CC_t^j, \boldsymbol{X_t}, k, N_t, D_t^{ws}, D_t^{se}, D_t^{ne}, u_t, a_t, \epsilon_t^{jn}$, which I denote as Ω_t. Women have full information regarding the models determining husband's income, child care expenditures, their own earnings, and their utility. The only remaining sources of uncertainty in the model are the choice specific utility shocks. The years of employment experience, the number of children, and the age of the youngest child all evolve deterministically according to women's choices in the model. Work experience and children born prior to the estimation period are included in women's state values.

[26] Allowing for three types fit the data well and were tractable to estimate.

The parameters of the model are represented in the vector θ. $V_t(\Omega_t, \theta)$ represents the present value of a woman's expected utility in year t given Ω_t and θ:

$$V_t(\Omega_t, \theta) = \begin{cases} \max_{j,n} \left[V_t^{jn}(\Omega_t, \theta)\right], & \text{if } t \in [A_0, 40] \text{ and } N_t < 4 \\ \max_{j} \left[V_t^{j0}(\Omega_t, \theta)\right], & \text{if } t \in [41, 50] \text{ or } N_t = 4 \end{cases} \tag{1.10}$$

I make a number of simplifications to make the model more empirically tractable. I model childbirth through age 40 or 4 children and employment decisions through age 50. These simplifications are not particularly restrictive because only about 4% of women in my sample have a child after age 40 or have more than 4 children. I focus on employment decisions through age 50 because the research question focuses on mothers' labor supply while they have young children at home. At age 51, women receive a continuation value equal to the utility their would receive from making a static optimal employment decision each year through age 65, which incorporates the role of higher future earnings into women's earlier employment decisions. $\bar{V}_t^{jn}$ represents the alternative specific value functions for each of the possible choices, which can be represented as a Bellman equation:

$$\text{For } t \in [A_0, 50]: \quad \bar{V}_t^{jn}(\Omega_t, \theta) = U_t(d_t^j, n_t, \Omega_t, \theta) + \delta E(V_{t+1}(\Omega_{t+1}, \theta)|\Omega_t, d_t^j, n_t) \tag{1.11}$$

$$\text{where } n_t = 0 \text{ for } t \in [40, 50] \text{ or } N_t = 4 \tag{1.12}$$

$$\text{and } E(V_{51}(\Omega_{51}, \theta)) = E \sum_{t=51}^{65} \delta^{t-51} \max_j \left[U_t(d_t^j, \Omega_t, \theta|\Omega_{50})\right] \tag{1.13}$$

1.3.5 Identification

In my model, the parameters are identified by the choice and earnings data combined with the functional form assumptions, the distributional assumptions, and exclusion restrictions. Although the parameters are jointly determined, in this section I provide an intuitive description of specific types of variation in the data that are particularly relevant to identify certain parameters. Table A.2 summarizes the parameters of the model and the identifying variation in the data.

Women's earnings parameters are primarily identified by the earnings data. The unemployment rate, women's education level, and women's cumulative work experience are exclusion restrictions that help identify the earnings parameters because they affect women's earnings but not utility directly. The parameters in the piece-wise linear functions that describe the relationship between experience and earnings are identified by earnings data observed for women with the same education level in the same year, but with different previous experience levels. To address the selection problem in observed earnings, I al-

low for unobserved differences across women to affect their log earnings through the three unobserved types in the model.

Women's utility parameters are identified by the choices women make in the data. The number of children a woman has, the age of her youngest child, and her husband's predicted income act as exclusion restrictions that affect women's utility in the different choices, but do not influence her potential earnings in employment. The overall share of women working in wage and salary employment and self-employment identify β_2^j. The difference between the observed employment choices for women with young children and those without identify the costs of working associated with children, β_3^j and β_4^j. Finally the fixed cost of entering self-employment for the first time, β_5^{se}, is identified by the fraction of women who ever become self-employed.

My main estimate of interest is the difference in the additional costs of working associated with having young children at home between wage and salary employment and self-employment, $\beta_3^{ws} - \beta_3^{se}$. This difference is identified by the differential effect of having young children on women's self-employment and wage and salary employment rates. For example, descriptive analyses show that wage and salary employment rates decline sharply with the presence of young children while self-employment rates do not (Lim (2016)). These differences in behavior are identifying the difference in these parameters.

The panel nature of the data allow me to identify the fraction of individuals in each latent type and the type-specific parameters. By observing the same woman multiple times, I can estimate the unobserved constant contribution to earnings and utility separately from the unobserved idiosyncratic error term. These type specific parameters are identified by women who look similar on observed characteristics making consistently different choices or having different earnings.

1.3.6 Estimation

The estimation procedure consists of two stages. First, I estimate the husband's earnings equation and the child care cost equations using OLS and probit regressions. I use these predicted values in the second step to estimate the utility parameters and women's earnings equations. In the second stage, for each guess of θ, I solve the full dynamic programming problem for each individual using backward induction and construct the likelihood of the observed data. Given the distributional and independence assumptions on ϵ, the log likelihood of observing a sequence of choices and log earnings over time for a number of

women, I, can be written as:

$$\ell = \sum_{i=1}^{I} \ln \left(\sum_{k=1}^{3} \prod_{t=A_0}^{T} \mu_k \frac{e^{\bar{V}_t^h(\Omega_t,\theta)/\rho}}{\sum_{h=1}^{H} e^{\bar{V}_t^h(\Omega_t,\theta)/\rho}} \left(\phi \left(\frac{\ln(\hat{m}_t) - \ln(m_t)}{\sigma} \right) \right) \right) \tag{1.14}$$

Instead of normalizing the variance of the random utility error, I use women's earnings, husband's expected income, and child care costs to denote utility levels in dollars. All dollar values in the model are measured in real 2000$, and I estimate the variance of ϵ. I fix the discount factor, δ, to be 0.95.[27]

1.4 Data

In this section, I explain how I map women's employment, fertility, and earnings histories into an annual level dataset that I use to estimate my model. I also describe the data used to estimate the expected child care costs associated with working.

1.4.1 National Longitudinal Survey of Youth 1979 (NLSY79)

My primary data source is the NLSY79, which follows 12,686 individuals who were 14-22 years of age in 1979 through the present day. The survey interviews respondents annually from 1979 through 1993 and bi-annually starting in 1994.

My primary sample includes white women who marry and do not divorce during the survey.[28] Nearly 50% of married white women divorce during the survey.[29] In Table A.3, I show that individuals in my sample who are always married do differ along observed characteristics from individuals who get divorced. Women who divorce marry earlier and have less education than those who remain married for the entire sample. These differences are statistically significant and economically large, and they fit with known patterns of divorce (e.g. Bramlett and Mosher (2002)). However, the differences in employment and fertility choices between the women who divorce and those who remain married are not

[27] A variety of papers use similar discount factors. Francesconi (2002), Adda et al. (2011), and Keane and Wolpin (2010) fix the discount factor to something between 0.93 and 0.952. Keane and Wolpin (1997) estimate the discount factor to be 0.936.

[28] Women in my sample may get divorced after leaving the survey. I do not consider cohabiting women as married, however evidence on white men in the NLSY79 suggests that 70% of live-in relationships began as marriage and 30% as cohabitation. The majority of cohabitations led to marriage with the same partner (Oppenheimer (2003)).

[29] An alternative sample is one that includes women while they are married regardless of whether they divorce. If women change their behavior in anticipation of divorce (see Poortman (2005)), the estimates will be biased.

particularly large from an economic standpoint, although most are statistically different.[30]

There are two general sources of bias caused by this sample selection. First, systematic differences in preferences for work and children between women who divorce and those who do not. Second, systematic differences in unobserved factors that affect earning potential, such as ability. In practice, as shown in Table 1.10, the model estimates are qualitatively similar when including all white married women in the estimation sample suggesting that women who divorce behave similarly to women who do not while they are married.

My estimation sample only includes the nationally representative sample from the NLSY79. I make a number of smaller refinements to the original NLSY79 sample to create the data I use to estimate my model. These are explained in detail in Appendix B and Table B.1 shows how each restriction affects the sample size. The final sample includes 1,035 women and 23,851 person-year observations.

The NLSY79 includes detailed information on marriage, fertility and employment and covers the relevant age range for my life-cycle model. I use this information to construct an annual level dataset of employment and fertility choices.[31] In each year, women are categorized as self-employed, wage and salary employed or not employed according to the type of employment they spent the most weeks at during that year. I consider women who were unemployed or out of the labor force to be not employed.[32] Within a year, many women have weeks assigned to different employment types highlighting the importance of interpreting the effect of self-employment as the effect of a year of being primarily self-employed. I calculate women's annual earnings as the sum of their weekly earnings from all of their jobs. There is some evidence that survey measures of self-employment income are underestimated because individuals under-report this income for tax reasons (Hurst et al. (2014)). My earnings measure does not use questions about annual income, and instead uses job specific information on pay rates and hours. This may mitigate some of the under-reporting, but any remaining systematic under-reporting would positively bias the utility cost of working in self-employment.[33] As a robustness check, I re-estimate the model with inflated self-employment earnings using Hurst et al. (2014)'s estimate of under-reporting

[30] See Francesconi (2002) for similar findings on these two samples. He argues ever married and always married women are similar in their employment and fertility decisions.

[31] If women have a birth after 40, I ignore it and assign them to their employment status with no birth. Around 2% of women in the sample have births after 40.

[32] This will affect the long-term unemployed. My model assumes that if women want to work at their predicted wage rate, which will be lower in worse economic times, they can find a job.

[33] I do find that both hourly wages and earnings are lower in self-employment. This is consistent with previous work on self-employment (Hamilton (2000)), and it is not clear what portion is from under-reporting of self-employment earnings versus real lower earnings in self-employment.

of 25%, and I find very similar results (see Table 1.10).

Information about the estimation sample of married, white, women can be seen in Table 1.1. The average age at the beginning of estimation is 25 and on average there are 23 years of data for each woman. Average earnings during years when women are categorized as wage and salary employed are around 28 thousand dollars, which is much higher than the 20 thousand dollar average for years when women are self-employed. These earnings differences include differences arising both from hourly wage rates and from hours worked decisions. Around 41% of the sample have a high school degree or less, 23% have some college, and 36% have a Bachelor's degree.

Table 1.2 shows the variation in the percentage of women selecting each choice by age and number of children. Around 27% of person-years are spent not-employed, 67% are spent in wage and salary employment and 7% in self-employment. Overall employment rates are increasing in age. Consistent with previous evidence that there is a strong positive relationship between age and self-employment, older women are more likely to be self-employed. Self-employment rates generally rise with the number of children in contrast to the percentage of women working in wage and salary positions. Women with many kids are also more likely not to work. Table 1.3 shows the year-to-year transitions between choices. There is a high level of persistence in the employment choice with nearly 90 percent of women who worked in wage and salary employment last year continuing in a wage and salary position. Self-employment and non-employment are slightly less persistent with continuation rates of closer to 80 percent.

In each interview, women in the NLSY79 are asked about their spouse's income, which I use to estimate a model of husband's income in the first stage of estimation. The estimates from the husband's income regression are shown in Table A.5. Husband's earnings increase with the wife's age, and husbands of women with a Bachelor's degree have higher earnings growth.

1.4.2 Child Care Expenditure Data

Child care expenditure data come from the Survey of Income and Program Participation (SIPP). The SIPP is a longitudinal panel that follows individuals for up to 4 years and periodically asks questions about child care expenses. I use SIPP panels from 1984 through 2008, which have child care expenditure data for 15 different years spanning 1986-2011. See appendix Table B.2 for more information on the specific panels and survey waves used. I limit the sample to white married employed mothers with a youngest child under the age

of 10.[34]

In the first stage of estimation, I generate predictions for expected child care costs using these SIPP data. The results from the regressions predicting positive child care payment and child care expenditures conditional on positive payment are shown in Table A.4. Women with infants, older women, and more educated women tend to pay more for child care. The self-employed are around 25 percentage points less likely to make positive payments for child care, but conditional on payment they pay only slightly less per week.

1.5 Parameter Estimates

In this section, I discuss the parameter estimates from the second stage of estimation and provide evidence that the model fits the life-cycle patterns and overall employment and fertility choices observed in the data.

1.5.1 Women's Earnings

Figure 1.3, which plots the effect of experience on earnings, shows that self-employment experience has a small negative effect on women's future wage and salary earnings, but the effect is not as severe as time spent not employed. These results indicate that being self-employed is relatively better for women's future earning potential in wage and salary employment than not working. Wage and salary experience has strong positive effects on wage and salary earnings and more moderate positive effects on self-employment earnings. I use different linear spline specifications for self-employment and wage and salary employment because the densities of experience across the two types of employment are very different. In the figure, the returns at each year of experience represents the change in log earnings associated with that level of experience relative to zero years of that type of experience with all other factors held constant. The effects are additive because there are no interactions between experience types. Table 1.4 shows the earnings parameter estimates and the returns to experience in table format.

My results are consistent with previous estimates of the returns to self-employment. Bruce and Schuetze (2004) estimate the effects of self-employment and unemployment spells on wage and salary earnings relative to wage and salary experience; however, their results for women are too noisy and varied across years to draw any firm conclusions. They do find that for men self-employment consistently is worse for wage and salary earnings

[34] Although women who aren't working do purchase child care, the SIPP did not record expenditures for non-employed women across all panels.

than wage and salary employment, but better than unemployment. In a similar analysis, Williams (2000) finds evidence that self-employment experience for women is not as rewarded as wage and salary employment experience in terms of wage and salary earnings, but his estimates also suffer from relatively large standard errors.

The magnitudes of the returns to experience in wage and salary employment are in line with previous estimates. Although they use a different specification, dataset, and focus on log wages, my estimates are similar to Light and Ureta (1995). They estimate that 3, 5, and 8 years of actual experience increase white women's log wages by 0.20, 0.31, and 0.44 log points respectively. I find estimates of 0.28, 0.34, and 0.41 log points, which at low levels of experience are a bit higher than their estimates but are closer to their preferred richer specification.[35] My estimates of the effect of years spent not employed on wage and salary earnings are also generally consistent with previous research. Jacobsen and Levin (1995) focus on the rebound in earnings after an employment gap and find that the log wage penalty varies from -0.30 log points 1 year after the gap to around -0.05 log points 20 years after the gap. I estimate that a 1 year gap leads to a 0.12 log point decline in wage and salary earnings, which seems reasonable because the estimate is the average penalty to earnings in all future years.[36]

I estimate that self-employment experience has strong positive returns within self-employment earnings, and that wage and salary experience is associated with a small positive effect on self-employment earnings. Returns are higher for experience in the same type of employment. Employers may value wage and salary experience more highly because self-employment experience is difficult to verify. There could also be skills developed through experience that are specific to the type of employment. For example, the self-employed need to learn about filing taxes, managing cash flow, marketing their business, and other skills that may not have been a part of wage and salary employment. The higher returns could also be picking up tenure effects within a job or type of job, which are not otherwise explicitly accounted for in this analysis. As in wage and salary earnings, I estimate a negative effect of years spent not employed on self-employment earnings.

Because the model describes log earnings and not log wages, the parameter estimates

[35] Light and Ureta (1995) prefer a model that keeps track of the percentage of each year a woman was employed and controls for the order of their employment history. I compare my results to the specification that is the most similar to mine, which uses cumulative actual experience. In this specification, they use a quadratic form, which is known to underestimate returns to very low levels of experience. This might explain why my estimates are larger for 1 and 3 years. Additionally their study focuses on women's work behavior between the ages of 24 and 30, who were born a decade before the NLSY79 sample, and it includes additional control variables like job tenure.

[36] A preferred specification would allow earnings to depend on the length of time since the employment gap occurred, but that would increase the computational burden of estimation substantially.

reflect the combined effect on women's wage rates and their hours worked. This could be important for interpreting the coefficients because if women who spend time in self-employment or not working tend to be women who also work part-time in wage and salary employment, this could explain part of the negative effect on earnings of these two types of experience. Additionally many self-employed women work part-time (Devine (2001)), so a switch from wage and salary employment to self-employment could represent a change from full-time to part-time work, depressing the returns to wage and salary experience within self-employment earnings.

As Table 1.4 shows, there are positive returns to education in both wage and salary employment and self-employment. Women with some college education earn 16% more in wage and salary employment than women with a high school degree or less, while women with a Bachelor's degree earn around 30% more. The magnitudes are similar but a bit higher in self-employment, where women with some college education earn 19% more than high school educated women and those with a Bachelor's degree earn 38% more. A one percentage point increase in the unemployment rate decreases women's earnings in both types of employment by about 2%.

The estimates from Table 1.4 show that there are important unobserved factors affecting women's earnings. I estimate that around 23% of the population are type 1 individuals who are relatively low earners in both wage and salary and self-employment. They earn, on average, around 0.7 log points less in wage and salary employment and 1.0 log point less in self-employment relative to medium earners. A little over half of women are type 2 or medium earners in both types of employment. Type 3 individuals make up 24% of the population and are high earners in both wage and salary and self-employment. These women earn 0.5 log points more than medium type earners in wage and salary employment and 0.65 log points more in self-employment. These levels of heterogeneity in earnings across types are similar in magnitude to those found in Francesconi (2002). These differences represent both underlying differences in productivity across women, which would affect their wage rate, and differences in preferences for hours worked, which would also affect their earnings.

Overall, these earnings equations imply that self-employment experience is better for future earnings than spending a year not employed. The comparison between a year of self-employment and spending a year in wage and salary employment is less clear. Wage and salary experience has higher returns in wage and salary earnings, but self-employment experience has stronger positive effects on self-employment earnings. Because most women spend the majority of their careers in wage and salary employment, wage and salary experience is likely to be the choice that maximizes future earning potential.

1.5.2 Women's Utility

The estimates of women's utility parameters confirm that working has utility costs, and as Table 1.5 shows, self-employment is the relatively more costly employment type. I estimate that the there is a utility cost equivalent to $95,200 incurred the first time a woman enters self-employment. This entry cost can be thought of as the time and effort spent developing the business idea and gathering all the necessary material and licenses to become self-employed. There is an additional annual utility cost of $14,900 for each year spent working in self-employment. This cost includes any loss in leisure associated with working in self-employment relative to non-employment and additional stress associated with being self-employed. Working in wage and salary employment also has a net utility cost of around $4,000 which similarly represents the loss of leisure and stress associated with working. These utility costs represent net costs and so also include positive traits associated with working, like a sense of accomplishment, fringe benefits, and having a social network of co-workers. The difference in the provision of fringe benefits may contribute to the much larger net utility cost of self-employment relative to wage and salary employment.

While in general the utility costs of working in self-employment are higher than in wage and salary employment, the additional costs of working associated with having children are smaller in self-employment. I find that women whose youngest child is 0-5 years of age incur an additional cost of working in wage and salary employment of $11,300. The cost for these mothers in self-employment is around $3,900. I interpret this difference of around $7,400 as the value of flexibility offered by self-employment for mothers with young children. This flexibility is also important for mothers whose youngest child is 6-9 years old, and I estimate its value at around $3,400. These estimates are consistent with my hypothesis that self-employment offers additional non-pecuniary benefits to mothers with young children. Additionally the lower value for women whose youngest child is 6-9 years of age is consistent with the idea that self-employment provides a means to take care of children when they require the most care.

My estimates of the marginal utility of consumption suggest that all else equal women with higher earning husbands are less likely to work, which is consistent with general patterns of female employment and spousal income. I find that the effect of husband's income on employment is smaller in self-employment, which may partially reflect differences between women with high earning and low earning spouses in access to financial or human capital that make it easier to be self-employed. My estimate for the marginal utility of consumption in wage and salary employment is 0.91 and for self-employment it is 0.95, which are similar in magnitude to Francesconi (2002) who estimates a value of 0.98 for full-time

wage and salary employment and 0.94 for part-time wage and salary employment.[37]

There is substantial heterogeneity in the parameter estimates for the utility women receive from children. I find that medium earning type 2 and high earning type 3 individuals receive very similar utility from children, while lower earning type 1 individuals receive a lower value from children. Simulations of the baseline model show that type 1 women have on average 2.4 children, type 2 women have 2.0 children, and the high earning type 3 women have 1.8 children. Although type 1 women receive lower levels of utility from their children, they have lower overall levels of utility and lower opportunity costs of having children because of their relatively low earning potential.

I estimate the standard deviation of the utility shock to be $21,000, which suggests that there is a relatively large role for unobserved factors to influence choices. This value represents around 25% of their average annual utility. The size of this utility shock implies that there will be many instances where women make different choices from the one with the highest expected value because of a positive utility shock to one alternative. While a richer model could better explain women's choices and decrease the variance of the utility shock, I view this model as capturing the primary aspects of preference heterogeneity across women and the main differences between wage and salary employment and self-employment.

1.5.3 Model Fit

In order to check the fit of the model, I simulate women's decisions according to the baseline model using each woman's actual initial conditions at the beginning of the estimation period. The values in this section are calculated from the simulated data in years when the actual NLSY data were used in estimation.[38] Table 1.6 compares the overall percentages of women making each employment-fertility choice and their completed fertility between the NLSY79 data and the simulated data. The model fits the overall distribution of choices very well and the distribution of children reasonably well given the quadratic functional form for the utility from children. Chi-squared tests fail to reject the model.

I investigate the fit of the model over the life-cycle by plotting the fraction of women making each choice as a function of their age. I compare the prevalence of the six choices over the lifecycle between the simulated choices and the NLSY79 data in Figure 1.4. The model fits the age profile for self-employment behavior pretty closely. It over-predicts wage

[37] Van der Klaauw (1996) has a different specification that is not directly comparable, but qualitatively he also finds that women with wealthier husbands have lower marginal utilities of consumption in working than in non-employment.

[38] For example, if a woman leaves the sample at age 40, the model can simulate her choices through age 50, however these data will not be in the sample statistics in the NLSY so are not used in assessing the model fit.

and salary employment among young individuals and under-predicts non-employment. In later ages, the pattern is reversed and the model under-predicts wage and salary employment and over-predicts non-employment. Chi-squared tests of the choices at each age reject the model at a 5% level for ages 18 to 21, but fail to reject the model from ages 22 through 50.

There are a number of reasons that the model may not match employment choices at young ages. First, there are relatively few women in the sample at young ages because women do not enter the estimation until they are married and no longer enrolled in school.[39] Second, the women who are in the sample at young ages might be different along unobserved dimensions as well as observed characteristics. These women did not attend a four-year college directly after high school, and they married relatively early.

Table 1.7 shows the year-to-year transitions implied by the simulated data from the model. In comparison to the transitions in the underlying data, shown in Table 1.3, women are more likely to move between employment types in the model. This is especially true for women in non-employment and self-employment. In the model, movements between types of employment are costless, but in reality there are likely frictions that limit these transitions. Figure 1.5 plots the distribution of the total number of years each woman made each choice over her lifetime. These diagrams show that the simulated data fit the distribution of time spent in self-employment and non-employment, but do not have enough individuals with very low levels of wage and salary employment. Overall, the model fits the life-cycle pattern of fertility and employment choices from the data relatively well, particularly at ages 25 and above.

1.5.4 Implications of Modeling Simplifications

I make a number of modeling simplifications to balance computational tractability with realism. Some of the most important simplifications are not allowing savings, having risk neutral agents, and not modeling the intensive labor supply decision.

My model abstracts from savings and borrowing decisions, by assuming that women consume all of their income each year. If women are motivated to work to save for retirement, this incentive could make working look more attractive, positively biasing the cost to working parameters. If there is little heterogeneity in the preference for saving for retirement in my population, this will not cause bias in the other parameters. Additionally, the magnitude of this bias may be smaller for my sample because their earnings make up only a third of household income.

[39] At age 21, 27% of the sample is present, and by age 22, 37% of the sample is present.

Second, my model does not allow for risk averse agents, which implies that the relative riskiness of self-employment versus wage and salary employment does not affect women's decisions. If self-employment is more risky than wage and salary employment and women are risk averse, then the costs of working in self-employment will be negatively biased.

The omission of savings and earnings risk interact and together they reduce the problem to a lifetime wealth maximization modified by the psychic value of work and children (Eckstein and Wolpin (1989)). Including one without the other is likely to have small effects on the parameter estimates, but including both could change the incentives reflected in the model substantially. If women see riskiness in their future income stream and have the ability to save, we might see a lot more employment at young ages to gain a buffer stock to insure against future shocks. While these are interesting incentives to investigate, they are beyond the scope of this paper. If this incentive to work to gain savings is large β_2 could be positively biased. If these working years coincide with having young kids at home, β_3 and β_4 could also be positively biased.

Finally, this paper focuses on women's extensive labor supply decisions missing any changes to the number of hours they work. This omission is particularly relevant for my research question because women with young kids are more likely to work part-time or to choose family friendly jobs, both of which may lower their earnings.[40] In the model, this causes women with young kids to have earnings that are overestimated leading to a negative bias in the parameters that estimate the costs of working associated with having young children, β_3 and β_4. If the self-employed and wage and salary employed react differently to the presence of a young child, this could bias my estimate of the value of flexibility. For example, suppose that the self-employed are more able to adjust their hours downward in response to having a child, then the self-employment disutility of work term will be too negative and the value of self-employment flexibility will be underestimated. If instead, self-employment allows women to maintain their level of hours better than wage and salary employment while still caring for children, the self-employment flexibility will be overestimated.

In order to estimate the sign and potential effect of this omission, I examine whether the earnings residuals vary differentially with the presence of young children for women in self-employment and wage and salary employment. Specifically, I regress log earnings residuals on an indicator for self-employment status, an indicator for having a youngest child ages 0

[40]For example, women with young kids have shorter commutes on average, which could reflect their desire to work closer to home (Black et al. (2014)). There is also evidence that at least part of the motherhood penalty is attributable to part-time work and family friendly jobs (Gangl and Ziefle (2009), Budig and England (2001)).

to 5 and one for having a youngest child 6 to 9 years of age, and their interactions.[41] I find that the earnings for mothers in general are over-predicted. The estimates suggest that for mothers with preschool-aged children, their self-employment earnings are over-predicted by a greater amount than their wage and salary earnings, but a large standard error makes the difference statistically insignificant. I estimate that for mothers who have a youngest child ages 6-9 years of age, self-employment earnings and wage and salary earnings are both over-predicted, but by similar amounts. The effect has a small point estimate but a large standard error. The signs and magnitudes of the estimates suggest that the value of self-employment flexibility for women with children between the ages of 0 and 5 is underestimated and that the value of self-employment flexibility for women with children between the ages of 6 and 9 is not biased by the hours omission. Neither of the interaction terms are statistically significant and the estimates are imprecise so it's difficult to evaluate how large the bias is likely to be.

Overall, I do not think that the omission of modeling job characteristics or the hours decision is likely to change the overall qualitative conclusion of the paper that self-employment represents a more flexible option for mothers with young children.

1.6 Counterfactual Exercises

In this section, I describe three partial equilibrium counterfactual exercises I conduct using the model. Together these exercises provide evidence that workplace flexibility influences women's employment and fertility decisions, which in turn affect their lifetime utility and earnings.

1.6.1 Value of Self-Employment Flexibility

In the first counterfactual, I estimate the value of self-employment flexibility by assuming that mothers with young children in self-employment face the same utility costs of working as mothers in wage and salary employment. Specifically, I set a new value for the disutility of working in self-employment with a preschool-aged child, $\tilde{\beta}_3^{se}$, to equal the baseline estimated utility cost in wage and salary employment, $\hat{\beta}_3^{ws}$. I do the same for the cost of working associated with having children 6 to 9 years of age: $\tilde{\beta}_4^{se} = \hat{\beta}_4^{ws}$. I interpret the difference between the estimated model and this counterfactual as quantifying the impact of the additional flexibility mothers receive in self-employment.

[41] The regression results can be found in the appendix Table A.6.

I find that self-employment flexibility is a big motivator for women to become self-employed. Table 1.8 provides a summary of how the counterfactual exercises affect women's earnings, work experience, fertility and utility. Without the additional flexibility, self-employment rates fall from 7.8% to 4.0%. The availability of self-employment flexibility increases completed fertility by around 3.0%. This estimate is similar in magnitude to Adda et al. (2011) who find that doubling the annual cash transfer per child in Germany would increase fertility by 2% in the long run.

I estimate that self-employment flexibility has a small negative effect on the present value of women's median lifetime earnings. Among the women who were induced to become self-employed by the additional flexibility, I find that around 80% of the years that they would have spent in self-employment they instead spend working in wage and salary employment. Because, on average, wage and salary employment earnings are higher, and wage and salary employment experience has higher returns in future wage and salary employment, making self-employment as inflexible for mothers as wage and salary employment reduces women's lifetime earnings by around 1.2%. On average women who switched from self-employment to wage and salary employment earned around $3,200 more that year, while women who switched to non-employment lost $15,400 in earnings. The additional years of wage and salary employment experience paid off because for years when the women worked in wage and salary employment in both scenarios they earned $2,700 more when self-employment was no more flexible for mothers than wage and salary employment.

As Figure 1.9 shows, without the additional flexibility in self-employment, overall employment rates fall relative to the baseline at every age, but fall the most during the ages when the largest share of women have children at home. The lower earnings resulting from these lower employment rates are more than compensated for by higher earnings among women who remain employed and increase their wage and salary employment experience.

I estimate a much smaller effect of self-employment flexibility on women's utility; on average it increases women's utility by 0.15%. Table 1.8 shows that the average lifetime utility in present value terms is $1.33 million so the willingness to pay for the additional flexibility is around $2,000 per woman.[42] The willingness to pay among the marginal women who became self-employed when self-employment was more flexible is $8,700. In order to benefit from the added flexibility in self-employment, I estimate that women have to pay high utility costs to become and stay self-employed. Therefore, when self-

[42]Present value in this case is the value of future utility discounted to the start of estimation for each woman. Figures are expressed in year 2000$. The $2,000 figure would be the amount of money the average woman would be willing to pay at the beginning of the estimation period to have self-employment flexibility.

employment becomes less flexible, those women lose out on the flexibility but they also no longer have to pay the large costs of becoming self-employed. Women who decide not to be employed gain in leisure and women who decide to work in wage and salary employment pay a much lower cost of working and earn more. These results suggest that the evaluation of policies should consider changes to leisure and home production in addition to changes in earnings.[43]

1.6.2 More Flexible Wage and Salary Employment

In this section, I estimate how women's choices change if wage and salary employment were as flexible as self-employment. This counterfactual exercise represents implementing a set of policies within wage and salary employment to mimic the flexibility offered in self-employment. I simulate the model with a new value for the disutility of working in wage and salary employment with a preschool-aged child, $\tilde{\beta}_3^{ws}$, that equals the original estimate for the utility cost of working in self-employment, $\hat{\beta}_3^{se}$. I do the same for the utility cost of working associated with having a child between the ages of 6 and 9 by setting: $\tilde{\beta}_4^{ws} = \hat{\beta}_4^{se}$. These estimates represent an upper bound on the positive impacts of enacting policies that make wage and salary employment comparably flexible to self-employment because these policies have costs to employers and would likely result in lower wages for women if they were implemented on a large scale.[44]

I estimate that increasing wage and salary employment flexibility would increase women's median lifetime earnings by 12.5%. This increase in earnings comes from two sources. First, when wage and salary employment is more flexible, the fraction of years that women spend not employed falls from 25% to 23% as women are encouraged to continue working even when they have young children at home. Second, women are encouraged to switch from self-employment to wage and salary employment because self-employment is no longer as valuable as a flexible work alternative. These two effects can be seen in Figures 1.6 and 1.7. In Figure 1.6, the average earnings of women are increasing from both an increase in participation and an increase in earnings conditional on employment. Figure 1.7 shows the difference in earnings conditional on employment demonstrating that higher earnings among working women is concentrated later in life when cumulated work expe-

[43] See Greenberg and Robins (2008) on the importance of accounting for the value of non-market time in cost-benefit analyses.

[44] See Pitt-Catsouphes et al. (2007) for details on employers' biggest barriers to flexible work policies. There may, however, exist policies that could make wage and salary employment more flexible than self-employment. There are many occupations within self-employment that lack certain types of flexibility. For example, see Goldin and Katz (2012) for a description of how pharmacists find more flexibility in wage and salary employment.

rience pays off. At younger ages, the wage and salary flexibility encourages lower earning women to work, which increases median earnings among all women but puts downward pressure on employed women's earnings.

Figure 1.8 shows that the majority of the increase in lifetime earnings comes from relatively low lifetime earners increasing their earnings. Flexible wage and salary employment raises the lifetime earnings of low and medium type earners by over 13% but only increases high earning types' lifetime earnings by 2% as shown in Table 1.9. Women's average completed fertility rises from 2.03 to 2.52 children, which represents a very large increase in fertility. Increasing workplace flexibility increases women's utility by around 2.8% representing an average willingness to pay for additional wage and salary flexibility at the beginning of estimation of $37,200 per person. As Figure 1.9 shows, increasing workplace flexibility for mothers within wage and salary employment raises women's employment at all ages, but the effect is particularly large in their late 20's and 30's when employment rates dip under the baseline model.

Overall, this exercise suggests that making workplaces more flexible could yield relatively large increases in women's earnings and welfare. These benefits to workers can help explain why firms offer telecommuting options, flexible schedules, job sharing, and parental leave. Unfortunately, there are also many barriers to implementing flexible work policies. Top concerns among employers include concerns about monitoring employees, a loss in productivity, and treating all employees fairly (Pitt-Catsouphes et al. (2007)). There are also legal issues making it difficult for employers to track hourly non-exempt employees if they work varied schedules or work from home (Yager (2014)). Finally, there are some businesses that operate under a more traditional culture, where managers don't promote the implementation of flexible policies (SHRM (2010)).

These results provide a benchmark for understanding the potential benefits of increasing flexible work policies. They complement previous survey evidence, which shows that around 70% of working mothers said schedule flexibility was extremely important to them (Parker and Wang (2013)). Given current evidence that the gender earnings gap arises when women have children, policies targeted to benefit parents when they have young children are likely to be particularly effective in addressing the earnings gap. Additionally, these results suggest that workplace flexibility can encourage fertility, which could be important for countries trying to maintain or increase their fertility rates.

1.6.3 Decrease Barriers to Female Self-Employment

In this section, I estimate the impact of a policy to reduce the costs of entering self-employment by 10%. This counterfactual represents any intervention that lowers the barriers to entering self-employment for women. In response to some evidence that women and minorities have more difficulty accessing capital and business networks to start a business, there have been targeted programs to increase business ownership among these groups (Barr (2015)). These policies include expanding small business loans backed by the Small Business Association, and grants to provide training programs and improve connections between successful and prospective business owners. An evaluation of these types of programs is beyond the scope of this paper, but this counterfactual highlights the potential impacts of policies that successfully lower the entry costs of self-employment for women.[45] Licensing requirements to operate a business or work in a profession also represent entry costs to self-employment because the self-employed are more likely to be licensed workers (Council of Economic Advisors (2015)). Licensure can include completing training courses, passing an inspection, and filing paperwork to start a business (Kleiner (2013)). Governments may reduce these costs by streamlining these processes or requiring only the aspects of licensing necessary to maintain consumer safety (Council of Economic Advisors (2015)).

As shown in Table 1.8, I find that reducing the entry cost to self-employment increases self-employment rates by 40% and decreases women's median lifetime earnings by 0.9%. The policy has a modest positive effect on fertility rates and raises lifetime utility by 0.17%. These results suggest that measures to reduce the costs of becoming self-employed for women would increase their self-employment rates substantially, but would not influence fertility by as much. I estimate that reducing the entry costs of self-employment for women would increase the observed gender earnings gap. Although self-employment it relatively more flexible for mothers, it has lower returns to future wage and salary employment earnings and is on average a lower paying type of employment. Advocates of policies encouraging female self-employment often have in mind promoting female entrepreneurship in high growth industries. An intervention of this type could potentially have a positive impact on women's earnings because it increase their earning growth rates. The counterfactual pre-

[45] In general, as Barr (2015) and Michaelides and Benus (2012) mention, many programs do not have rigorous evaluations of their impact on outcomes. In particular, there has been a lot of focus on helping the unemployed become self-employed. Michaelides and Benus (2012) analyze a policy to promote self-employment among individuals who are employed, unemployed and out of the labor force and find no effects for non-unemployed individuals but positive effects for the unemployed. A recent paper by Caliendo (2016) also finds positive effects of active labor market programs promoting self-employment for unemployed individuals.

sented here simulates the average female self-employment experience in my sample, which tends to be relatively slower growth areas such as child care or housekeeping.

1.7 Discussion and Interpretation

1.7.1 Robustness to Alternative Measures of Earnings

I re-estimate the model using two alternative measures of women's earnings. First, to address concerns that self-employment income is under-reported in the survey, I inflate self-employment earnings by 25%. This is the estimate of average under-reporting found in Hurst et al. (2014). Table 1.10 shows that the estimated value of self-employment flexibility is similar to the baseline. Under the counterfactual exercise where self-employment is no more flexible for mothers than wage and salary employment, the estimated fertility effect and lifetime earnings effect are also qualitatively similar.

Second, I use an alternative measure of earnings that is constructed using the annual number of hours worked and the woman's average wage instead of job specific hours and earnings. See Appendix B for details and information comparing the two earnings measures. Again Table 1.10 shows that the results are quite similar between the baseline and the alternative earnings specification. The estimates of the value of self-employment flexibility are within the standard errors of the original baseline estimates.

1.7.2 Robustness to Alternative Samples

As a robustness check, I re-estimate the model on a sample of white women that includes women who get divorced. The estimation covers the years during the woman's first marriage and only includes women who are married for at least five years. I also estimate the model on a sample of always married women of all races. Expanding the sample in these ways lowers the overall utility levels estimated in the model because the additional women tend to have lower earning spouses and be lower earnings themselves. In order to compare these results to the main estimates, I normalize them by the utility of the women in the sample at age 40. As shown in Table 1.10, I find that the results are qualitatively similar among both of the expanded samples suggesting that the sample restrictions made to estimate the original model do not severely limit the applicability of the results to women outside the main sample.

1.7.3 Robustness to Alternative Specifications

In order to test some of the many modeling assumptions, I run a number of robustness checks. First, I estimate the model with four unobserved types rather than three. Second, I estimate it without different unobserved types to see if the results are driven by differences across the types. Third, I estimate the model with a lower discount factor of 0.9 to see if the results change if women discount their future earnings more heavily. Fourth, I estimate the model using indicators for the utility from the number of children rather than the quadratic specification. Using indicators for each number of kids allows me to match the completed fertility distribution more closely because it is a more flexible specification. Finally, I estimate the model weighting women's contribution to the likelihood according to their NLSY79 sample weights, which should make the sample more nationally representative.

As shown in Table 1.10. all of these robustness checks provide similar qualitative estimates of the value of self-employment flexibility and the effect of the flexibility on fertility. All of the alternative specifications show that the additional flexibility lowers women's lifetime earnings by a small amount, with the exception of having only one unobserved type. In that specification, the additional flexibility raises women's lifetime earnings by a small amount. This is driven by the fact that 30% of the marginal women who were induced to become self-employed by the additional flexibility choose non-employment, compared to 20% in most of the other counterfactuals. Overall, the main results from the paper are robust to a variety of different specifications.

1.7.4 Evidence for Flexibility Interpretation

In this paper, I interpret the difference in the costs of working associated with having young children between wage and salary employment and self-employment as the value of self-employment flexibility for mothers. I use the term flexibility to encompass many features of self-employment including the ability to control and change one's work schedule, hours, and location. These features may provide women with the ability to combine work and family in ways that wage and salary employment does not.[46]

To provide evidence for this interpretation, I incorporate some measures of workplace flexibility into the baseline model. These results should be viewed as suggestive because the measures I use are noisy measures of women's access to flexible jobs. I use these measures to control explicitly for some of the differences in flexibility across employment types to test whether the observed residual effect that I interpret as flexibility decreases. The

[46] See Lim (2016) for evidence on the ways that self-employed mothers spend their time differently from wage and salary employed mothers.

analysis also provides direct evidence that self-employment is more flexible along these measures, and that flexibility decreases the costs of working for mothers. If $flexibility^j$ is a measure of the flexibility provided in employment type j, I modify the non-pecuniary utility of working from:

$$\beta_2^j + \beta_3^j \mathbb{1}(a_t \in [0,5]) + \beta_4^j \mathbb{1}(a_t \in [6,9]) + \beta_5^{se} \mathbb{1}(D_t^{se} = 0)$$

to:

$$\beta_2^j + \alpha_1^j flexibility^j + \beta_3^j \mathbb{1}(a_t \in [0,5]) + \beta_4^j \mathbb{1}(a_t \in [6,9]) + \beta_5^{se} \mathbb{1}(D_t^{se} = 0) + \alpha_2^j flexibility^j \mathbb{1}(a_t \in [0,9])$$

The ideal measure of workplace flexibility would capture women's access to flexible schedules, hours, and location within wage and salary employment and within self-employment. As a proxy for each woman's access to workplace flexibility, I define two imperfect measures and use variation in these measures across occupations to measure differences across women. The first measure is the fraction of workers within an occupation who answered yes to the question: "Do you have flexible work hours that allow you to vary or make changes in the time you begin and end work?" This question was asked of both self-employed and wage and salary employed workers in the May supplement of the 1989 Current Population Survey (CPS).[47] The question doesn't ask about the extent of control over one's schedule, but it is focused on one type of flexibility that might be important to mothers with young children. Appendix Table A.7 shows the fraction of workers who answered yes to the question by employment type and broad occupation group.[48] Within wage and salary employment the fraction of workers in an occupation with schedule flexibility ranged from 4 to 37 percent, while in self-employment it ranged from 12 to 100. Unfortunately the small sample size does not allow for very precise measures of access to schedule flexibility, particularly within self-employment. For the second measure, I use the fraction of childless women working fewer than 35 hours per week in an occupation, following Herr and Wolfram (2012). This measure is constructed from the monthly CPS files from 1980 to 1999. Appendix Table A.8 shows the fraction of women without children who worked part-time across occupations. The fraction of childless women working part-time is meant to represent access to a part-time schedule in that occupation. This as-

[47]The contingent worker survey was run in 1991, but the question of interest excluded self-employed individuals. It was also run in 1995, but I use the 1989 survey because it is in the middle of when the majority of women in my sample have young children. The overall level of schedule flexibility increased over this time period; however, the ranking of occupations was quite similar between 1989 and 1995.

[48]Due to the small sample size, the analysis includes all workers, but there was very little difference in the fraction of workers with schedule flexibility within an occupation by gender.

pect of flexibility measures something different from schedule flexibility, and the ordering of occupations is very different between Appendix Tables A.7 and A.8.

Along both measures of flexibility, self-employment appears to be the relatively flexible employment type. In every occupation, a higher fraction of workers have schedule flexibility in self-employment with an average difference of 32%. In all but two occupations, part-time work is more prevalent in self-employment, and on average 15% more workers work part-time in self-employment. These measures offer some direct evidence that self-employment provides additional workplace flexibility within an occupation.[49]

Next, I assign a broad occupation to each woman in the sample using the job she has prior to the birth of her first child (see Appendix Table A.9 for the crosswalk from NLSY occupations to broad occupations). If she didn't work prior to having a child, I use her first job. If she never works, I assign her the occupation with the average level of flexibility. The idea behind assigning women to an occupation is to measure individual access to workplace flexibility. I recognize that women change occupations over their lifetime, but think of this assignment as measuring access to flexibility at an important time in women's lives.[50]

I re-estimate the model using the two different measures of workplace flexibility. Panel B of Table 1.10 compares the coefficients of interest from the baseline specification and the two alternatives. There is some evidence that the difference in the β_3s and β_4s between employment types is smaller after controlling for the flexibility measures, although only by \$100 to \$200. The estimates of α_2 are small in magnitude indicating that an increase in workplace flexibility does not have a large effect on the costs of working for mothers.

Overall the estimated value of flexibility for mothers with young children remains relatively similar across all three specifications. The results from controlling for women's access to workplace flexibility within their occupation are consistent with my interpretation of the difference in costs across employment types arising from differences in flexibility. The measures of flexibility that I use in the analysis are imperfectly measured for a number of reasons. Access to schedule flexibility is very imprecisely estimated, while the fraction of childless women working part-time might not reflect the type of flexibility that mothers with young children need. Additionally, the assignment of women to one occupation likely mis-measures their access to workplace flexibility because they have the opportunity to change occupations. The specification considers wage and salary employment and self-employment flexibility within the same occupation, but many transitions to

[49] Analysis not shown here shows that the self-employed have higher measures of workplace flexibility within 3-digit occupation codes as well. These more detailed codes may represent even more similar types of jobs than the broader occupation groups shown here.

[50] In my sample, 15% of women work in only 1 broad occupation during the estimation period, 21% in 2, 26% in 3 and around 35% work in 4 or more.

self-employment represent a change in occupation. Finally, women's occupation is endogneous, and there is evidence that women who want to take time out of the labor force select into relatively more flexible occupation (Polachek (1981) and Adda et al. (2011)).[51] For these reasons, I cannot conclude from these results that the value of workplace flexibility as measured by schedule flexibility or access to part-time employment is small for mothers even though my estimates suggest that variation in these measures does not have a large effect on mothers' costs of working.

1.7.5 Discussion of Alternative Interpretations

In this section, I discuss the validity of three alternative explanations other than workplace flexibility for the difference in the costs of working associated with having children between wage and salary employment and self-employment. These different interpretations identify factors that change differentially between the two employment types when women have children.

First, mothers may use self-employment as a way to avoid discrimination in the wage and salary employment sector, which would make self-employment appear relatively more attractive to mothers. While previous research has established that a motherhood penalty in earnings exists, the amount of the penalty due to discrimination appears to be relatively small. For example, Gangl and Ziefle (2009), argue that almost all of the motherhood wage penalty can be explained by changes to part-time or family friendly positions and time spent out of the labor force. My model explicitly takes into account time spent not employed, and I discuss the potential impact of family friendly positions in the previous section. While employer discrimination against mothers may exist, it is unlikely to account for a large portion of the difference in the utility costs of working associated with young children between the two employment types.

Second, having children may prompt women to become self-employed to pass their business on to their children, which would increase the value of self-employment relative to wage and salary employment for women with kids. Women's observed self-employment behavior is not consistent with this motivation. Only 1.6% of US businesses are inherited (Fairlie and Robb (2007)), and relatively few women in my data remain self-employed for the duration of their careers. The majority of the types of businesses in the data are not ones that are typically inherited: housekeeping, child care, hairdressing. Finally, my results suggest that self-employment is most valuable to women with preschool aged children and

[51] This could explain why I estimate that women in occupations with more flexible schedules actually have a higher average cost of working. The main effect of schedule flexibility, α_1, is negative.

less valuable to school aged children, a pattern that is not implied by a desire to pass on a business to children.

Third, having young children could lower a woman's tolerance for risky work making self-employment less attractive to mothers.[52] This effect would bias my estimates the opposite direction, making them underestimates of the value of flexibility. However, the women in my sample may be relatively more shielded from this income risk because the majority of them are the secondary earner in the household.

While there are alternative explanations that could be contributing to the higher self-employment rates among mothers of young children, there is relatively strong descriptive evidence to support additional flexibility within self-employment as the key causal factor. Overall, the evidence to support becoming self-employed to avoid workplace discrimination or pass on a business is much weaker. These motivations could contribute to the benefits of self-employment for mothers, but the majority of the effect is likely to still be due to a desire for flexibility.

1.8 Conclusion

As the share of households with working mothers continues to rise, workplace flexibility has become increasingly important. In this paper, I estimate a life-cycle model of married women's fertility and labor supply. My results provide evidence that workplace flexibility influences married women's fertility and employment decisions. I show that on average self-employment imposes smaller additional costs of working on mothers with young children than wage and salary employment. My estimates suggest that women with preschool-aged children value the additional workplace flexibility of self-employment at around $7,400 per year. Flexibility appears to be an important motivation for becoming self-employed. I estimate self-employment rates would decline by over 40% if self-employment were no more flexible for mothers than wage and salary employment.

My partial equilibrium counterfactual exercises suggest that policies that increase flexibility within wage and salary work could have large positive effects on women's earnings, fertility and employment. I find that self-employment flexibility raises women's employment rates, but has a small negative impact on their lifetime earnings by encouraging women to switch from wage and salary employment to self-employment. In contrast, increases in the flexibility for mothers within wage and salary employment are estimated to

[52] Self-employment earnings among men have been shown to have higher unconditional variance than wage and salary earnings and therefore might represent a more risky employment option (Evans and Leighton (1989), Hamilton (2000)). In my data, self-employment earnings actually have a lower variance, which might be explained by my focus on married white women.

increase both employment and lifetime earnings by substantial amounts. Because wage and salary employment is much more common than self-employment, focusing on flexibility in that type of employment is likely to bring the most widespread benefits to women.

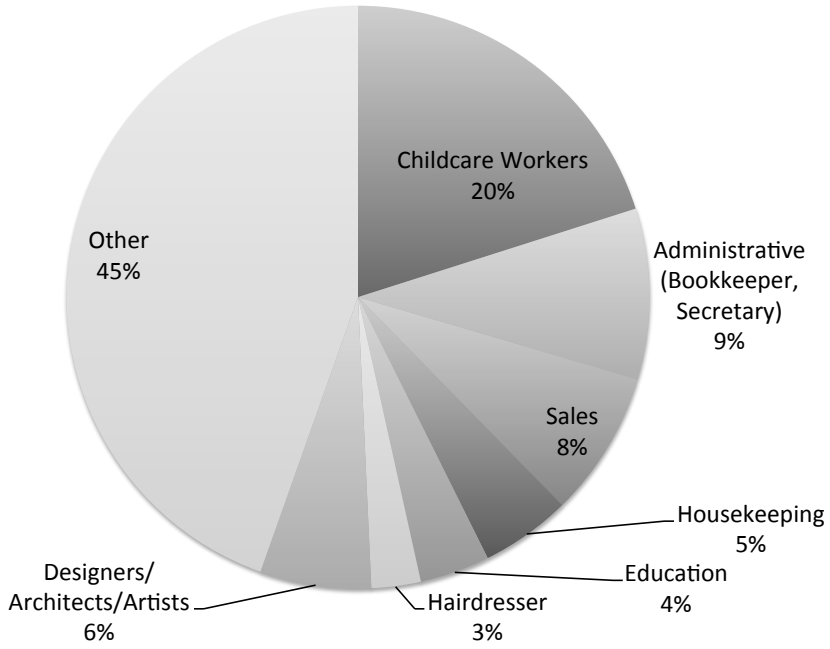
A task for future research is to quantify the potential negative consequences of workplace flexibility, including discrimination against women viewed as likely to use such policies.[53] If making workplaces more flexible causes women's wages to fall substantially, the benefits outlined in this paper may be offset by lower lifetime earnings. Indeed, Blau and Kahn (2013a) provide suggestive evidence that American women outpace their OECD counterparts in attaining highly paid management positions and one potential explanation is that the family friendly policies offered by other countries segment women into low-earning part-time positions.

Workplace flexibility is inherently a multidimensional concept, but further documentation of the types of policies firms are offering and the policies actually utilized by workers would help clarify the state of workplace flexibility in the US. Additional research should also focus on potential interactions between policies. For example, a policy implementing a flexible work schedule might be more effective for mothers when it is combined with paid maternity leave. Finally, additional research is needed to understand whether policies that allow both women and men to better manage work and family responsibilities could have positive effects on marriage quality and children's wellbeing.

[53] See Blau and Kahn (2013a) for a discussion of the benefits and costs of "family friendly" policies. See Gruber (1994), Prada et al. (2015), Thomas (2014), and Fernández-Kranz and Rodríguez-Planas (2013) for evidence of the effect of specific policies on women's wages.

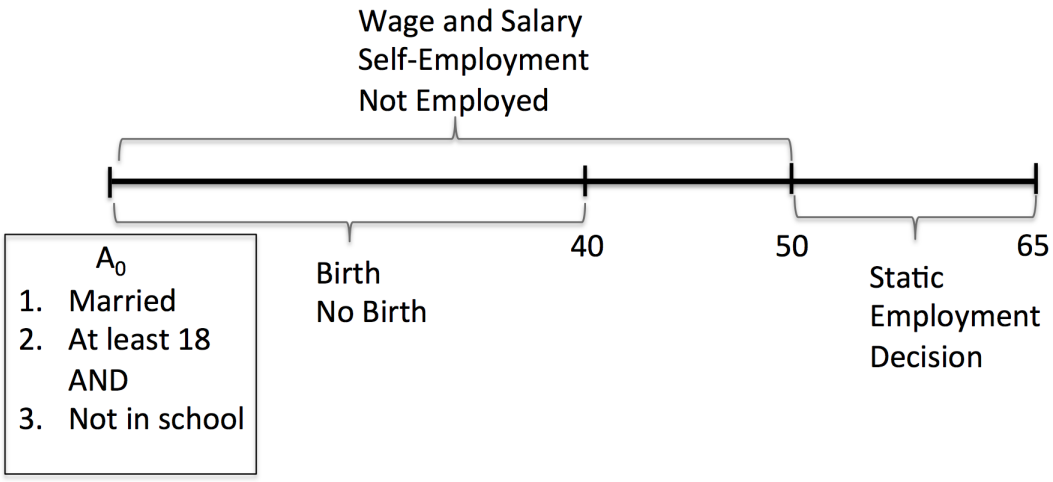
Tables and Figures

Figure 1.1: Top Jobs Among Self-Employed Women in Sample; NLSY79



Notes: Data are from the NLSY79. Estimates are person-year unweighted observations of self-employed white married women from the estimation sample.

Figure 1.2: Model Timing Description



Notes: Figure shows the relevant decisions at each age in the model.

Table 1.1: Summary Statistics of Estimation Sample

Year-Individual Observations	N=23,851		
	Mean	**Standard Deviation**	**Median**
Age	36.1	8.1	36
Earnings (2000$) Wage & Salary[1]	28,401	31,586	22,226
Earnings (2000$) Self-Employed[1]	20,094	25,715	14,022
Husband's Earnings (2000$)	44,021	60,604	34,627
Individual Observations	**N=1,035**		
	Mean	**Standard Deviation**	
Fraction of the Sample:			
High School or Less	41.2	.	.
Some College	22.9	.	.
Bachelor's	35.9	.	.
Ever Self-Employed	28.4	.	.
Number of Children[2]	1.93	1.08	2
Age at Beginning of Estimation	25.2	5.4	24
Years of Estimation	23.0	7.0	25
Prior Years in Wage & Salary	3.6	4.7	2
Prior Years in Self-Employment	0.1	0.7	0
Prior Years Not Employed	0.4	1.5	0
Total Years in Wage & Salary	18.3	8.5	20
Total Years in Self-Employment	1.6	3.6	0
Total Years Not Employed	6.3	7.0	4

[1] Only includes observations who worked in that type of employment.

[2] Number of children at the end of the sample period.

Notes: Summary statistics cover the estimation period only and include white married women who do not divorce while in the sample. Estimates are unweighted. Data are from the NLSY79.

Table 1.2: Percent of Observations Making Each Choice by Age of the Mother and the Number of Children

	Wage & Salary		Self-Employed		Not Employed		N
	No Birth	Birth	No Birth	Birth	No Birth	Birth	
All Ages	63.0	3.6	6.2	0.4	23.2	3.7	23,851
18-25	53.3	6.2	2.3	0.3	23.5	11.5	2,717
26-30	54.7	8.4	5.1	0.9	23.5	7.4	3,964
31-35	59.0	5.9	6.3	0.8	23.9	4.1	4,508
36-40	66.3	1.9	6.5	0.4	23.2	1.8	4,572
41-50	70.6	0.0	7.8	0.0	21.6	0.0	8,090
Number of Kids							
0	68.0	7.6	5.0	0.6	12.8	6.0	5,402
1	57.7	6.6	5.4	0.8	22.5	7.0	4,931
2	65.6	1.1	6.0	0.2	25.4	1.7	8,932
3	58.1	0.6	9.5	0.2	30.0	1.6	3,328
4	56.0	0.0	6.8	0.0	37.2	0.0	1,258

Notes: Table includes observation-years during the estimation period. Sample includes white married women who do not divorce while in the sample. Data are from the NLSY79.

Table 1.3: Annual Transitions Across Choices

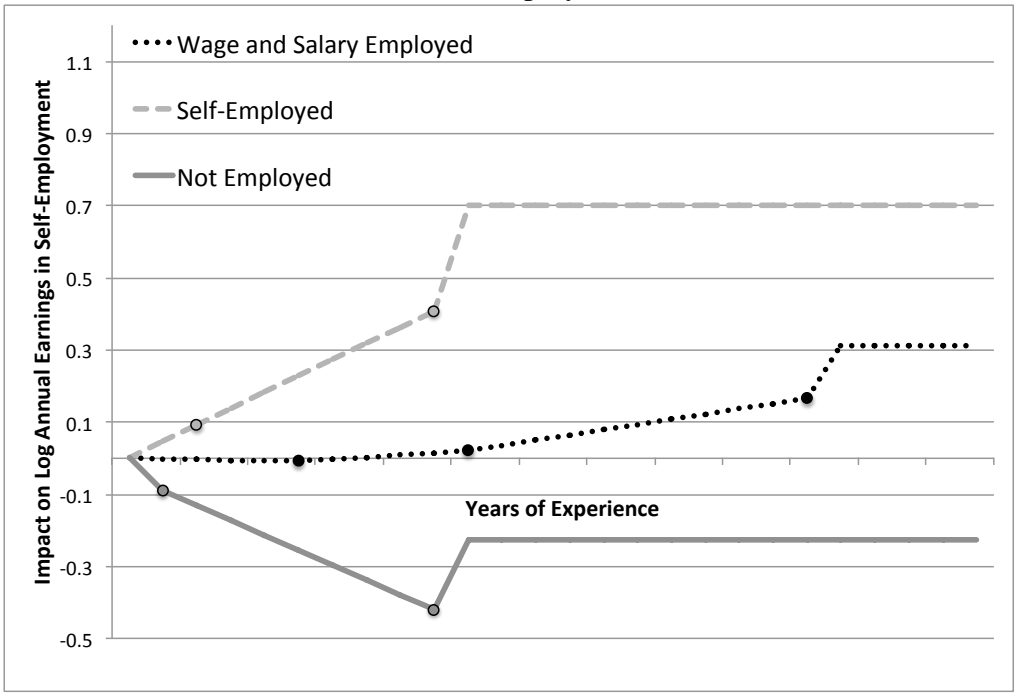
		Choice in Period $t+1$						
		Wage & Salary		Self-Employed		Not Employed		Row Percent
Choice in Period t		No Birth	Birth	No Birth	Birth	No Birth	Birth	of total
Wage & Salary	No Birth	86.9	5.0	1.3	0.2	4.9	1.7	62.7
	Birth	85.3	2.7	2.5	0.1	7.7	1.8	3.7
Self-Employed	No Birth	12.9	1.1	73.6	4.6	6.9	1.1	6.1
	Birth	17.0	1.0	73.0	0.0	9.0	0.0	0.4
Not Employed	No Birth	14.7	1.0	2.1	0.2	72.8	9.2	23.2
	Birth	16.3	0.5	1.8	0.1	75.4	5.9	3.8

Notes: Table includes observation-years during the estimation period only. Sample includes white married women who do not divorce while in the sample. Data are from the NLSY79.

Figure 1.3: Implied Effect of Experience on Earnings

(a) Wage and Salary

(b) Self-Employment



Notes: Figures show how different levels of experience in the three employment choices affect women's expected earnings in wage and salary employment and self-employment. The levels are all relative to having zero years in that employment type. Plots come from the earnings parameters estimates in Table 1.4. Dots denote nodes of the piece-wise linear function.

Table 1.4: Log Earnings Parameter Estimates

Wage and Salary Log Earnings			Self-Employment Log Earnings		
Description	Estimate	Standard Error	Description	Estimate	Standard Error
Wage and Salary Experience-Linear Spline			Wage and Salary Experience-Linear Spline		
1-2 Years	0.122*	[0.019]	1-5 Years	−0.002	[0.005]
3-5 Years	0.032*	[0.008]	6-10 Years	0.006	[0.003]
6-10 Years	0.024*	[0.003]	11-20 Years	0.015*	[0.002]
11-15 Years	0.021*	[0.003]	21 or More Years[1]	0.147*	[0.018]
16-23 Years	0.030*	[0.002]			
24 or More Years[1]	0.028*	[0.011]			
Self-Employment Experience-Linear Spline			Self-Employment Experience-Linear Spline		
1-2 Years	−0.013*	[0.004]	1-2 Years	0.047	[0.034]
3-9 Years	−0.013*	[0.003]	3-9 Years	0.045*	[0.010]
10 or More Years[1]	0.001	[0.018]	10 or More Years[1]	0.294*	[0.055]
Years Not Employed-Linear Spline			Years Not Employed-Linear Spline		
1 Year	−0.116*	[0.003]	1 Year	−0.090*	[0.012]
2-9 Years	−0.028*	[0.001]	2-9 Years	−0.041*	[0.005]
10 or More Years[1]	0.029*	[0.007]	10 or More Years[1]	0.191*	[0.038]
Unemployment rate	−0.019*	[0.002]	Unemployment rate	−0.018*	[0.008]
Some College	0.160*	[0.008]	Some College	0.191*	[0.018]
Bachelor's Degree	0.303*	[0.007]	Bachelor's Degree	0.379*	[0.017]
Type 1-Low	−0.717*	[0.008]	Type 1-Low	−0.972*	[0.038]
Type 2-Medium	0.000	.	Type 2-Medium	0.000	.
Type 3-High	0.514*	[0.006]	Type 3-High	0.650*	[0.019]
Intercept	−2.035*	[0.031]	Intercept	−2.330*	[0.066]
Fraction Type 1-Low Earning			22.5*	[1.6]	
Fraction Type 2-Medium Earning			53.6*	[1.9]	
Fraction Type 3-High Earning			23.9	-	

	Ratio Wage and Salary Earnings	Ratio Self-Employment Earnings
Workers with X years of wage and salary experience versus workers with none:		
3 Years	1.28	1.00
10 Years	1.46	1.02
15 Years	1.57	1.09
Workers with X years of self-employment experience versus workers with none:		
1 Year	0.99	1.05
3 Years	0.96	1.14
5 Years	0.94	1.23
Workers with X years of non-employment versus workers with none:		
1 Year	0.88	0.91
3 Years	0.83	0.83
5 Years	0.77	0.75

Notes: Estimates are from maximum likelihood estimation.

1. Top experience categories are just indicators for having experience levels at or above that cutoff essentially flattening out the earnings profile. Predicted log earnings are denominated in 100,000s of $2000. Standard errors are calculated using the Fisher information matrix. *p<0.05

Table 1.5: Utility Parameter Estimates

Parameter	Description	Estimate	Standard Error
β_1^{ws}	Marginal Utility Consumption W-S	0.91	[0.002]
β_1^{se}	Marginal Utility Consumption S-E	0.95	[0.005]
β_2^{ws}	Working in W-S	-3,987	[267]
β_2^{se}	Working in S-E	-14,909	[607]
β_3^{ws}	Youngest Child 0-5 W-S	-11,310	[290]
β_3^{se}	Youngest Child 0-5 S-E	-3,918	[593]
	Difference	-7,392	[659]
β_4^{ws}	Youngest Child 6-9 W-S	-5,033	[556]
β_4^{se}	Youngest Child 6-9 S-E	-1,655	[1,021]
	Difference	-3,378	[1,163]
β_5^{se}	Entry to S-E	-95,210	[2,685]
	Linear Children Term-Type 1-Low	1,793	[192]
β_6	Linear Children Term-Type 2-Medium	3,287	[137]
	Linear Children Term-Type 3-High	4,035	[217]
	Quadratic Children Term -Type 1-Low	-558	[44]
β_7	Quadratic Children Term -Type 2-Medium	-879	[33]
	Quadratic Children Term -Type 3-High	-1,020	[58]
$\frac{\rho\pi}{\sqrt{6}}$	Standard Deviation ϵ	21,044	[313]
	Log Likelihood	-34,857	

Notes: These estimates come from the second stage maximum likelihood estimation. Parameter values are denominated in 2000$ except for the marginal utility of consumption parameters.

Table 1.6: Model Fit-Overall Choices and Fertility

Choices	**Data**	**Model**
Wage and Salary, No Birth	63.0	62.1
Wage and Salary, Birth	3.6	4.5
Self-Employment, No Birth	6.2	6.7
Self-Employment, Birth	0.4	0.6
Not Employed, No Birth	23.2	23.3
Not Employed, Birth	3.7	2.9
Completed Fertility		
0	12.9	11.3
1	15.9	15.6
2	44.6	40.9
3	18.6	27.8
4	8.0	4.6

Notes: Table compares overall distribution of choices and completed fertility implied by the model with the data.

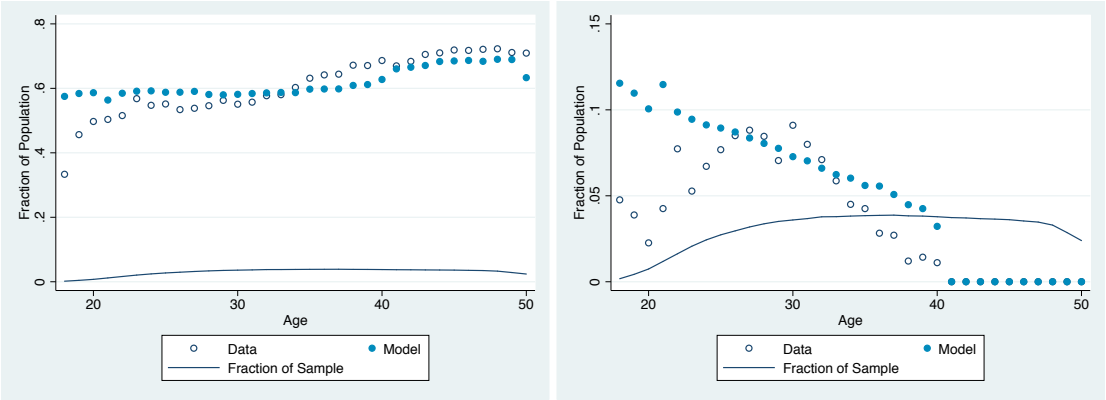
Table 1.7: Annual Transitions Across Choices Simulated Model

		Model						
		Choice in Period $t+1$						
		Wage & Salary		Self-Employed		Not Employed		
Choice in Period t		No Birth	Birth	No Birth	Birth	No Birth	Birth	Row Percent
Wage & Salary	No Birth	72.3	3.9	4.5	0.3	17.2	1.8	62.0
	Birth	52.6	16.4	4.4	1.1	20.3	5.4	4.7
Self-Employed	No Birth	41.2	2.2	36.1	2.45	16.8	1.2	6.6
	Birth	30.3	7.3	33.2	8.9	16.0	4.3	0.6
Not Employed	No Birth	46.6	2.2	4.9	0.3	41.1	4.2	23.2
	Birth	32.6	7.3	3.6	0.8	44.8	10.3	3.0

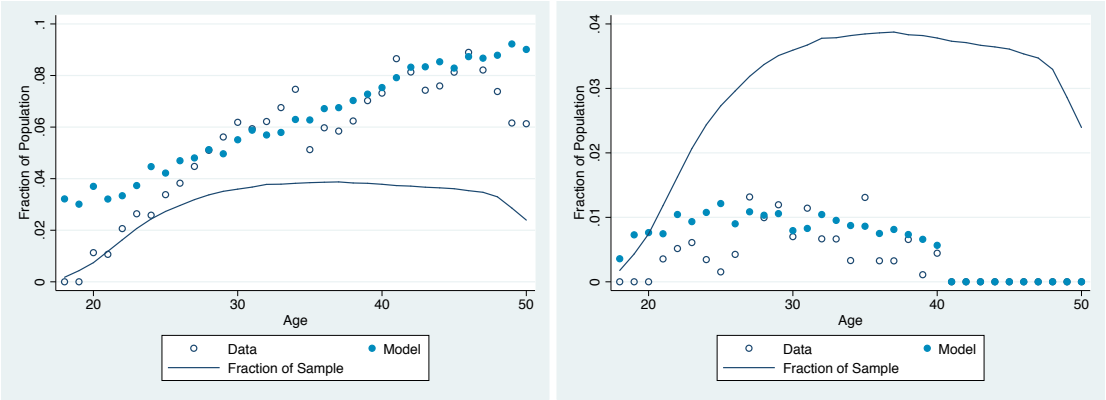
Notes: Table shows transitions in choices from simulated data using the estimates from Table 1.4 and Table 1.5. The simulated choices are calculated using the estimates to simulate the model 20 times for each woman. Each woman starts with her actual initial conditions but makes decisions according to the model with the estimated parameters. Simulation years correspond only to years that exist in the data.

Figure 1.4: Choices Over the Life-Cycle; Model v. Data

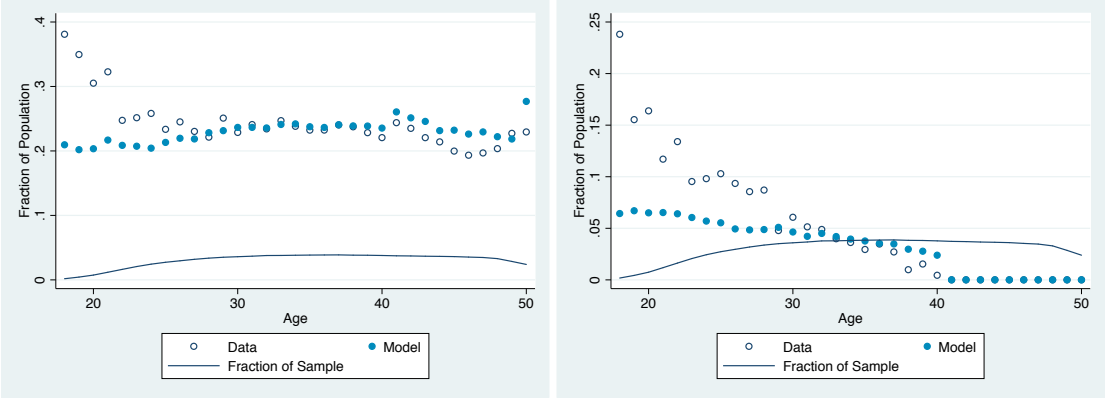
(a) Wage and Salary (No Birth, Birth)



(b) Self-Employed (No Birth, Birth)



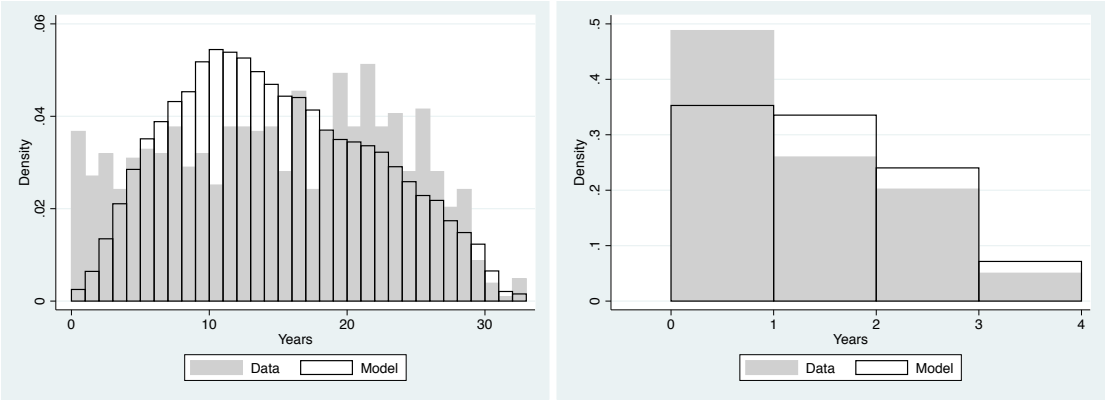
(c) Not Employed (No Birth, Birth)



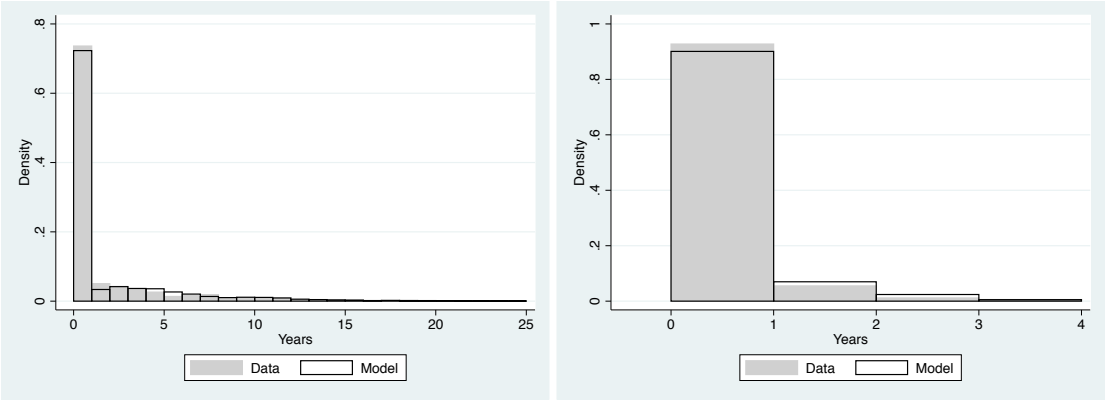
Notes: Figures show the proportion of individuals at each age choosing each of the six possible fertility-employment choices from the data and from simulations from the model. Simulation years correspond only to years that exist in the data.

Figure 1.5: Cumulative Years Choices; Model v. Data

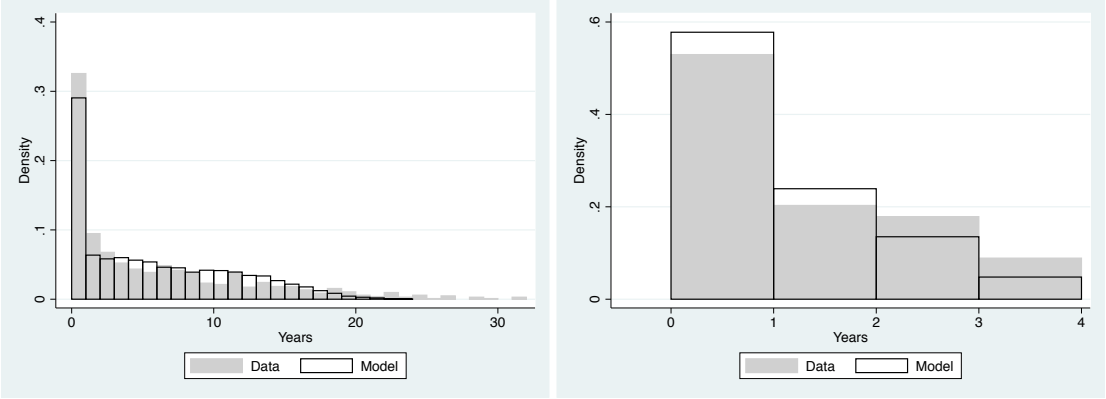
(a) Wage and Salary (No Birth, Birth)



(b) Self-Employment (No Birth, Birth)



(c) Not Employed (No Birth, Birth)



Notes: Figures show the distribution of the total number of years each woman made each of the six possible fertility-employment choices from the data and from simulations from the model. Simulation years correspond only to years that exist in the data.

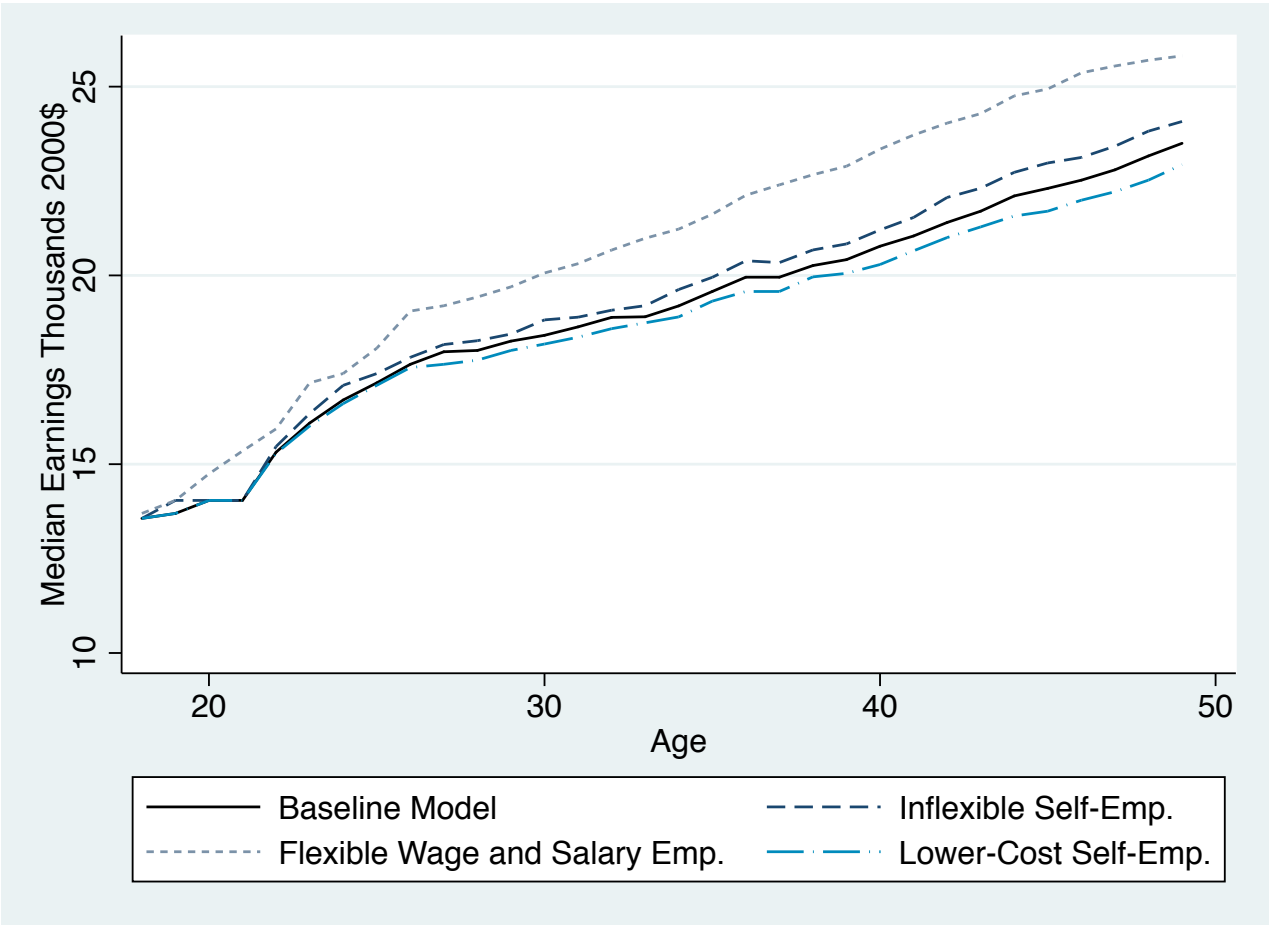
Table 1.8: Effect of Counterfactual Exercises on Fertility, Earnings, Employment and Utility

	Model Baseline	Inflexible Self-Employment	Flexible Wage & Salary Employment	10 Percent Lower Self-Employment Entry Cost
Completed Fertility	2.03	1.97	2.52	2.05
Pct Ever Self-Employed	29.7	20.2	21.7	41.9
PV Median Lifetime Earnings (Thousands 2000$)	282.2	285.6	317.6	279.6
Percent Change in PV Median Lifetime Earnings		1.2	12.5	–0.9
	Fraction in Each Employment Type			
Wage & Salary	67.1	70.3	72.8	64.5
Self-Employment	7.8	4.03	4.5	10.8
Not Employed	25.2	25.65	22.8	24.7
	Average Cumulative Years in Each Employment Type			
Wage & Salary	27.4	28.7	29.7	26.4
Self-Employment	3.2	1.6	1.8	4.4
Not Employed	10.3	10.5	9.3	10.1
	PV Lifetime Utility (Millions 2000$)	**Average Percentage Change Relative to Baseline**[1]		
All	1.33	–0.15	2.80	0.17
High School or Less	1.13	–0.17	3.07	0.19
Some College	1.26	–0.16	2.94	0.21
Bachelor's Degree	1.59	–0.13	2.39	0.13

[1] This is the mean of the individual percentage changes in utility.

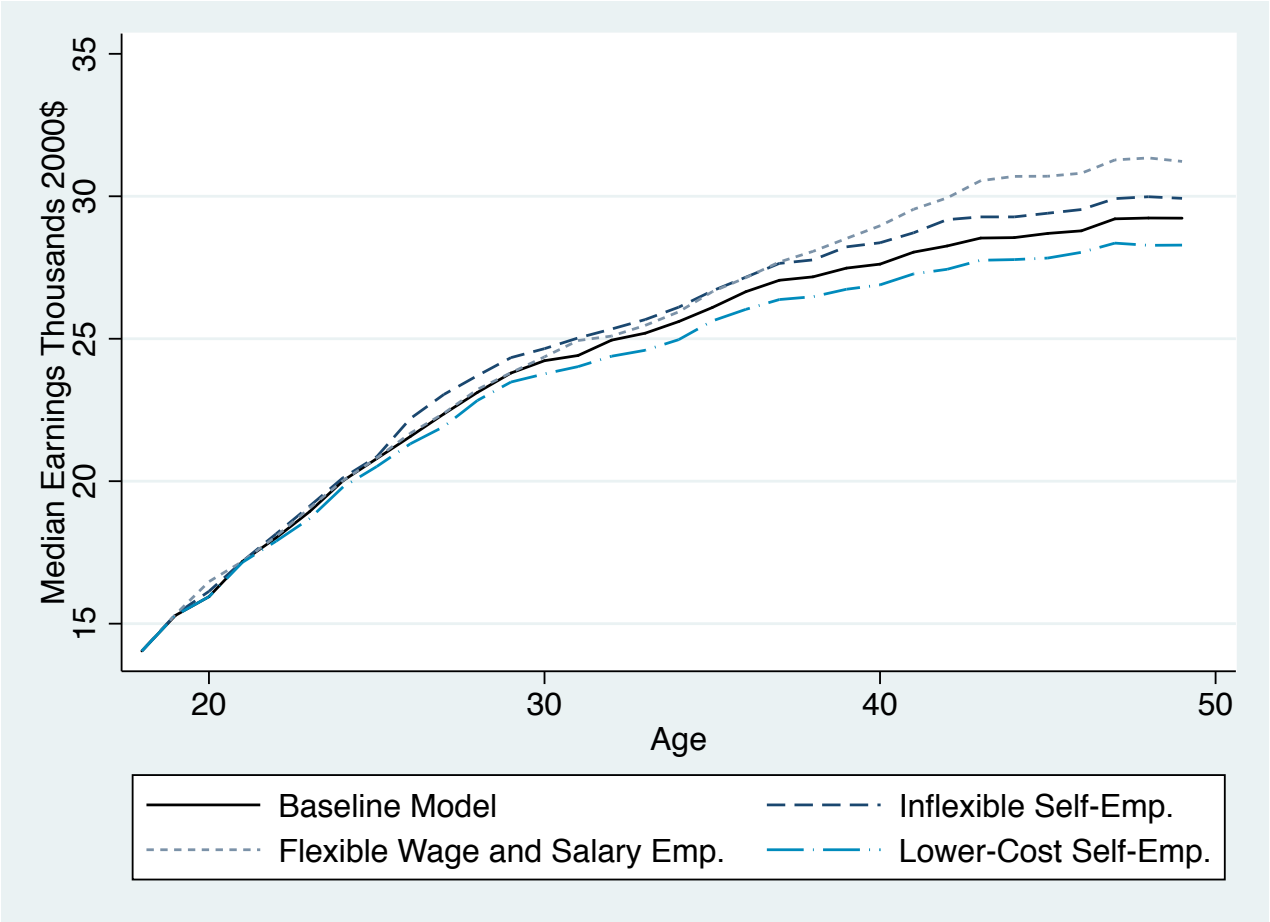
Notes: Estimates come from comparing simulated data from the baseline model to simulated data under three counterfactual scenarios. Simulation years include years after the individuals enters the estimation sample through age 50 and figures include the continuation value from ages 51 through 65.

Figure 1.6: Median Earnings Over the Life Cycle Among All Women: Baseline and Counterfactuals



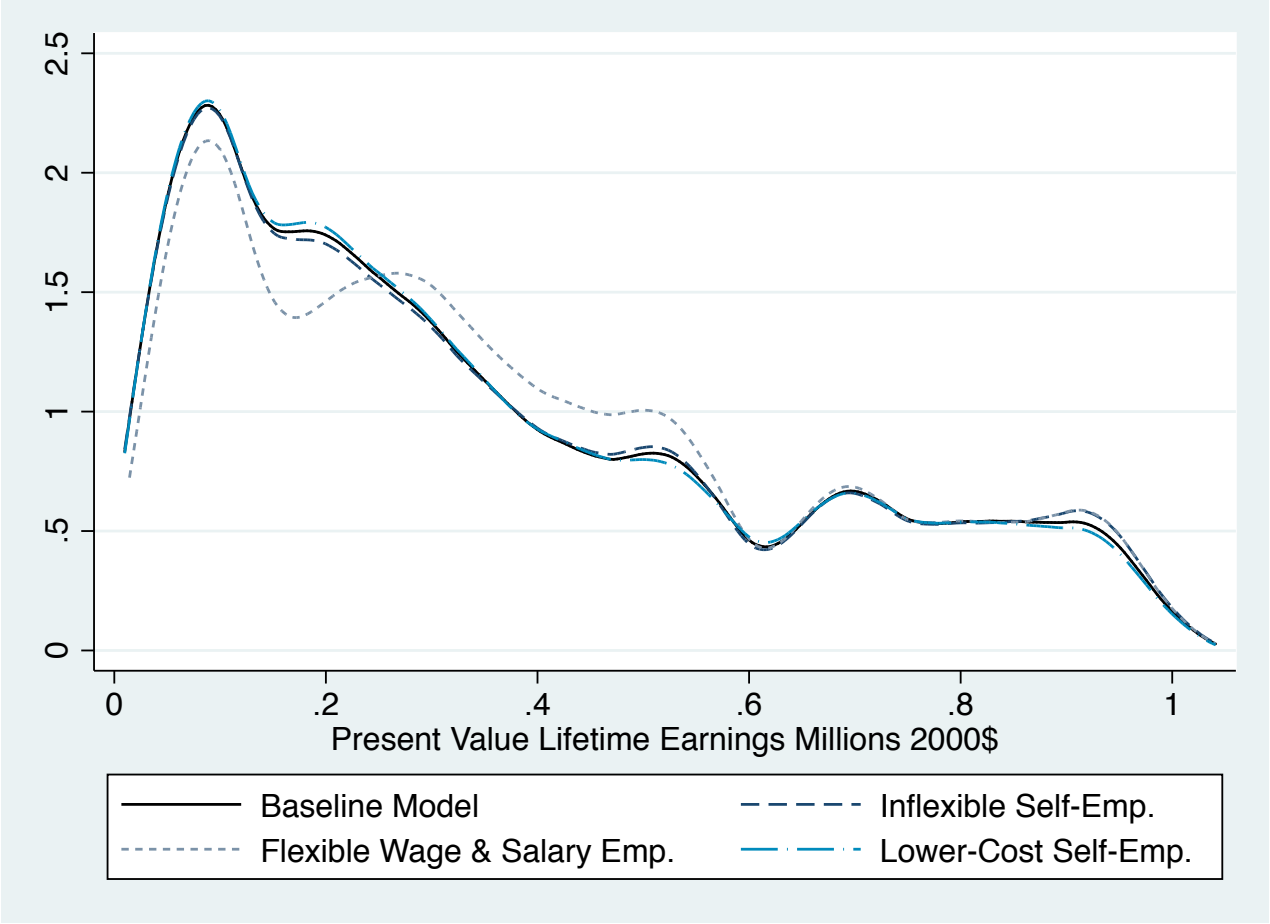
Notes: Figure shows women's median earnings by age for women in the baseline and across the three counterfactual scenarios. Sample includes women not working with zero earnings. Simulation years include years after the individuals enters the estimation sample through age 50.

Figure 1.7: Median Earnings Over the Life Cycle Among Employed Women: Baseline and Counterfactuals



Notes: Figure shows women's median earnings by age for employed women in the baseline and across the three counterfactual scenarios. Simulation years include years after the individuals enters the estimation sample through age 50.

Figure 1.8: Distribution of Present Value Lifetime Earnings: Baseline and Counterfactuals



Notes: Figure shows the density of the present value of lifetime earnings in the baseline model and across the three counterfactual scenarios. Simulation years include years after the individuals enters the estimation sample through age 50 and values include the continuation value of earnings from ages 51 through 65.

Table 1.9: Effect of Counterfactual Exercises on Fertility, Earnings, Employment and Utility: By Unobserved Type

	Model Baseline	Inflexible Self-Employment	Flexible Wage & Salary Employment	10 Percent Lower Self-Employment Entry Cost
Completed Fertility				
Low	2.39	2.36	2.70	2.39
Medium	1.96	1.90	2.49	1.99
High	1.83	1.75	2.44	1.87
PV Median Lifetime Earnings (Thousands 2000$)				
Low	69.2	69.1	77.6	69.2
Medium	279.1	282.5	315.0	276.4
High	763.9	779.2	779.4	753.7
Average Percent Change in PV Lifetime Earnings[1]				
Low		0.10	13.71	0.17
Medium		1.17	13.68	–0.77
High		1.06	1.75	–0.79
Average Cumulative Years in Each Employment Type				
Wage & Salary (All)	27.4	28.7	29.7	26.4
Low	18.4	18.8	19.5	18.0
Medium	28.0	29.1	30.4	26.9
High	34.6	37.4	37.24	33.1
Self-Employment (All)	3.2	1.6	1.8	4.4
Low	1.9	1.3	1.5	2.8
Medium	3.0	1.7	1.9	4.2
High	4.8	2.0	2.1	6.4
Not Employed (All)	10.3	10.5	9.3	10.1
Low	20.5	20.8	19.5	20.1
Medium	9.9	10.1	8.6	9.7
High	1.3	1.4	1.3	1.3

[1] This is the mean of the individual percentage changes in utility.

Notes: Low earning types represent 23% of the population, medium earning types represent 53%, and high earning types represent 24%. Estimates come from comparing simulated data from the baseline model to simulated data under three counterfactual scenarios. Simulation years include years after the individuals enters the estimation sample through age 50 and figures include the continuation value from ages 51 through 65.

Figure 1.9: Life-Cycle Employment Rates: Baseline and Counterfactuals

Notes: Figure shows the fraction of women working at different ages under the baseline model and the three counterfactual scenarios. Simulation years include years after the individuals enters the estimation sample through age 50.

Table 1.10: Robustness of Main Results to Alternative Specifications

Panel A:

	Value of Self-Employment Flexibility				Effect Inflexible Self-Employment	
	Youngest Child Aged 0-5		Youngest Child Aged 6-9		Percentage Change in:	
	2000$	% Utility at 40	2000$	% Utility at 40	Completed Fertility	Lifetime Earnings [1]
Baseline Model	7,392	8.3	3,378	3.8	3.0	−1.2
Alternative Earnings Specifications:						
1) Inflate Self-Emp Earnings for Tax Evasion	7,473	8.4	3,536	4.0	2.9	−1.7
2) Alternative Earnings Measure	7,687	8.6	3,240	3.6	2.6	−2.0
Alternative Samples:						
3) Ever Married White Women	5,009	7.3	537	0.8	2.8	−1.2
4) All Races	4,630	7.3	1,011	1.6	1.9	−0.4
Alternative Specifications:						
5) 4 Types	6,424	7.8	2,662	3.1	2.8	−1.8
6) 1 Type	6,697	8.2	3,161	3.9	2.7	0.9
7) Discount Factor: 0.9	6,429	7.6	2,989	3.5	2.8	−0.3
8) Indicators Utility from Kids	7,665	8.6	3,811	4.3	3.1	−2.0
9) Weighted	6,657	7.6	3,053	3.5	2.8	−1.2

Panel B:

Parameter Estimates from Alternative Specifications Controlling for Flexibility Measures

	β_3^{ws}	β_3^{se}	β_4^{ws}	β_4^{se}	α_2	$\lvert\beta_3^{ws}-\beta_3^{se}\rvert$	$\lvert\beta_4^{ws}-\beta_4^{se}\rvert$
Baseline Model	-11,210	-3,918	-5,033	-1,655	.	7,392	3,378
10) Flexible Schedule	-11,439	-4,238	-5,148	-1,954	647	7,201	3,194
11) Fraction Part-Time Workers	-11,137	-3,801	-4,952	-1,586	-131	7,313	3,343

Notes: This table compares the difference in the costs of working across employment types associated with having young kids and the estimated effect of the additional flexibility for mothers provided by self-employment under different specifications of the model.

1) Increases women's self-employment earnings by 25% following the results from Hurst et al. (2014), which show that even in survey data self-employment earnings may be underreported.

2) Uses an alternative earnings measure that looks at annual hours worked to compensate for some missing job earnings information for very low hour non-CPS jobs.

3) Includes all white women from the cross-sectional sample while they are married.

4) Includes all races from the cross-sectional sample.

5) Allows for 4 unobserved types.

6) No variation on unobserved ability or preferences for kids.

7) Discount factor is set at 0.9 rather than 0.95.

8) Uses indicators for the utility from the number of children rather than a quadratic.

9) Women are weighted in the likelihood according to their sample weights from the NLSY79.

10) Controls for the fraction of workers who have a flexible schedule in the occupation the woman works at prior to the birth of her first child.

11) Controls for the fraction of childless women who work part-time in the occupation the woman works at prior to the birth of her first child.

[1] Change in lifetime earnings is measured as the change in the median of the present value of lifetime earnings.

[2] The value of flexibility under these specifications for women with a preschool aged child is: $-1[\beta_3^{ws} - \beta_3^{se} + \alpha_2 * (flexibility^{ws} - flexibility^{se})]$. The value is calculated at the mean values of the $flexibility$ measure and at the ones with the largest and smallest difference between the two types of employment.

CHAPTER 2

New Evidence on Self-Employment and Workplace Flexibility for US Mothers

Mothers of young children often reduce their labor supply to manage household responsibilities. Workplace flexibility is an important determinant of these labor supply decisions that have lasting implications for women's future labor force participation and earnings. This paper provides new evidence that self-employment is an alternative that mothers use to gain flexibility along multiple dimensions while continuing to work. First, I use within-person variation to show that women with young children are more likely to be self-employed than women without young children using data from the Survey of Income and Program Participation. The results indicate that the self-employment rate among women whose youngest child is two years old is 11-17 percent higher than the predicted rate without their youngest child. Second, I show that self-employed women appear to have more flexibility in their work location, hours, and schedule than wage and salary employed women using data from the American Time Use Survey. My findings suggest that self-employment itself allows women to spend more time with their children even while working the same number of hours. These results contribute to a deeper understanding of the varied work decisions women with young children make, which can inform policies related to child care, workplace flexibility, and programs to promote self-employment.

2.1 Introduction

Between 1980 and 2010, American mothers increased their labor force participation by 14 percentage points.[1] While this increase is impressive, many women today still take time off work or decrease their hours when they have children.[2] Among women who continue to work, over half say that managing family and work responsibilities is "somewhat or very difficult".[3] Previous research suggests that one important determinant of mothers' labor force participation decisions is workplace flexibility.[4] A recent Pew Foundation survey found that over 70% of working mothers say having a flexible work schedule is extremely important to them (Parker and Wang (2013)).

This paper uses a nationally representative panel dataset to provide new evidence on mothers' use of self-employment as a more flexible work environment. Previous research has found that self-employment rates are higher among women with children and conjectured that flexibility is an important explanation for this pattern (Wellington (2006), Hundley (2000)). The self-employed are more likely to be able to work from home, choose the number of hours they work and decide when to work those hours (Devine (2001)).

My paper makes three primary contributions to the existing literature on female self-employment and children. First, I use a large panel dataset, which allows me to control for unobserved time invariant differences across individuals that could drive both self-employment behavior and fertility. Previous work using cross sectional datasets or two year panel datasets could not rule out that the positive correlation between self-employment and children arises because women who have a preference for self-employment also have stronger preferences for children. Second, my analysis traces out the relationship between self-employment behavior and the age of a woman's youngest child. While previous work finds a positive correlation between children and female self-employment, showing self-employment propensities by the age of the youngest child provides further evidence that self-employment is associated with time periods when children require a large amount of care. This finding suggests that self-employment offers the flexibility to provide that care. Third, I investigate whether the relationship between self-employment and the age of the youngest child has changed between 1984 and 2012. The increase in mothers entering the labor force during this time period likely altered the composition of working mothers.

[1] The BLS Labor Force Statistics from the Current Population Survey reports 70.8% of women with children under 18 worked in 2010 compared to 56.6% in 1980.

[2] Byker (2012) documents that 15-20 percent of women decrease their hours worked two years after having their first child. This pattern persists between 1980 and 2010.

[3] The Pew Research Center conducted a survey on work and family in 2012; see Parker and Wang (2013) for details.

[4] See Goldin (2014), Herr and Wolfram (2012) for examples.

If these newly employed women have different underlying preferences about work, their entry may have changed self-employment rates and patterns.

I use the Survey of Income and Program Participation (SIPP) to estimate the relationship between self-employment and the age of a woman's youngest child. I find that it exhibits a positive inverted U-shaped relationship that is strongest when the youngest child is two. My results provide evidence that self-employment is associated with time periods when children require a large amount of care, suggesting that self-employment offers flexibility to more easily provide that care. I find no evidence that the relationship has changed between the late 1980s and early 2010s, and the estimates are robust to a variety of sample restrictions and weighting schemes. The estimated relationship is statistically and economically significant. Women whose youngest child is two years old have predicted self-employment rates that are 11-17 percent higher than their predicted rates without their youngest child. Married women with young children are more likely to become self-employed than single women, which could be because self-employment is easier with a second earner. Married women may have access to spousal health insurance. They may also have a higher tolerance for the income risk of being self-employed because their households often have two incomes. In addition, married women might have greater access to startup capital, which could make transitioning to self-employment easier.

The increase in self-employment rates among women with young children contrasts starkly with their decrease in labor force participation. These patterns suggest that self-employment provides an opportunity to combine work and family in a way that wage and salary employment does not. I use the American Time Use Survey (ATUS) to investigate the mechanisms through which self-employment might be more compatible with household responsibilities. Relative to women working in wage and salary positions, I find that self-employed women tend to work fewer hours, are more likely to work from home, and spend more time as the primary caretaker of their children. My results are consistent with previous work that has suggested that many women become self-employed to manage family responsibilities (Hundley (2000), Gurley-Calvez et al. (2009), Fairlie and Robb (2009)). I find self-employed women with young children spend an extra two hours per day with their children after conditioning on hours worked and demographic characteristics. These results provide suggestive evidence that self-employment allows women to structure their time differently and offer context for the observed relationship between self-employment and the presence of young children.

Overall, my findings suggest that self-employment provides a flexible alternative to wage and salary employment for women with young children and provide a deeper understanding of employment decisions during an important time in women's working lives.

There is evidence that the gender wage gap in the U.S. grows between ages 30 and 35 when women are more likely than men to decrease their labor supply (Bertrand et al. (2010), Goldin (2014), Guvenen et al. (2014)).[5] These reductions in labor supply result in many women having less work experience than their male counterparts, which hurts their future employment prospects. Additionally for many women, having children coincides with the time period when they are building their careers, meaning that time taken off can have an especially large negative impact on their future earning potential. In a life-cycle model of women's fertility and labor supply decisions, Lim (2016) finds that self-employment is better for women's future earning potential than not working, but that it is far less rewarded by future employers than wage and salary employment experience. The findings from this paper detail some of the non-pecuniary benefits self-employed mothers receive, which may compensate them for a relative loss in future earning potential.

The remainder of the paper is organized as follows. In section 2, I provide a short background on women's self-employment in the US. I discuss the previous literature on female self-employment and the labor supply of mothers in section 3. In section 4, I describe my two data sources: the SIPP and the ATUS. In section 5, I outline my empirical strategy for estimating the relationship between having young children and self-employment. I also describe my analysis on time use differences between self-employed women and wage and salary workers. I present my results in section 6 and section 7. Section 8 concludes.

2.2 Female Self-Employment Background

Female self-employment rates in the US increased sharply from 4 percent to around 7 percent during the 1970s and 1980s and have remained between 7 percent and 8 percent since 1990 (Roche (2014), Devine (1994)).[6] Table 2.1 lists the top occupations among self-employed women over time. In general the self-employed are overrepresented in service occupations, administrative positions, and sales. There are a large number of self-employed women working in relatively low skilled occupations including as hairdressers, childcare workers, and housekeepers, as well as many self-employed women working in high skilled occupations such as physicians, lawyers, and management analysts.

[5]These papers study highly educated, high earning individuals. Bertrand et al. (2010) focuses on MBAs, Goldin (2014) studies the 40 highest earnings occupations, and Guvenen et al. (2014) study the top 1% of earners. For these women their prime childbearing ages are between 30 and 35.

[6]Self-employment rates are usually defined as the percent of the labor force who are self-employed. The figures reported in this section use that definition. In my empirical analysis, I do not condition on employment and instead focus on the fraction of the population who are self-employed.

Roche (2014) provides a recent update on the demographic composition of the female self-employed that largely matches what previous literature has documented. Using CPS data for 2012, she finds that self-employment rates are increasing in age from around 1.3% for 20-24 year olds to 16% for women over 65. Self-employment is more common among those who are married or divorced and among those with children. There is not a strong relationship between education level and self-employment rates with the exception of women with professional degrees who have much higher self-employment rates than other groups, and women without high school degrees who have relatively lower rates. Evidence from the Census 5% samples, shown in Table 2.2, suggests that self-employment rates show a U-shaped pattern with spousal income. Women with the lowest earning husbands and the highest earning husbands generally have the highest self-employment rates.

2.3 Previous Literature

This paper adds to the literature on self-employment and motherhood by offering additional evidence that children influence mothers' self-employment behavior. A number of existing studies use comparisons between men and women to argue that women are more likely than men to become self-employed to manage their family responsibilities. Dawson et al. (2009) analyzes responses to a large U.K. employment survey and finds that 22% of self-employed women say family responsibilities are a major reason for becoming self-employed compared to only 2% of men.[7] Hundley (2000) uses cross sections from the NLSY72 and PSID to examine the relationship between demographic characteristics and self-employment propensity and earnings. He finds that female self-employment is positively associated with marriage, larger families, and spousal income but that male self-employment is not. He also finds that self-employed women do more housework and have lower earnings when they are married and have large families. He concludes that self-employed men and women specialize in work and home production respectively. Using more recent data, Gurley-Calvez et al. (2009) analyze American Time Use Surveys to compare time use by sex and self-employment status. They conclude that self-employed women spend more time caring for children and less time working than men and women working in wage and salary positions. My results are consistent with these previous findings, but use better data that allow for an improved empirical strategy.

My paper highlights the contrast between the patterns of self-employment rates and overall employment rates among mothers of young kids contributing to a relatively large literature documenting and assessing the impact of American women's decrease in labor

[7] Data come from the United Kingdom Quarterly Labour Force Survey 1999-2001.

supply after they have children. A recent paper by Byker (2012) uses the SIPP to demonstrate that women of all education levels reduce their labor supply after having a child in a pattern that has been remarkably consistent since 1984. Bertrand et al. (2010) analyze the career trajectories of women with MBAs from a top business school and find that 15 years after graduation women with children work 24% fewer hours than men and have eight months less actual experience. They argue that these differences explain a large part of the gender gap in wages and that this gap originates during the prime childbearing ages. Interestingly, they find very small differences in earnings between women without children and men. Similarly, Black et al. (2008), find that differences in college majors and actual work experience explain a large proportion of the gender wage gap commonly observed in cross sectional studies. These papers provide evidence that temporary reductions in labor supply are likely contributors to the gender wage gap.

Another portion of the literature on female labor supply focuses on estimating the earnings penalties associated with taking time out of the labor force. Taking time off results in lower levels of experience, but it can also result in large earnings penalties that are unrelated to the amount of time the woman spends out the labor force. Goldin and Katz (2011) find that women with MBAs who have career interruptions see a 41% reduction in their pay that is unrelated to the length of time taken off. Goldin (2014) suggests that non-linearity in the relationship between experience and earnings in certain professions can explain why a small amount of time out of the labor force can result in such a large difference in earnings. If women take time off when they otherwise would be earning key promotions that further their careers, their earnings may never recover. Hotchkiss and Pitts (2003) find that women who have career interruptions have earnings that follow a process that provides much smaller returns to experience than the process for women who are continually employed. They find a 23% wage differential between women who they characterize as continuous workers and those they characterize as intermittent workers. Around 90% of that wage differential is explained by differences in the wage equation coefficients rather than differences in the women's characteristics. These results are concerning because they imply that women who take time off are not experiencing the same gains to experience as women who remain in continuous employment. If self-employment allows women to avoid taking time out of the labor force, it might help them avoid suffering large earnings penalties.

This paper focuses on flexibility as a reason why self-employment is attractive to mothers. There are a few recent papers that examine the role of workplace flexibility in determining female labor supply. Herr and Wolfram (2012) examine Harvard undergraduates 10 and 15 years after graduation and find that women in flexible jobs are 5-6 percentage points

more likely to stay in the labor force after having children. She considers occupations with a higher share of childless women working part-time to be more flexible. Goldin (2014) provides evidence that flexible occupations have the smallest gender wage gaps. Her study characterizes the flexibility of occupations using O*Net questions to determine how substitutable another employee is for that worker. This measures tries to capture the idea that workers without a good substitute co-worker have less flexibility in when they work. She argues that the smaller gender earnings gaps in flexible occupations are because women in those occupations do not have to take time off to care for children. My paper contributes to this literature by providing additional evidence that workplace flexibility is an important component of mothers' employment decisions.

2.4 Data

The analyses in this paper use two main data sources: the Survey of Income and Program Participation (SIPP) and the American Time Use Survey (ATUS). The SIPP is a longitudinal survey that has been conducted by the Bureau of Labor Statistics since 1984. Its large sample size and panel structure make it an ideal data source for studying self-employment behavior. My analysis requires a relatively large sample of individuals because only around 5% of women between the ages of 18 and 55 are self-employed. The panel design allows me to control for time invariant unobservable characteristics that influence self-employment behavior allowing me to focus on the role of having young children. In contrast, the ATUS is a cross sectional dataset that also has a considerable sample size. This survey includes detailed time diaries, which allow me to document the nature of the flexibility provided by self-employment.

2.4.1 Survey of Income and Program Participation (SIPP)

The SIPP provides information on respondents at a monthly level for 3-5 years depending on the panel year of the survey.[8] My analysis uses the combined 1984-1986 panels, the 1996 panel, and the 2008 panel. I select these time periods to compare three snapshots roughly a decade apart in order to investigate changes in self-employment behavior over time.

The analysis focuses on women who are 18 to 55 years of age and are present during the first wave of each survey.[9] Limiting the sample to women 55 and under avoids picking

[8] See www.census.gov/sipp/ for documentation and more information about the survey.

[9] The SIPP adds individuals to the survey if they move into a surveyed household.

up self-employment as partial retirement and focuses the analysis on my population of interest since the majority of women above age 55 do not have young children at home.[10] The key variables for this paper include information on women's employment, fertility history, and demographic information. Women are considered to have worked in a month if they had a paid job at any point during the month even if they were absent from that job due to maternity leave or vacation.[11] Women are considered self-employed if they owned a business that month and worked more hours at the business than in wage and salary employment. I determine the number of children a woman has by assigning children to mothers using the relational identification variables within the family.[12] Demographic variables of interest include race, age, education level, and marital status.

The SIPP includes monthly weights for each individual-month observation as well as overall longitudinal panel weights for each individual to account for the survey design and attrition. Only individuals who participate in every month of the survey have positive values of the panel weights. Because using the final panel weights severely decreases the sample size, I present my main results using the monthly weights in the final period that a woman is observed.[13] I show estimates of my main specification using both the final panel weights and no weights as a robustness check, and the results are qualitatively similar.

Table 2.3 presents summary statistics for the key variables separately for the three panels. Some of the biggest changes across the panels are an increase in the fraction of women working, an increase in women's educational attainment, an increase in the percentage of the sample who identify as Hispanic, and a decrease in the percentage of the sample who are married. A little under half of the sample have children under 18. Women with children are relatively more likely to be married and self-employed and less likely to be working relative to the full sample.

2.4.2 American Time Use Survey (ATUS)

In order to characterize the flexibility associated with self-employment, I use time diaries from the ATUS to analyze differences between women who are self-employed and those who work in wage and salary employment. The ATUS selects individuals who are in their

[10] See Karoly and Zissimopoulos (2004) for evidence on self-employment as partial retirement.

[11] Paid jobs include the self-employed so all individuals who are self-employed are also considered working.

[12] This means that "mothers" in my sample only include women whose children live with them.

[13] Technically, these are not the correct weights to use because they overweight individuals who are similar to those who leave the sample. Other authors have used the monthly weights from the first period of observation, but these would overweight individuals who have similar characteristics to those who remain in the sample. See Lavelle and Smock (2012) as an example of a paper using the baseline monthly weights and Byker (2012) and Kim (2015) as examples that use the final monthly weights.

final month of the Current Population Survey and asks them to record their activities for a 24 hour period. The survey is representative of the US population and includes information about respondents' employment and demographics. I consider individuals to be self-employed if they indicate that they are self-employed in their main job. The main job is the job at which the person usually works the most hours and is consistent with the way I have defined self-employment in the SIPP. The time diaries provide information on the type of activity, the length of its duration, its location, and who else is present during the activity. My analysis uses the years 2003-2012 of the survey and includes women ages 18 to 55.

Table 2.4 shows summary statistics for the full ATUS sample and for the subset of women who have children under six years of age. Overall, women with young children are less likely to work, and if they do work, they spend less time per day on work related activities. Not surprisingly, women with children under six spend more time caring for children. They spend an average of 2.5 hours per day on direct childcare tasks such as changing diapers, reading to children and helping with homework and 5 hours per day as the primary supervisor of their children.

2.5 Empirical Strategy

To investigate the relationship between self-employment and the presence of young children, I use the SIPP to estimate a linear probability model predicting self-employment status as a function of the age of a woman's youngest child. I include individual fixed effects, which control for women's time invariant unobserved traits. These include a woman's preference for autonomy, risk tolerance, opportunities for self-employment within her trained industry or occupation, her underlying skill in self-employment, her preferences for children and housework, and her preferences for work.

Specifically, I estimate regressions of the following form:

$$Y_{ijt} = \beta_0 + \boldsymbol{\beta} X_{ijt} + \sum_{a=1}^{11} D_{ijt}^{a} \delta_a + \alpha_i + \gamma_t + \nu_j + \epsilon_{ijt}$$

The dependent variable Y_{ijt} is an indicator for the self-employment status of woman i in month j in year t. The vector X_{ijt} is a vector of covariates that includes indicators for whether the individual is married, indicators for having two, three, or four or more children, a quadratic in the woman's age, and state unemployment rates. I control for year fixed effects in γ_t, the reference month in ν_j, and individual fixed effects in α_i. The vector

of indicators for the age of the youngest child, D^a_{ijt}, includes indicators for each age 0 through 8, an indicator for having a youngest child between the ages of 9 and 13, and an indicator for having a youngest child aged 14 to 17.

The coefficients of interest are the δs, which estimate the effect of the age of the youngest child on the probability of being self-employed. The identification of these coefficients comes from within-person variation in the number of children and the age of the woman's youngest child. While the SIPP panels allow me to observe the same woman with different numbers of children and different ages of her youngest child, the panels are too short to observe the same woman with a youngest child at all ages between 0 and 17. Each observation then helps with identifying the subset of coefficients corresponding to the observed ages of the woman's youngest child. Additionally, the reference category are women who have no children under the age of 18, which includes both women who have never had children and women who have children older than 18 years of age. The effect of having a newborn relative to having no children under 18 years of age is identified by women who have their first child during the survey.

To allow for differences across panels in the relationship between self-employment and the explanatory variables, I estimate a separate regression for each panel. When I examine differences by education level and marital status, I pool the panels together to increase the precision of the estimates. This form is less flexible because it forces the relationship between the explanatory variables and self-employment propensity to be constant over time, however, my results suggest that the relationship has not changed appreciably over this time period.

To offer a deeper understanding of the flexibility self-employment can provide, I use the ATUS to examine differences in time use between women in self-employment and those in wage and salary employment. First, I compare the distributions of daily and weekly hours worked between the two groups to look for differences in the number of hours worked. Then I examine the mean differences in specific types of time use across women who are self-employed and those who are not. For these comparisons, I focus on employed women with at least one child under the age of 18. These differences show the time allocation decisions of mothers conditional only on their choice to be self-employed or not and describe the average differences in behavior between mothers who work in wage and salary positions and mothers who work in self-employment.

While these mean comparisons are suggestive of differences in the ease of combining work with other activities, self-employed women differ along a number of observed dimensions that could also account for differences in time allocations. Self-employed women tend to be older, and are more likely to be white and married. By controlling for factors such

as age, education level, number of children, hours worked, and marital status, I am better able to isolate the time differences attributable to the ability to structure time differently in self-employment. In interpreting the results, it is important to note that the controls, in particular the number of hours usually worked, are in some sense controlling for part of the effect of interest. One way that self-employment provides flexibility is allowing women to choose the number of hours they work. The multivariate regressions are useful though because they show that women who are similar on observed dimensions still spend their time differently if they are self-employed. This is further evidence that self-employment has a work environment that differs from wage and salary employment in ways that allow mothers to spend more time with their children.

In order to control for these characteristics, I use multivariate regressions to predict the amount of time individuals spend per day doing certain activities as a function of their self-employment status. The regressions follow this form:

$$Y_i = \beta_0 + \boldsymbol{\beta} X_i + \delta \mathbb{1} self\_emp_i + \nu_i$$

The outcome variable, Y_i, is the number of minutes spent in an activity per day, and the coefficient of interest is δ, which describes on average how self-employed individuals differ in their time use controlling for a vector of covariates X_i. All regressions include indicators for race, education level, marital status, employment status, and the month, year, and day of week of the survey. Regressions also control for the usual number of hours worked and quadratics in mothers' age and the number of children. Self-employed mothers on average work fewer hours than wage and salary employed mothers. I control for hours worked in order to see whether self-employment itself appears to offer a different way of combining work and home life conditional on the same number of hours of work.

I select measures of time use that represent some of the potential benefits to self-employment for mothers of young children. The outcomes of interest for both the mean comparisons and the multivariate regressions are the time spent actively caring for children, supervising children, working while supervising children, sleeping, doing housework, and the time spent in leisure activities. The ATUS distinguishes between childcare and the supervision of children. Childcare includes activities like reading to a child, helping a child with homework, feeding a child or changing a diaper. Supervising children also includes time that the individual may be doing another primary activity, but he or she is responsible for watching the child.[14] Supervision is only recorded for children under the age of 13.

[14]Generally childcare is a subset of supervision, however, there are categories of childcare including waiting to pick up children, attending school conferences, and organizing and planning for children that would not be included in supervision time. Additionally, childcare activities for children over the age of 13 would

Leisure activities include all time categorized as socializing, relaxing and leisure, sports, exercise, and recreation and talking on the phone to relatives or friends.[15] I also examine two other types of outcomes: the percentage of women working only from home, and the percentage of working minutes completed at home.

2.6 Results: Self-Employment and Motherhood

2.6.1 Main Results

I find that young children are associated with higher self-employment rates, and this association is strongest when the youngest child is two to three years of age. The main regression results are shown in Table 2.5. Figure 2.1 plots the coefficients on the age of the youngest child indicators from the regression pooling all of the panels together, while Figure 2.2 plots the results separately for the three panels. The relationship between self-employment status and the age of a woman's youngest child exhibits an inverted U shape. This pattern is present in all three panels and there is little evidence that it has changed over time.

These results are consistent with previous findings that women with young children are more likely to be self-employed. The coefficients in Table 2.5 suggest that self-employment rates rise with the mother's own age at a decreasing rate; a result that is well established in the literature. The effect of being married is not directly comparable to the same coefficient in a cross sectional regression because it is only identified from changes in marital status within the panel. However, my results do suggest that marriage is positively associated with self-employment, which is in line with previous research (Evans and Leighton (1989), Devine (2001), Hipple (2010)).

While the magnitude of the coefficients of interest are small, they represent large percentage changes because only 5% of women aged 18 to 55 are self-employed. I describe the magnitude of the effects using two measures, which both show relatively large increases in self-employment rates associated with having a young child. First, I compute the percentage change in self-employment propensity associated with having a youngest child of age two relative to the predicted self-employment rate for individuals with no children under 18. For example, in 1996, having one child who is two years of age is associated with a 1.2 percentage point increase in the self-employment rate. The model predicted self-employment rate among women without a child under 18 is 5.0% so the 1.2 percentage point increase associated with having a two year old represents a 24% increase in the self-employment

not be included in supervision time.

[15] Leisure does not include religious activities, volunteering, or any type of shopping.

propensity. The percentage changes for the 1984-1986 and 2008 panels are of a similar magnitude and are reported in Table 2.6. An alternative measure of the effect is to calculate how the predicted self-employment rate of women whose youngest child is two years of age would change if they had not had that youngest child. This effect can be thought of as the marginal effect of the last child. In the 2008 panel, the predicted self-employment rate among women whose youngest child is two years of age is 6.8%. The adjusted predicted value without the youngest child is 5.9% so the additional child raised the predicted self-employment rate by 16 percent. Table 2.6 shows the percentage changes for all three panels, which range from 11-17 percent. I prefer this second measure because it is calculated on the same underlying sample of women with children, which holds constant other covariates.[16]

The positive relationship between having young children and self-employment contrasts sharply with the well-known pattern that women with young children are less likely to work (e.g. Byker (2012)). I show the negative relationship between working and having children, for women in my sample, by estimating the same regression specification but with working status as the dependent variable. My definition of working requires the respondent to have worked for pay at some point during the previous month.[17] Figure 2.3 plots the coefficients on the age of the youngest child for these regressions. Women from the 1984-1986 and 1996 panels who have a newborn are 17 percentage points less likely to work than women without a child under 18. The decline in employment is slightly less in the 2008 panel at around 13 percentage points, but it is still large. All panels show the same pattern: women are more likely to work as their youngest child gets older.

The stark contrast between Figures 2.3 and 2.2 suggests that self-employment provides a work environment that is compatible with having young children in ways that other employment alternatives do not. The positive relationship between self-employment and having young children is not conditional on employment. The coefficients in Figure 2.2 imply that even though women leave employment when they have children there must be more women entering self-employment than leaving. Self-employment is different from wage and salary work along a variety of different dimensions. Many of the self-employed can choose their work location, the number of hours they work, and when they work those hours. These aspects might be relatively more important for women with small children.

[16] Married women without children under 18 may differ in age, education and other observed characteristics that could contribute to their predicted self-employment rate, which I use as the base in the first magnitude measure.

[17] This definition is not the same as labor force participation because I exclude unemployed women looking for work during the previous month from my working definition.

2.6.2 Robustnesss

As previously mentioned, using the monthly weight from the last observation may overstate the influence of individuals who are similar to those who leave the sample. As a robustness check, I re-estimate the same regressions using the full panel weights, which exist only for individuals who were interviewed in every month of the panel. I also redo the analysis on the unweighted sample to examine the effect that the weights have on the estimates.

In Figure 2.4, I show the main coefficients of interest under the three weighting schemes estimated on a pooled sample of women across the three panels. The results are quite consistent across the different weights. I also redo the analysis using the full panel weights and no weights on each panel separately, and the results are shown in Appendix Figures C.1 and C.2. The results using the full panel weights are very similar in magnitude, but are mostly not statistically significant because of the smaller sample size. The unweighted results are also very similar to my main results. My general findings are also robust both to including all women who are ever in the survey rather than only those who are selected in the first wave and to limiting the sample to women who are in the survey for at least two years.[18]

My fixed effects empirical strategy controls for time invariant differences in women's entrepreneurial drive and skill as well as their overall preferences for children, however, there are time varying factors that could influence both self-employment behavior and fertility. For example, a positive income shock could encourage women to become self-employed and to have additional children due to an increased sense of financial security. Additionally, it is difficult to determine whether having young children drives women to become self-employed or whether self-employment lowers the opportunity cost to having children and induces women to have another child. A recent paper by Noseleit (2014) finds evidence that having children leads European women to pursue self-employment, but that self-employment does not increase fertility offering some support for treating fertility as exogenous to self-employment as some previous papers have assumed (e.g. Boden (1999), Budig (2006), Lombard (2001)).

Although I cannot separate the influence of these factors from the effect of having a young child on women's decision to become self-employed, the pattern of the estimates is consistent with women using self-employment to care for their young children. The explanation that self-employed women decide to have more children for reasons unrelated to the complementarities between self-employment and care taking suggests that we should see a positive relationship between self-employment and the year prior to the birth of a child.[19]

[18] These results are available from the author upon request.

[19] For example, Broussard et al. (2015) argue that the self-employed have more children to have an heir for

I re-run my main specification on the data pooled across panels adding an indicator for the year prior to a birth. As shown in Appendix Table C.1, the estimates are nearly unchanged, and the year prior to a birth appears to have little association with women's probability of being self-employed. These results do not offer support for the idea that women who become self-employed subsequently decide to have another a child. Interestingly, they also do not offer evidence that women looking to combine self-employment with child care become self-employed in anticipation of having children.

In order to assess the importance of income changes driving both self-employment and fertility decisions, I re-run the main specification controlling for current and lagged household income net of women's earnings. Specifically, I control for the current month income, income lags for each of the prior five months, and the amount of income received in the months six to eleven months prior. The results shown in Appendix Table C.1 are similar to the main results suggesting that income shocks are not driving the relationship between self-employment and the age of a woman's youngest child.

2.6.3 Results by Education Level and Marital Status

Next, I examine whether the relationship between self-employment and the presence of young children varies by the mothers' education level and marital status. Education level and marital status may affect the opportunities and costs of being self-employed, which could influence the relationship between children and self-employment. I pool all of the panels together to increase the precision of the estimates. There are a number of reasons to believe that education level and marital status might affect self-employment behavior. Women with higher levels of education often have greater access to flexibility in their wage and salary positions so they might not exhibit the same patterns of self-employment with respect to the age of their youngest child.[20] Although there is not a strong relationship between self-employment rates and education levels, it might be the case that women with more education have an easier time becoming self-employed because they have greater access to capital and husbands who are also more educated. Married women may be able to use their spouse's health insurance and be more willing to take on the risk associated with self-employment if they have a second household income. Empirically, self-employment earnings have higher variance both between individuals and within individuals across time (Hamilton (2000), Rosen and Willen (2002)). Many new businesses fail and some require

the family business, which could drive a positive relationship between fertility and self-employment.

[20] A recent article from the Council of Economic Advisors (2014) reports that 55% of women with a bachelor's degree or higher have access to some schedule flexibility compared to 38% of women with less than a high school education.

taking on debt to start so researchers have generally considered self-employment more risky than wage and salary employment.

Figure 2.5 plots the coefficients from a regression including women with at least a bachelor's degree and one that includes women with less than a bachelor's degree. Having a youngest child of age two is associated with a 1.5 percentage point increase in self-employment propensity for women with bachelor's degrees compared to a 1.2 percentage point increase for women with less than a bachelor's degree. The point estimate on each age indicator is higher for women with more education suggesting that young children raise self-employment rates more for more educated women although the effects are not statistically different. In percentage terms, however, the impacts are similar because women with bachelor's degrees do have slightly higher rates of self-employment than women without bachelor's degrees. Figure 2.6 shows the results from a regression that includes women who are married during the entire survey and one that includes only women who are single during the entire survey. These results suggest that married women are more likely than single women to become self-employed when they have young children at home. Although the coefficients from the single women regression are not statistically different from zero, they follow the same inverted U-shaped pattern as the main results. I take these results as suggestive that single mothers may use self-employment to gain workplace flexibility, but the size of the effect is too small to be estimated with precision with the SIPP sample size.

2.6.4 Occupational Transitions

Finally, I examine how occupations change during transitions into and out of self-employment among women who were self-employed while they had a child under the age of 13. I find that the majority of transitions to and from self-employment are accompanied by a change in occupation, and that many transitions are movements to and from non-employment. Appendix Figure C.3 shows transitions between the most common wage and salary occupations to the most common self-employment occupations from the 2008 SIPP. It shows that 40% of women who became self-employed did not work in the six months prior to their transition, and 23% did not work in wage and salary employment but had a previous spell in self-employment. Employment across occupations in self-employment is a bit more concentrated than in wage and and salary employment. Appendix Figure C.4 shows the same information, but only includes individuals who worked in wage and salary employment in the six months prior to becoming self-employed. Both figures suggest a lot of occupational switching occurs in transitions to self-employment. Appendix Figures C.5 and C.6 show occupational transitions for two digit occupation codes among all women

and previously wage and salary employed women respectively. Even among these fairly broad occupational categories we see a great deal of switching occupations, but there are also noticeable flows of continuity between occupation categories including personal care and service, sales, building and grounds cleaning and maintenance.

Transitions out of self-employment show similar patterns as shown in Appendix Figures C.7, C.8, C.9, and C.10. Over 60% of previously self-employed individuals do not work in wage and salary employment during the six months after they leave self-employment. Around 24% move back into self-employment and 40% do not work in the six months after leaving self-employment. Among those who do work in wage and salary employment, there is a lot of occupational switching during the transition. Comparing Figures C.6 to C.10, there seems to be slightly more continuity in broad occupation groups during transitions into self-employment relative to transitions out of self-employment.

These occupational patterns suggest wide variation in mother's self-employment experiences. For some women, moving into self-employment represents a continuation of employment in a similar occupation as their previous wage and salary employment, while for others it represents an occupational change. These patterns have implications for the impact of self-employment on women's future earnings because some women may be gaining more relevant work experience than others. Overall the transitions out of self-employment do not lend support for the idea that self-employment is a stepping stone to wage and salary employment for this sample of mothers who were self-employed while they had children at home. This analysis highlights the prevalence of transitions between self-employment and non-employment. Movements between non-employment and self-employment make up around 40% of transitions. There is also evidence that women are moving into and out of self-employment relatively frequently. Over 20% of transitions into self-employment were preceded by self-employment during the previous six months and a similar percentage of transitions from self-employment result in a return to self-employment in the following six months. Finally, while this occupational transitions analysis is suggestive, it is done on a selected subset of self-employed women and on a relatively small sample size so the results should not be used to describe self-employment transitions in general.[21]

2.7 Time Use Results: Workplace Flexibility and Self-Employment

Using the ATUS, I examine differences in time use and work location between wage and salary employed women and those who are self-employed. These comparisons provide evidence of how self-employment allows women to combine caring for family with their

[21] There are around 1,200 transitions into and out of self-employment over the panel time-frame.

work.

Self-employed women work fewer hours on average than women in wage and salary employment, but the distribution of their working hours has a much higher variance. Figure2.7 displays women's weekly and daily hours worked in self-employment and wage and salary employment. While those in wage and salary employment tend to work 40 hours per week or 8 hours per day, the self-employed do not have hours clustered at a traditional full time work week. A particularly large share of self-employed women work fewer than 30 hours per week and fewer than 6 hours per day.

One aspect of the flexibility provided by self-employment might be the ability to choose a lower number of hours of work than is available in wage and salary employment. Altonji and Paxson (1992) find evidence that women switch jobs in order to reduce their hours after they have children, which is consistent with an inability to fully adjust their hours within their current job. Herr and Wolfram (2012) and Goldin (2014) suggest that some positions might require a commitment to a minimum numbers of weekly hours. These minimum hours requirements may cause women to leave the labor force if their desired hours are less than the minimum threshold. Blau and Kahn (2013b) suggest that one reason the U.S. female labor force participation rate has declined relative to other countries is because other countries have policies that provide part-time work and forbid discrimination against part-time workers. A 2012 Pew study found that 47% of mothers thought working part-time would be ideal, but only 19% actually worked part time (Parker and Wang (2013)). This mismatch suggests that either suitable part time-work is not available or is not affordable for American mothers. Self-employment may be a way for women to work part-time when part-time work is unavailable in wage and salary employment.

2.7.1 Differences in Time Use Between Self-employed and Wage and Salary Workers

Table 2.7 shows the coefficients on the self-employment indicator from bivariate and multivariate regressions predicting a number of time use outcomes. These regressions include only women with children who are working, so the coefficient can be interpreted as the difference between mothers working in wage and salary employment and self-employed mothers. The mean comparisons show that the self-employed spend on average 43 fewer minutes working per day than the wage and salary employed, which is consistent with the high levels of part-time work among self-employed women.

There are large time differences in the number of minutes spent supervising children. The mean comparisons show that self-employed women with children under six spend over

two additional hours per day supervising their kids compared to women in wage and salary employment. Interestingly, it appears that self-employed women multi-task by spending 40 more minutes per day working while supervising their children. These differences remain after controlling for demographic covariates and the number of hours the women work, as shown in the last two columns of Table 2.7. Self-employed women with young children spend an additional 106 minutes per day supervising their children and over an extra hour per day working while supervising their children relative to women in wage and salary employment. Importantly these effects are conditional on the number of hours worked so they do not reflect a reduction in work to spend more time caring for children.

On average the self-employed spend 40 more minutes per day on housework and around 8 minutes less per day commuting. The self-employed spend around the same time sleeping and in leisure activities as wage and salary workers. They are 21 percentage points more likely to work from home and on average do 38 percent more of their work at home. Controlling for covariates has little impact on the percentage of work hours completed at home or the percent of individuals who work exclusively from home. The ability to work from home while self-employed appears to exist for women regardless of marital status and education level. Self-employed women do spend more time on housework than women in wage and salary work, but controlling for covariates accounts for half of the difference in means.

Self-employed mothers spend more time per day in childcare tasks, but this effect is explained by demographic differences and the number of hours worked. In order to understand the type of extra childcare being provided by self-employed mothers, I follow Aguiar and Hurst (2007) and use the detailed ATUS activity codes to categorize childcare activities into three types: primary, educational, and recreational. Primary childcare tasks can be thought of as addressing children's basic needs while educational activities include reading to children or helping them with their homework and recreational activities include playing games or attending sporting events. Table 2.8 shows that self-employed mothers on average spend more time in all three activities. The self-employed spend more time in educational childcare activities in particular; they spend on average around 50% more time per day in these activities than wage and salary employed mothers. This additional time could have positive effects on their children's later life outcomes. After controlling for covariates, the self-employed and the wage and salary employed spend similar amounts of time on childcare and breaking down the childcare time by primary, educational, and recreational time shows no statistically significant differences by self-employment status. After controlling for covariates and hours worked, the remaining large differences in time mothers spend with children appears to occur through extra time spent supervising children

while doing another primary activity.

Examining the joint distribution of time spent supervising children and time spent working reveals much more variation in how the self-employed combine these activities. As shown in Appendix Figure C.11 the most common combination for the wage and salary employed is to spend 8 hours per day working and 2 to 4 hours per day supervising their children. Many self-employed mothers also spend around 8 hours per day working and 2 to 4 hours supervising children, but a much greater fraction of these women spend 12 or more hours supervising their children per day (See Appendix Figure C.12). The differences between these figures suggests that self-employment may allow women more choice in how they combine work and childcare supervision.

Many self-employed mothers operate family daycares and therefore almost by definition are able to spend time with their children while working and are able work from home (Connelly (1992)). Table 2.9 shows the time use analyses excluding women who work in childcare. There is little change in the effect of self-employment on working from home, but there is a 15%-20% reduction in the extra minutes the self-employed spend supervising their children and a 30% reduction in the number of minutes they spend working while supervising their children. The coefficients remain statistically significant and economically important suggesting that the estimated effects are not only explained by women who become childcare providers.

Comparing self-employed women and women in wage and salary positions in the ATUS provides evidence that self-employment offers flexibility in the number of hours worked and in work location. Women with young children who are self-employed spend substantially more time supervising their children. Although on average self-employed women work fewer hours, the difference in time spent with their children cannot be explained by a reduction in the number of hours worked. In addition, self-employed women appear to "multi-task" by working while supervising their children.

2.8 Conclusion

This paper provides new evidence on the self-employment motivations and behavior of American mothers. Taken together the evidence from the SIPP and ATUS suggests that mothers become self-employed to both care for and spend more time with their children, particularly when their children are young. While there are a variety of reasons that women may decide to become self-employed, this particular pattern is consistent with self-employment providing a way for mothers to balance work and household responsibilities. It is difficult to think of an alternative explanation for the specific inverted U-shaped rela-

tionship between self-employment and the age of a woman's youngest child. The effect is greatest when children require the most care at home and declines after children are school aged. In addition, some women may feel that there is no affordable or acceptable substitute for the childcare they provide. For these women, self-employment may offer an alternative work option that allows them to work while bring the primary caretaker of their children.

One important question this study does not address is the long-term effect of this self-employment experience on women's careers. While self-employment has many attractive attributes, it also has many associated costs.[22] Hamilton (2000) finds that the self-employed earn 35% less than equivalent wage and salary workers. Starting a business includes time and monetary costs and self-employment can be a risky source of income. The evidence on the returns to self-employment experience in wage and salary employment are mixed. For women, the research suggests that self-employment experience has smaller returns to future wage and salary earnings than wage and salary experience but is better than time spent not employed (Bruce and Schuetze (2004), Williams (2000), and Lim (2016)). The analyses of transitions to and from self-employment in this paper suggest that, for mothers with children at home, self-employment often involves an occupational transition as well. Work experience in a different occupation may not be as valuable to future employers, hurting women's future earning potential. Additional research using larger datasets to investigate how the returns to self-employment experience vary by broad occupation categories would be useful to improve the design of existing programs that promote self-employment. If the returns to certain types of self-employment activities is much higher than others, programs could encourage the self-employed to start businesses in these occupations or industries.

This paper fits into a broader debate of how families combine work and household responsibilities. While it offers evidence that self-employment is one strategy that mothers use to care for children while continuing to work, it leaves open the question of how to provide this type of work environment at the lowest cost. Better estimates of the relative returns to different types of employment would inform policymakers about the relative career costs of female self-employment. These estimates could be combined with measures of the career costs of flexible work policies within wage and salary employment to understand whether mothers would be better served by policies that promote female self-employment or policies that enhance workplace flexibility within wage and salary employment.

[22] See Pugsley (2011) for estimates of the non-pecuniary benefits of self-employment. SeeLim (2016) for estimates of the non-pecuniary benefit associated with time, schedule and location flexibility for mothers with young children.

Tables and Figures

Table 2.1: Top Occupations Among Self-Employed Women Over Time

All Women

1980		1990		2000		2012	
	Share		**Share**		**Share**		**Share**
Managers	10.4	Childcare Worker	12.5	Childcare Workers	11.8	Childcare Workers	7.7
Hairdressers	9.3	Hairdresser	7.1	Hairdressers	6.6	Hairdressers	6.5
Sales Supervisors	7.5	Sales Supervisor	5.7	Housekeepers	5.7	Housekeepers	4.9
Childcare Workers	6.4	Managers	4.5	Sales Supervisors	4.5	Real Estate Agents	4.8
Farmers	5.8	Bookkeepers	4.3	Real Estate Agents	3.4	Secretaries	4.1
Bookkeepers	5.3	Farmers	4.0	Bookkeepers	3.1	Sales Supervisor	4.0
Real Estate Agents	3.8	Real Estate Agents	4.0	Salesperson	2.9	Bookkeepers	3.1
Secretaries	3.5	Secretaries	3.1	Secretaries	2.7	Managers	2.7
Other Teachers	3.4	Salesperson	2.7	Farmers/Ranchers	2.7	Designers	2.5
Salesperson	3.1	Designers	2.5	Designers	2.4	Other Teachers	2.5
Door to Door Sales	2.6	Janitors	2.5	Other Teachers	2.0	Salesperson	2.2
Designers	2.0	Other Teachers	2.2	Accountants	1.6	Accountants	2.0
	63.1		55.1		49.5		46.9

Women with Bachelor's Degree

1980		1990		2000		2012	
	Share		**Share**		**Share**		**Share**
Other Teachers	8.8	Managers	5.6	Lawyers	4.7	Real Estate Agents	5.4
Physicians	8.3	Other Teachers	5.3	Other Teachers	4.4	Other Teachers	4.9
Managers	6.9	Real Estate Agents	5.1	Designers	4.2	Designers	4.0
Lawyers	6.9	Sales Supervisors	5.1	Real Estate Agents	4.0	Accountants	4.0
Psychologists	5.3	Childcare Workers	4.4	Sales Supervisors	3.9	Lawyers	3.9
Sales Supervisors	4.3	Designers	4.3	Childcare Workers	3.9	Sales Supervisor	3.5
Artists	3.9	Lawyers	3.9	Accountants	3.7	Management Analysts	3.3
Real Estate Agents	3.8	Psychologists	3.6	Management Analysts	3.4	Physicians/Surgeons	3.2
Authors	3.6	Physicians	3.5	Psychologists	3.0	Managers	3.1
Designers	2.9	Artists	3.0	Physicians/Surgeons	2.9	Childcare Workers	3.1
Farmers	2.0	Accountants	2.9	Writers/Authors	2.6	Psychologists	2.7
Management Analysts	2.0	Bookkeepers	2.6	Salesperson	2.5	Secretaries	2.1
	58.7		49.2		43.0		43.2

Notes: 1980, 1990, and 2000 data come from the Census 5% sample and 2012 data come from the ACS. Data were downloaded from IPUMS and estimates include all self-employed women ages 18-65 and are weighted using person weights.

Table 2.2: Self-Employment Rates of Married Women by Spousal Income Quintile

	All Women			Employed Women		
Spousal Income Quintile	**1980**	**1990**	**2000**	**1980**	**1990**	**2000**
1	4.6	5.8	6.2	7.0	8.0	8.2
2	3.5	5.3	6.0	5.6	7.3	7.7
3	3.2	5.5	6.0	4.6	6.9	7.3
4	3.4	6.0	6.5	5.0	7.4	7.8
5	4.5	7.8	8.3	7.6	10.5	10.7
All	3.8	6.3	6.8	5.9	8.3	8.5

Notes: 1980, 1990, and 2000 data come from the Census 5% sample. Spousal income is defined as the total household income less the woman's total personal pretax income. Data were downloaded from IPUMS and estimates include all married women ages 18-65 and are weighted using person weights.

Table 2.3: SIPP Summary Statistics

	1984-1986 Pooled Panels	1996 Panel	2008 Panel
	All Women		
Age	34.0	35.4	36.1
Percent of Sample:			
Married	62.4	58.3	53.7
With Children Under 18	46.7	44.6	41.5
Working	64.0	70.0	68.2
Self-Employed	4.9	5.4	4.9
White Non-Hispanic	77.4	69.1	61.8
Black	12.9	14.3	13.8
Hispanic	6.6	11.8	16.0
High School or Less	59.8	42.8	28.3
With Associates Degree/Some College	22.2	33.2	38.9
With Bachelor's Degree or Higher	17.9	24.0	32.8
Number of Observations	32,389	26,318	27,069
	Women with Children Under 18		
Age	34.0	34.8	36.0
Age of Youngest Child	6.8	6.6	6.6
Percent of Sample:			
Married	77.1	72.2	68.4
Working	57.3	66.1	65.4
Self-Employed	5.5	5.7	5.3
White Non-Hispanic	74.6	62.3	57.4
Black	14.2	15.6	14.3
Hispanic	8.0	14.4	20.2
High School or Less	65.1	47.2	31.7
With Associates Degree/Some College	19.9	32.3	38.3
With Bachelor's Degree or Higher	15.0	20.5	30.0
Number of Observations	16,856	13,585	13,423

Notes: The sample includes women ages 18-55 who are present during the first wave of the survey. Summary statistics are weighted using the monthly weight from each woman's final observation, but the number of observations are unweighted.

Table 2.4: American Time Use Survey Summary Statistics

	Women with Children Under 18	Women with Children Under 6
Age	35.5	31.7
Percent of Sample:		
Married	69.5	73.8
Working	66.4	59.7
Self-Employed	5.6	4.7
White-Non-Hispanic	61.2	57.0
Black	13.7	13.8
Hispanic	19.8	23.5
High School or Less	42.7	43.7
Associates Degree or Some College	28.9	26.6
Bachelor's Degree or Higher	28.4	29.7
Average Number of Weekday Hours:		
Working if Employed	7.3	7.2
Childcare if Children Under 13	1.9	2.5
Supervising Children if Children Under 13	4.3	5.0
Leisure	3.5	3.3
Sleeping	8.3	8.5
Housework	2.3	2.3
Number of Observations	31,855	14,834

Notes: The sample includes women ages 18-55 in the ATUS 2003-2012 dataset with at least one child under 18. Summary statistics are weighted using the survey person weight, but the number of observations are unweighted.

Table 2.5: Self-Employment Propensity

Dependent Variable: Self-Employment Status				
	1984-1986 Pooled Panels	1996 Panel	2008 Panel	All Panels Pooled
Married	0.630**	0.464	0.315	0.461**
	[0.291]	[0.320]	[0.325]	[0.185]
Age	0.446**	0.360**	0.439***	0.430***
	[0.166]	[0.170]	[0.164]	[0.098]
Age Squared	–0.006**	–0.005**	–0.006***	–0.006***
	[0.002]	[0.002]	[0.002]	[0.002]
Indicator for 2 Children	0.241	0.211	0.355	0.295
	[0.268]	[0.352]	[0.327]	[0.183]
Indicator for 3 Children	–0.494	–0.578	1.040**	0.099
	[0.454]	[0.612]	[0.525]	[0.304]
Indicator for 4 or More Children	–1.354**	–0.585	0.503	–0.470
	[0.585]	[1.006]	[1.020]	[0.495]
Youngest Child Indicators:				
Age 0	0.375	0.567	0.323	0.398
	[0.346]	[0.426]	[0.549]	[0.264]
Age 1	0.943**	1.033**	0.615	0.859***
	[0.399]	[0.482]	[0.597]	[0.296]]
Age 2	1.425***	1.203**	1.262**	1.326***
	[0.435]	[0.514]	[0.584]	[0.304]
Age 3	1.159***	1.240**	1.275**	1.259***
	[0.449]	[0.539]	[0.575]	[0.303]
Age 4	0.839*	0.986*	1.264**	1.080***
	[0.476]	[0.539]	[0.568]	[0.306]
Age 5	0.925*	0.986*	1.050*	1.021***
	[0.490]	[0.557]	[0.579]	[0.314]
Age 6	0.983*	0.807	0.587	0.800**
	[0.517]	[0.548]	[0.577]	[0.318]
Age 7	0.867*	0.340	0.659	0.628**
	[0.521]	[0.544]	[0.565]	[0.315]
Age 8	0.519	0.509	0.304	0.415
	[0.493]	[0.533]	[0.539]	[0.301]
Aged 9-13	0.596	0.355	0.189	0.354
	[0.453]	[0.478]	[0.472]	[0.270]
Aged 14-17	0.170	0.190	–0.208	0.137
	[0.362]	[0.386]	[0.338]	[0.207]
Mean Self-Employment Rate	4.6	5.2	4.9	4.9
Observations	823,686	950,501	1,117,047	2,891,234
Number of Individuals	31,080	26,065	27,069	84,214

Notes: Regressions predict self-employment status; additional controls include the state unemployment rate, and year, month of interview, and individual fixed effects. Coefficients are multiplied by 100 for ease of interpretation. The sample includes women ages 18-55 who are present in wave 1 of the panel. Results are weighted by the monthly weight of the woman's final observation and standard errors are clustered at the individual level. Separate regressions are run for the 1984-1986 pooled data, the 1996 panel, and the 2008 panel. *** p<0.01, ** p<0.05, * p<0.1

Table 2.6: Magnitude of Effects

	1984-1986 Pooled Panels	1996 Panel	2008 Panel
Predicted Self-Employment Rate:			
Women with No Children Under 18	4.0	5.0	4.5
Adding Coefficient for Youngest Child of Two	5.4	6.2	5.8
Percentage Change	35.5	24.2	28.1
Predicted Self-Employment Rate:			
Women with Youngest Child of Two	5.6	6.3	6.8
Without their Youngest Child of Two	4.8	5.7	5.9
Percentage Change	16.8	10.6	15.7

Notes: Predicted self-employment rates use fixed effect regressions described in Table 2.5. The first row is the predicted self-employment rate for women without children under 18. The second row adds the coefficient for a youngest child of two to the first row and the third row is the implied percentage change associated with having a child who is two years of age. The fourth row is the predicted self-employment rate among women whose youngest child is two years of age. The fifth row is the predicted self-employment rate if those women had not had their youngest two year old child. The sixth and final row is the percentage change in the predicted self-employment rate associated with the two year old youngest child.

Table 2.7: Differences in Time Use Associated with Self-Employment

Dependent Variable	Mean Comparisons		Multivariate Comparisons	
	Women with Children Under 18	Women with Children Under 6	Women with Children Under 18	Women with Children Under 6
Minutes Spent On:				
Work	−43.3	−59.8		
	[7.2]	[10.5]		
Childcare	17.7	27.6	5.3	5.2
	[3.1]	[5.8]	[3.0]	[5.6]
Supervising Children <13	75.3	123.7	56.4	105.5
	[8.3]	[12.9]	[7.6]	[12.7]
Working while Supervising Children <13	39.7	59.6	43.5	67.1
	[3.9]	[7.1]	[4.3]	[8.0]
Leisure	−7.0	−1.5	−5.3	1.4
	[4.4]	[6.7]	[4.3]	[6.4]
Sleeping	−4.0	−0.1	3.0	6.6
	[3.5]	[5.7]	[3.3]	[5.4]
Housework	39.3	39.7	17.7	19.8
	[4.3]	[5.8]	[4.0]	[5.6]
Commuting	−7.6	−7.8	−6.4	−6.2
	[0.8]	[1.1]	[0.8]	[1.2]
Percentage Working from Home	21.1	20.0	21.1	20.3
	[1.2]	[1.8]	[1.3]	[2.0]
Percentage of Work Done at Home	38.4	37.6	34.8	33.1
	[1.2]	[1.8]	[1.6]	[2.6]

Notes: The sample for columns 1 and 3 includes women ages 18-55 in the ATUS 2003-2012 who are employed and have at least one child under the age of 18. Columns 2 and 4 restrict the sample to women with a child under the age of 6. All columns only include weekday observations. Mean comparisons include only a constant and a self-employment indicator term. Coefficients reported represent the difference in means between individuals who are self-employed and individuals in wage and salary employment. Multivariate regressions include controls for respondents' education, race, age, number of children, hours worked, employment status and a self-employment indicator. Coefficients reported represent the effect of being self-employed relative to working in a wage and salary position.

Table 2.8: Differences in Childcare Types Associated with Self-Employment

Dependent Variable	Mean Comparisons		Multivariate Comparisons	
	Women with Children Under 18	Women with Children Under 6	Women with Children Under 18	Women with Children Under 6
Minutes Spent On:				
Primary Childcare	7.9	15.2	2.3	4.8
	[2.3]	[4.5]	[1.3]	[4.6]
Mean Primary Childcare	44.2	75.5	44.1	75.5
Educational Childcare	6.4	6.6	1.1	1.6
	[1.1]	[1.9]	[0.6]	[1.7]
Mean Educational Childcare	12.6	11.3	12.6	11.3
Recreational Childcare	3.4	5.8	0.8	−1.2
	[1.4]	[2.9]	[0.8]	[2.8]
Mean Recreational Childcare	18.0	31.5	18.0	31.5

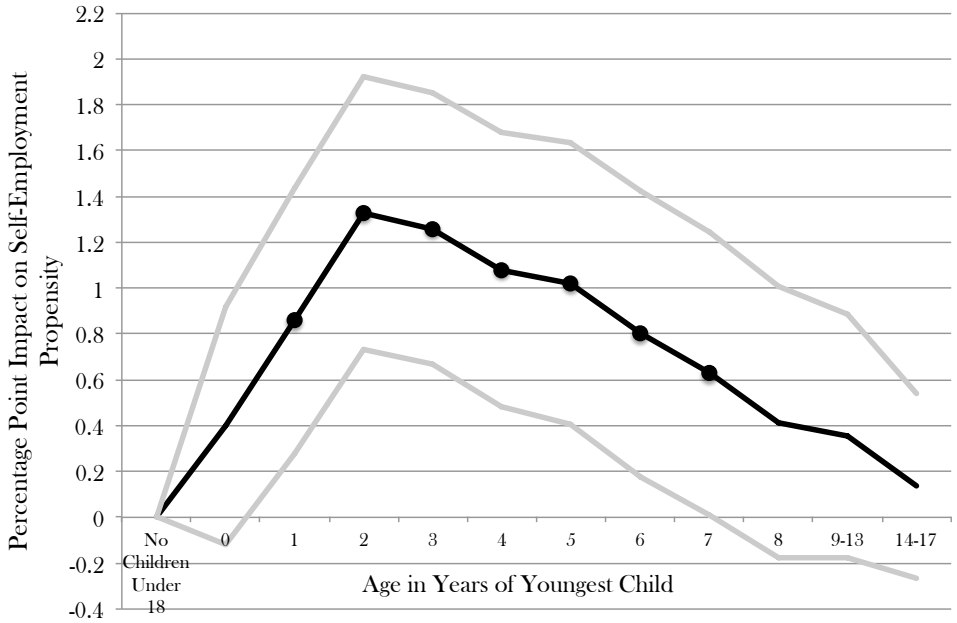
Notes: The sample for columns 1 and 3 includes women ages 18-55 in the ATUS 2003-2012 who are employed and have at least one child under the age of 18. Columns 2 and 4 restrict the sample to women with a child under the age of 6. All columns only include weekday observations. Mean comparisons include only a constant and a self-employment indicator term. Coefficients reported represent the difference in means between individuals who are self-employed and individuals in wage and salary employment. Multivariate regressions include controls for respondents' education, race, age, number of children, hours worked, employment status and a self-employment indicator. Coefficients reported represent the effect of being self-employed relative to working in a wage and salary position

Table 2.9: Differences in Time Use Associated with Self-Employment Excluding Childcare Workers

Dependent Variable	Mean Comparisons		Multivariate Comparisons	
	Women with Children Under 18	Women with Children Under 6	Women with Children Under 18	Women with Children Under 6
Minutes Spent On:				
Work	−55.1	−73.9		
	[7.3]	[10.6]		
Childcare	20.3	31.4	6.3	6.2
	[3.1]	[6.2]	[3.1]	[6.1]
Supervising Children <13	63.8	104.8	44.5	82.3
	[8.3]	[13.0]	[7.5]	[12.3]
Working while Supervising Children <13	27.8	40.2	30.2	45.2
	[3.2]	[5.8]	[3.5]	[6.7]
Leisure	−6.4	−2.0	−5.4	0.1
	[4.7]	[7.2]	[4.6]	[7.0]
Sleeping	−1.7	2.8	5.8	9.0
	[3.6]	[5.7]	[3.5]	[5.5]
Housework	41.5	39.7	18.2	21.9
	[4.5]	[5.8]	[4.3]	[6.0]
Percentage Working from Home	19.4	18.7	19.0	18.8
	[1.3]	[1.9]	[1.3]	[2.1]
Percentage of Work Done at Home	36.2	35.3	31.5	29.5
	[1.7]	[2.6]	[1.7]	[2.6]

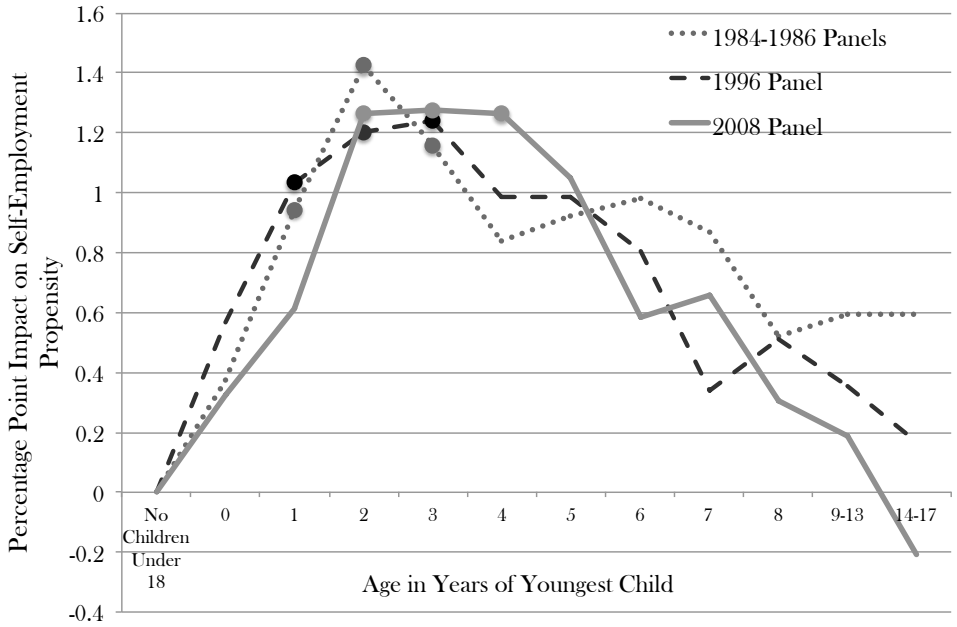
Notes: The sample for columns 1 and 3 includes women ages 18-55 in the ATUS 2003-2012 who are employed, but are not childcare workers, and have at least one child under the age of 18. Columns 2 and 4 restrict the sample to women with a child under the age of 6. All columns only include weekday observations. Mean comparisons include only a constant and a self-employment indicator term. Coefficients reported represent the difference in means between individuals who are self-employed and individuals in wage and salary employment. Multivariate regressions include controls for respondents' education, race, age, number of children, hours worked, employment status and a self-employment indicator. Coefficients reported represent the effect of being self-employed relative to working in a wage and salary position.

Figure 2.1: Female Self-Employment Rates and the Age of the Youngest Child; SIPP Wave 1 Respondents Using Final Month Weights



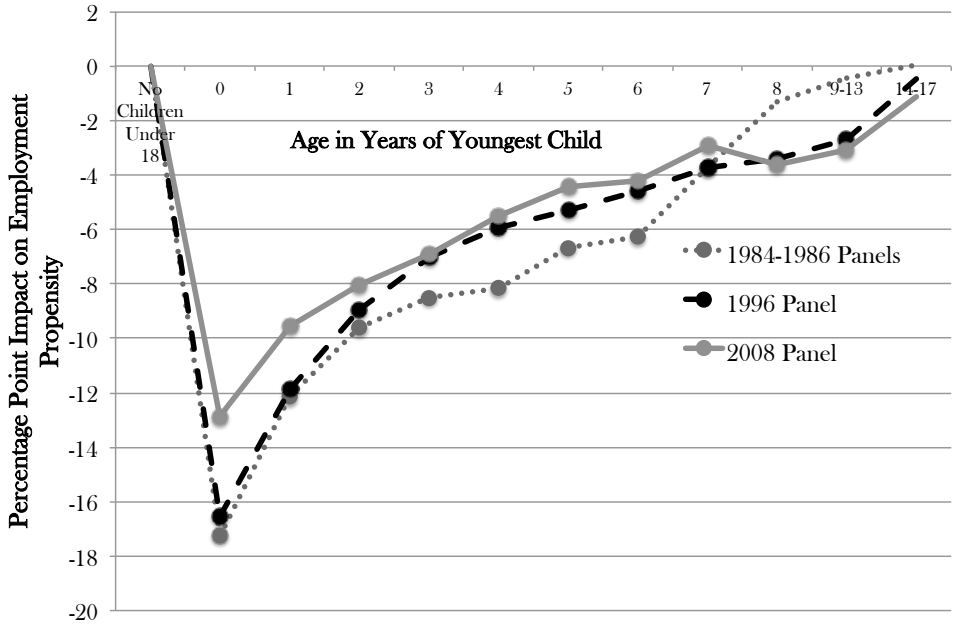
Notes: The regressions predict self-employment status controlling for age, marital status, number of children, and fixed effects with standard errors clustered at the individual level. The markers denote statistical significance at the 5% level and the light lines represent the 95% confidence interval. The estimation sample includes women ages 18-55 who are present in the first wave of each SIPP panel. Observations are weighted using the monthly weight from the individual's final month in the survey.

Figure 2.2: Female Self-Employment Rates and the Age of the Youngest Child; SIPP Wave 1 Respondents Using Final Month Weights



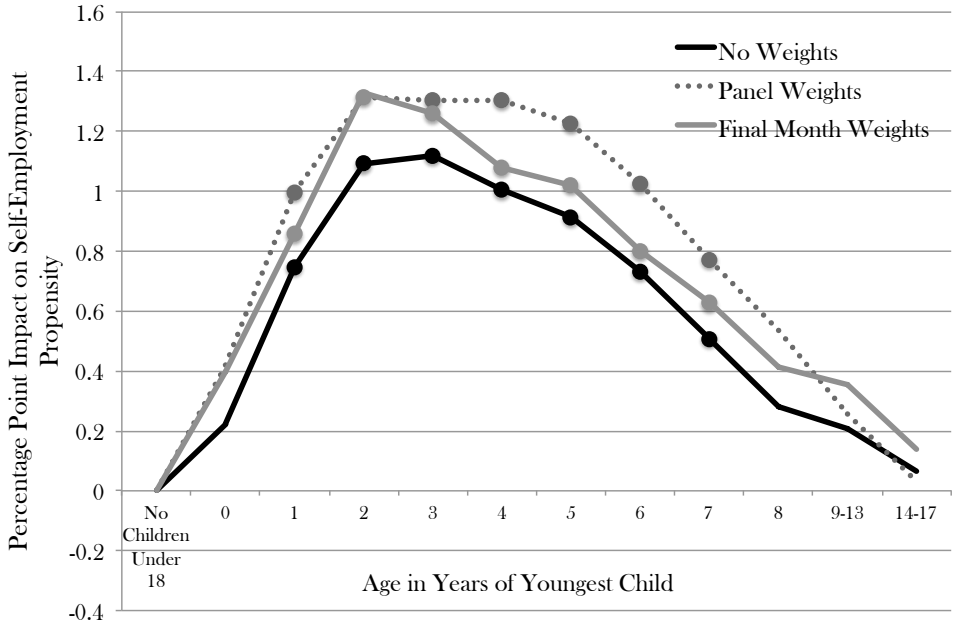
Notes: The three lines are plots of the coefficients on the age of the youngest child from regressions using different SIPP panels. The regressions predict self-employment status controlling for age, marital status, number of children, and fixed effects with standard errors clustered at the individual level. The markers denote statistical significance at the 5% level. The estimation sample includes women ages 18-55 who are present in the first wave of each SIPP panel. Observations are weighted using the monthly weight from the individual's final month in the survey.

Figure 2.3: Percentage of Women Working by the Age of the Youngest Child; SIPP Wave 1 Respondents Using Final Month Weights



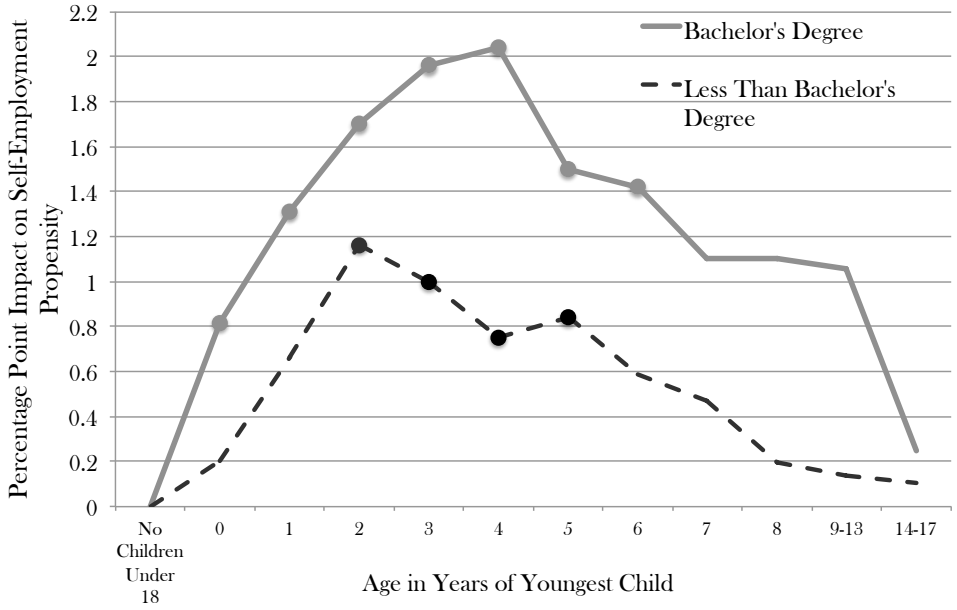
Notes: The three lines are plots of the coefficients on the age of the youngest child from regressions using different SIPP panels. The regressions predict working status controlling for age, marital status, number of children, and fixed effects with standard errors clustered at the individual level. The markers denote statistical significance at the 5% level. The estimation sample includes women ages 18-55 who are present in the first wave of each SIPP panel. Observations are weighted using the monthly weight from the individual's final month in the survey.

Figure 2.4: Female Self-Employment Rates and the Age of the Youngest Child; Pooled SIPP Panels; Different Weights



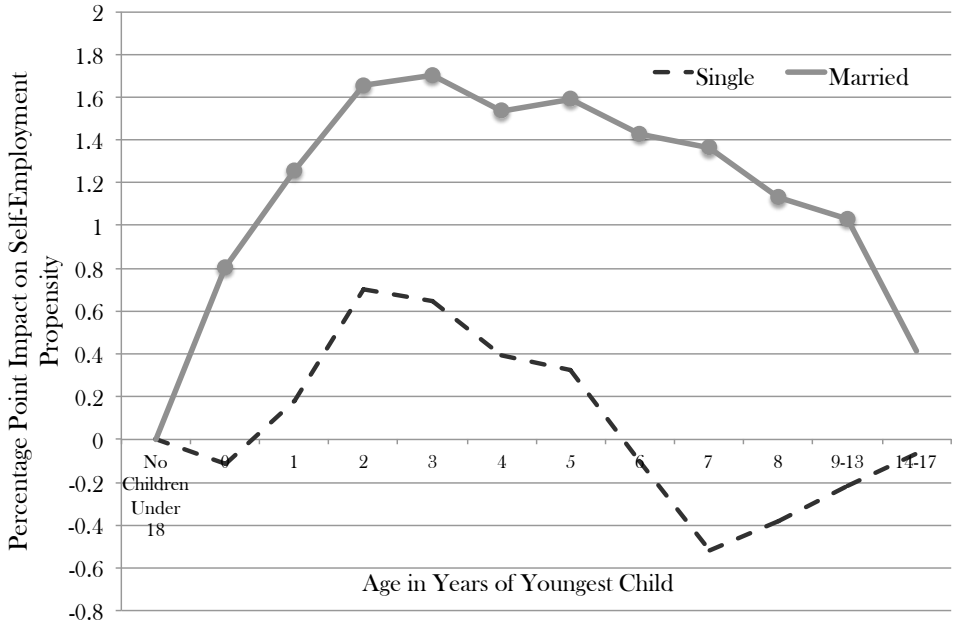
Notes: The three lines are plots of the coefficients on the age of the youngest child from regressions of the pooled surveys using no weights, the longitudinal panel weights and the final month of observation weights. The regressions predict self-employment status controlling for age, marital status, number of children, and fixed effects with standard errors clustered at the individual level. The markers denote statistical significance at the 5% level. The estimation sample includes women ages 18-55 who are present in the first wave of each SIPP panel.

Figure 2.5: Female Self-Employment Rates and the Age of the Youngest Child; Pooled SIPP Panels Using Final Month Weights; By Education Level



Notes: The two lines are plots of the coefficients on the age of the youngest child from regressions on the sample of women with at least a bachelor's degree and women without a bachelor's degree. The regressions predict self-employment status controlling for age, marital status, number of children, and fixed effects with standard errors clustered at the individual level. The markers denote statistical significance at the 5% level. The estimation sample pools all SIPP panels together and includes women ages 18-55 who are present in the first wave of a SIPP panel. Observations are weighted using the monthly weight from the individual's final month of the survey.

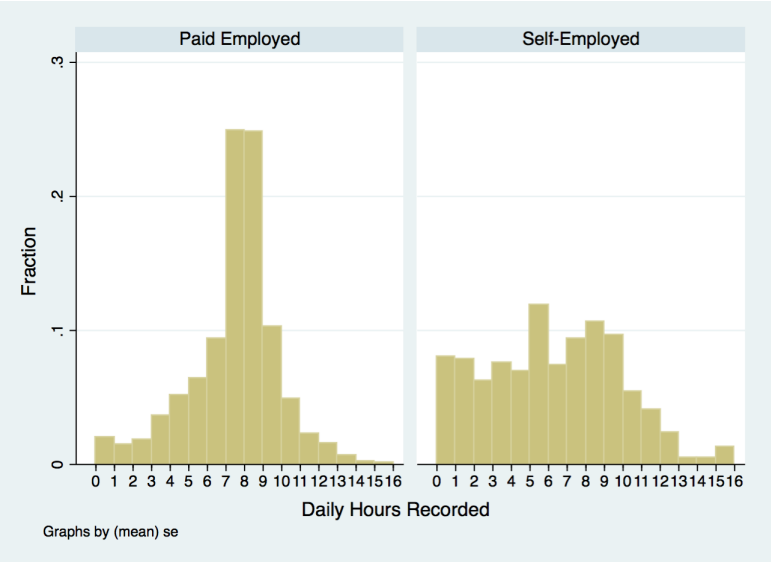
Figure 2.6: Female Self-Employment Rates and the Age of the Youngest Child; Pooled SIPP Panels Using Final Month Weights; By Marital Status



Notes: The two lines are plots of the coefficients on the age of the youngest child from regressions on the sample of women who are married throughout the entire survey and women who are single throughout the entire survey. The regressions predict self-employment status controlling for age, marital status, number of children, and fixed effects with standard errors clustered at the individual level. The markers denote statistical significance at the 5% level. The estimation sample pools all SIPP panels together and includes women ages 18-55 who are present in the first wave of a SIPP panel. Observations are weighted using the monthly weight from the individual's final month of the survey.

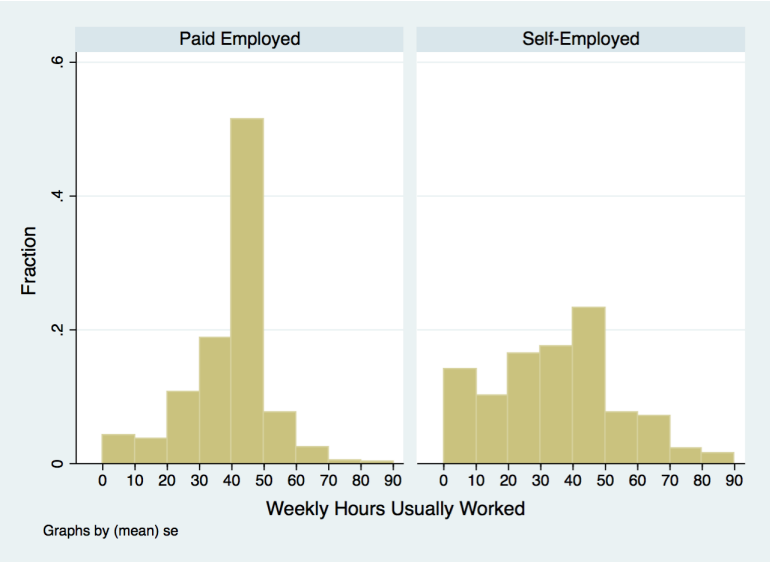
Figure 2.7: Distributions of Hours of Work By Self-Employment Status

Weekday Daily Hours Worked; Working Mothers from ATUS



Notes: These histograms show the weighted daily hours recorded as working in the ATUS for employed women with children under the age of 18 who were interviewed on a weekday and worked at least one minute that day. Observations are top coded at 16 hours. Self-employment status is determined according to the main job of the individual.

Usual Weekly Hours Worked; Working Mothers from ATUS



Notes: These histograms show the weighted usual weekly hours worked in the ATUS for employed women with children under the age of 18 who were interviewed on a weekday and worked at least one minute that day. These data come from the respondents' answer to a question about usual hours worked and not directly from the time diary data. Observations are top coded at 90 hours per week. Self-employment status is determined according to the main job of the individual.

CHAPTER 3

The EITC and Self-Employment Among Married Mothers

While the EITC provides a disincentive to work for most married women, previous research suggests that it encourages the reporting of self-employment earnings to the IRS when filing taxes (LaLumia (2009)). Using the Survey of Income and Program Participation, we use variation in EITC generosity across and within states between 1990 and 2012 to estimate the impact of the credit on married mothers' self-employment behavior. We estimate that the average increase in EITC generosity over this time period led to a 4 percentage point increase in the proportion of EITC-eligible married mothers reporting positive self-employment hours. This paper adds to the existing literature on the EITC and women's labor supply by providing new evidence that the EITC affects married mothers' employment type. By measuring self-employment as positive reported hours worked in a business, our results suggest that the EITC induces a real increase in self-employment behavior. These findings supplement previous work showing that the EITC encourages the reporting of self-employment earnings to the IRS. This observed shift towards self-employment could arise from an alleviation of credit constraints, a desire for flexible work, or an attempt to maximize the size of the credit through targeted changes in reporting and labor supply.

3.1 Introduction

In 2012, the Earned Income Tax Credit (EITC) provided $64 billion of income to 28 million households. This paper provides new evidence that the credit influences married women's decision to pursue self-employment contributing to two strands of the existing EITC literature. Previous work has focused on how the EITC affects single and married women's labor supply decisions; finding that the credit encourages work among single mothers and discourages employment among married mothers.[1] In this paper, we show that in addition to affecting women's employment decisions, the credit affects the type of employment they choose. Other research finds that changes in the EITC cause particularly strong responses among the self-employed as measured by reported income to the IRS.[2] We use an alternative measure of self-employment, hours worked at a business, to offer evidence that the EITC may increase real self-employment effort in addition to any changes in reporting behavior.

There are a number of reasons to expect the EITC to influence the choice between self-employment, wage and salary employment, and non-employment among married women. It is well documented that the self-employed are able to manipulate their reported income for tax purposes to maximize their EITC so policy-induced increases in the EITC could encourage individuals to become self-employed to take better advantage of the credit (Saez (2010), LeMaire and Schjerning (2013)). Increases in EITC generosity could also provide additional income that facilitates starting a business either through capital funding or an improved financial situation that allows women to move to an arguably riskier type of employment.[3] Although this income effect influences all EITC-eligible women, we expect it to have a larger impact on married women because it is likely easier for them to become self-employed with a secondary earner in the household to provide income security and health insurance.[4] Finally, part-time work is much more prevalent among self-employed women relative to wage and salary employed women so mothers may be using self-employment as a way to decrease their labor supply without exiting the labor force in response to the credit

[1] For example, see Eissa and Liebman (1996), Meyer and Rosenbaum (2001) and Hoynes and Patel (2015) for evidence that the credit increases single mothers' labor supply. See Eissa and Hoynes (2004) for evidence of the credit's effect on married women's employment.

[2] See Saez (2010) and Chetty et al. (2013) for evidence on income bunching by the self-employed.

[3] See Moskowitz and Vissing-Jørgensen (2002), Hall and Woodward (2010) for analyses of the risk of investing in one's own business and Ekelund et al. (2005) for evidence on the relationship of risk preferences and self-employment behavior.

[4] Self-employment rates among married women in 2012 are 9.1% compared to 3.2% among never married women. Access to spousal health insurance, a second income to reduce risk from income shocks, and possibly better access to capital all make it easier for married women to become self-employed (see Velamuri (2012), Lombard (2001); Fairlie et al. (2010), and Heim and Lurie (2010)).

(Lim (2016)).

Because the credit is based on total household income there is a marriage penalty for many dual-earner households creating disincentives for secondary earners to work. Approximately three-quarters of married filers eligible for the EITC have earnings in the phase-out region of the schedule, meaning that each extra dollar of earnings reduces household EITC benefits by around 20 cents. Over the past decade, efforts have been made to reduce the marriage penalty by extending the income threshold for married filers, although many married couples still face marriage penalties associated with the EITC (Holtzblatt and Rebelein (2000), Lin and Tong (2012), Michelmore (2015)). This disincentive applies to both work in self-employment and wage and salary employment. Previous research by Eissa and Hoynes (2004) has documented that expansions of the EITC between 1984 and 1996 led married women to decrease their overall employment by around one percentage point, but their work did not distinguish between types of employment.

This paper uses a simulated instrument strategy (Currie and Gruber (1996), Cohodes et al. (2014)), to estimate the effect of EITC expansions at the federal and state level on married women's self-employment behavior. First, we build on prior work that estimates the impact of the EITC on married women's labor supply by distinguishing between labor supply in wage and salary employment and self-employment. Previous research suggests that mothers with young children are more likely to be self-employed, which may allow them to spend more time with their children and pay less for childcare (Laughlin (2013)), Hundley (2000), Lim (2016)). This additional time may represent an improvement in the quality of care for children of low-income mothers.[5]

Second, we illustrate that work effort, as measured by hours worked, in self-employment increases when EITC generosity increases. Previous work using tax return data has been unable to determine whether increases in reported self-employment income represents additional work effort or merely a change in reporting to the IRS (LaLumia (2009)). Distinguishing between a real response and a reporting response is important for evaluating the effectiveness of the EITC in encouraging or discouraging work. Self-employment earnings are relatively easy to misreport since there is often no third-party reporting to the IRS. A recent paper by Kuka (2013) compares the impact of the 1993 federal EITC expansion on unmarried individuals' self-employment rates between the IRS tax data and the Current Population Survey (CPS). She finds a positive effect of the expansion on self-employment in both datasets, but the effect in the tax data is much larger leading her to

[5]Higher quality care has been shown to improve children's cognitive development (See Duncan (2003)). Care provided by the mother could represent an increase or decrease in quality depending on the quality level of the alternative care provider.

conclude that the majority of the increase in self-employment represents a reporting effect. We use data from the Survey of Income and Program Participation (SIPP), which may have more accurate accounts of self-employment earnings and effort than the CPS or tax data. In contrast to those annual data sources, SIPP respondents are interviewed every four months, which is intended to reduce recall bias among survey responses. This quarterly interviewing strategy may be particularly important for capturing self-employment work effort, as self-employment tends to be relatively short-lived. In our data, around 9% of self-employed married mothers are no longer self-employed in the following quarter. Rissman (2006) finds that among men 20-45 years of age in the NLSY79 half of self-employment spells end within a year. Additionally, we focus on changes in both hours spent working in self-employment and earnings because reported hours worked are less likely to be impacted by the incentives to evade taxes.[6]

Finally, we are able to corroborate previous evidence on the labor supply of self-employed workers and married women using a new source of variation in EITC generosity: state EITC expansions. Much of the earlier work on the EITC uses a federal expansion of the credit in the early 1990s to analyze how an increase in income affects outcomes for households with children compared to childless individuals. While the expansion was generous, it is now nearly 20 years old and affected all families with children at the same time. The identification strategy relies on a parallel trends assumption between women with no children and women with at least one child. This might be a particularly strong assumption especially for outcomes like female labor supply, which may differ substantially between households with no children and households with children. Using the implementation and expansion of state EITCs provides multiple sources of variation; variation in the timing of state expansions as well as variation in the generosity of benefits. Our empirical strategy provides an estimate of the effect of a dollar amount increase in the average EITC benefit on the employment decisions of married mothers, which may be more useful for considering current policy changes than the overall effect of previous expansions.

Our results indicate that policy-induced increases in the EITC discourage work overall for married mothers, but encourage self-employment. The average EITC for married women with children increased by $690 over our sample period. We estimate that this increase led to a 4 percentage point increase in self-employment rates as measured by positive hours worked in one's own business. This increase in self-employment hours suggests that

[6] Hurst and Pugsley (2014) find underreporting of self-employment earnings in the PSID by about 25% relative to wage and salary workers. They argue that individuals report the same underreported earnings as on their tax returns. Because the SIPP is quarterly and will often be conducted prior to tax time for that year, it may be less susceptible to this underreporting. Additionally some individuals in our sample will have an incentive to over-report and others to underreport depending on their location on the EITC schedule.

the EITC encourages real work effort in self-employment among married women rather than merely an increase in reported self-employment earnings to the IRS for tax filing. We find a small increase in the number of self-employment hours worked and a decrease in the number of wage and salary hours worked. Our results provide important evidence that the EITC influences the type of employment among married women in addition to affecting their overall labor supply. Additionally, our results suggest that relatively small increases in income encourage low-income married mothers to become self-employed. This could be evidence that credit constraints are a barrier to self-employment or of an income effect that encourages some women to pursue self-employment when the family's overall earning potential has increased. Alternatively, women may choose self-employment over wage and salary employment as a function of EITC generosity because they are able to more precisely adjust their labor supply and earnings, or their reporting of it to the IRS. On average self-employed women tend to work less and spend more time with their children (Hundley (2000), Gurley-Calvez et al. (2009)). If increases in the EITC induce women to shift to self-employment, this could have positive implications for their children. On the other hand, because self-employed women tend to have lower earnings than wage and salary employed women (Devine (1994), Hamilton (2000), our findings suggest potentially negative implications for women's earnings trajectories.

3.2 The Earned Income Tax Credit

The EITC began as a small, temporary credit in 1975, worth up to $400 ($1,750 in 2014 dollars) for households earning less than $8,000. Since then, the credit has been expanded several times at both the federal and state level, with the federal credit worth up to $6,000 in 2014 for households earning less than $53,000. The credit is fully refundable, so households with no tax liability receive the EITC in the form of a tax refund.

The EITC benefit structure is made up of three segments: a phase-in region, plateau, and phase-out region. For a household with two children in the phase-in region, every dollar of earned income increases the EITC benefit by 40 cents. Once earnings reach a certain threshold, benefits remain constant until earned income reaches a second threshold. For incomes above the second threshold benefits are taxed at approximately 20 percent. Figure 3.1 illustrates the federal EITC benefit structure for the 2014 tax year. The solid lines indicate the benefit structure for a single tax payer, while the dotted lines illustrate the structure for a married couple. Prior to the early 2000s, married filers were subject to the same income thresholds as head of household or single filers. Beginning in 2002, the plateau region of the benefit structure was extended for married couples in an effort

to reduce the marriage penalty associated with the EITC. In 2002, the plateau region was extended for an extra $1,000 for married couples and by 2014, married couples could earn an extra $5,430 before the phase-out took effect.

The trapezoidal structure of the EITC benefit schedule creates incentives for individuals on the phase-in portion of the schedule to increase their earnings because each dollar of earnings is associated with a larger EITC benefit. In contrast, those in the phase-out region have and incentive to reduce their earnings as each additional dollar of earnings is associated with a decline in EITC benefits. For individuals on the plateau, small changes in earnings will not affect EITC benefits. Workers may move from wage and salary employment to self-employment because self-employment may allow households to more easily target their earnings to maximize their EITC benefit. The self-employed could have more control over their number of hours worked and their income. Further, unlike wage and salary earnings, self-employment earnings are often not verified via third-party reporting to the IRS, making it easier for households to misreport income in order to maximize their tax refunds.

In addition to the federal benefit, 25 states and the District of Columbia have their own EITCs. These credits have the same eligibility criteria as the federal EITC, and increase the total EITC value by between 3 and 45 percent of the federal benefit. State level EITCs began in the late 1980s, but the majority of states implemented credits following welfare reform in the late 1990s and early 2000s. Many states used federal block grants intended to reduce the number of welfare caseloads to fund their new EITCs. A list of states and the year they implemented the credit can be found in Appendix Table D.1.

3.3 Data and Methodology

The data for our study come from the Survey of Income and Program Participation (SIPP) panels from 1990 to 2008, covering the years 1990 through 2012. The SIPP is a nationally-representative panel dataset surveying families for up to 60 months per panel. Households are interviewed once every four months regarding income and household characteristics of the previous four months. Information on all individuals living in the household is collected. The SIPP is an ideal data source for this analysis because of its large sample size (roughly 50,000 households per panel), and because it contains monthly information on labor force participation and income.

We focus our analysis on married women between the ages of 18 and 55 who have at least one child under 19 living in the household. This captures women during their prime working years, but avoids including self-employment behavior that could be characterized

as partial retirement.[7] For our main analysis, we exclude childless married women because only a small fraction are eligible for the EITC, and they are likely to exhibit very different working patterns than women with children.[8] We focus on married women in this analysis because we believe that they are the most likely to alter their decision between wage and salary work and self-employment because they have a potential second earner living in the household. Married mothers are about twice as likely to be self-employed as single mothers in the SIPP (8% of married mothers compared to 4% of single mothers).[9]

To identify the impact of EITC generosity on the self-employment patterns of married women, we compare the labor force participation of EITC-eligible married mothers to that of non-eligible married mothers as a function of state EITC generosity. We identify EITC-eligible households using income and family structure in the first year of each SIPP panel. We include married women with zero family earnings in the EITC eligible group. The SIPP does not contain reliable information on EITC receipt, so this measure represents an intent-to-treat effect. Take up of the EITC tends to be quite high, often over 80% (Scholz (1994), Currie (2004)). We then exclude observations from the first year of each SIPP panel in our analysis to reduce concerns of endogeneity of EITC-eligibility to the outcomes of interest. We focus on the reference month observations since each SIPP wave asks about the usual number of hours worked at the business during the previous four months.[10] These observations can be thought of as quarterly observations that summarize work activity during the previous four months. This results in a sample of 261,781 quarter-person observations.

3.3.1 Dependent Variables

In each interview, respondents are asked whether they have any business income and how many hours they usually spend doing activities for their business. We measure self-employment by whether the respondent reports any hours worked as part of a business in each wave. We construct an alternative measure of self-employment based on whether the respondent reports any positive income from a business during the reference period, which is a subset of individuals reporting any hours worked as part of their business. We construct a similar measure for whether the respondent is working a wage and salary job based on whether they report positive usual hours worked during the quarter. We also test whether

[7] Self-employment rates are much higher among older workers. See Karoly and Zissimopoulos (2007) and Bruce et al. (2000) for evidence on self-employment and partial retirement.

[8] 18% of married women with no children in our data have income that falls within the EITC-eligible range. Around half of them have 0 family earnings.

[9] We also conducted our analysis on single mothers, women with no children under 19 at home, and married fathers. Results are shown in Table 3.7.

[10] Results are not sensitive to this restriction.

married women are more likely to work in both self-employment and wage and salary employment as a function of EITC generosity to understand whether the EITC encourages women to combine types of employment. In addition, we examine the impact of the EITC on quarterly transitions between non-employment, self-employment and wage and salary employment to examine how the credit influences the gross flows of workers between employment types. Finally, we also measure the effect of the EITC on self-employment and wage and salary employment by analyzing the number of hours worked and earnings in self-employment and wage and salary employment as a function of EITC generosity.[11]

3.3.2 Empirical Strategy

Our goal is to examine how the propensity to work in self-employment is affected by changes in EITC benefits. To estimate this effect, however, we cannot simply regress self-employment behavior on own EITC benefits. Because EITC benefits are determined by family size and family income, working in self-employment is likely to be endogenous to own EITC benefits. Families with higher EITC benefits also have lower incomes than those who are not eligible for the EITC. These individuals may also be less likely to work in self-employment for reasons that are unrelated to their EITC benefits.[12]

To overcome this endogeneity problem, we employ a simulated instruments method, capturing changes in the EITC that are due to policy changes at the federal and state level and unrelated to potentially endogenous decisions within the household. This is similar to the approach used by Hoynes and Patel (2015), who simulate the impact of policy-induced increases in the EITC on employment and income.[13] This approach is also similar to a difference-in-differences methodology, but allows us to capture several policy changes over time. Further, since states implement EITCs of varying degree of generosity, this method also allows us to incorporate variation in the generosity of the treatment over time.

To construct our simulated measure of EITC generosity, we use the National Bureau of Economic Research's (NBER) TAXSIM model to generate the average household EITC for each state in each year for a nationally-representative sample of married filers. We then match this state-year measure of the average EITC to our sample of married mothers

[11] The effect of the EITC on the number of hours worked and on earnings includes both an intensive margin effect (changes in hours or earnings among those already working that employment type) and an extensive margin effect.

[12] Self-employment rates are higher among women with wealthier husbands suggesting a positive relationship between family income and women's self-employment (Bruce (1999)). Self-employment also has been shown to pay less suggesting a negative correlation between family income and self-employment (See e.g. Hamilton (2000), Hurst and Pugsley (2014)).

[13] This method has also been used in the Medicaid literature (Currie and Gruber (1996), Cohodes et al. (2014)), as well as in the case of education tax credits (Bulman and Hoxby (2015)).

by their year and state of residence. Our average EITC benefit represents the combined federal and state EITCs for each state-year combination.

We use a nationally-representative sample rather than using characteristics from a state level population to avoid any policy endogeneity arising from states changing their EITC policies in response to different concentrations of EITC-eligible households. To construct the nationally-representative sample of households, we take the sample of married respondents with children in the 1997 year of the SIPP survey, as this is the first full calendar year of data from the 1996 SIPP. We then replicate this sample for each year, adjusting nominal income levels using the Consumer Price Index. This avoids concerns that changes in EITC generosity over time reflect changes in the national income distribution over time.

Variation in our measure of average EITC benefit reflects only EITC policy variation across states in a given year and within states over time, eliminating variation due to endogenous household decisions about geographic location, household size, or household income in relation to the outcomes of interest. The variation in our measure comes from both state level and federal level variation in the EITC. We use variation generated by changes in state EITC policies over time, both in the timing of implementation and in the generosity of the state credits. Our specification includes year fixed effects, which account for average level changes in the EITC from federal EITC legislation. However, federal changes to the EITC automatically impact state level EITC values because they are structured as a percentage of the federal EITC. The differential impact of federal changes across states is variation we use to identify the effect of the EITC on self-employment decisions. Between 1990 and 2012, the federal EITC was expanded several times.[14] In the early 1990s, the EITC was drastically expanded for households with at least two children. In the early 2000s, the plateau region was expanded multiple times for married couples, allowing married filers with higher earnings than single and head of household filers to be eligible for the EITC. Additionally beginning in 2008, families with three or more children were eligible for a higher EITC than families with two children.

This approach has several advantages over other identification strategies. Using one's own EITC includes both variation in the benefits that is driven by policy changes, which is the variation of interest, and variation due to other household decisions that may be endogenous to the outcomes of interest, such as changes in employment or family structure over the course of the year. Using the maximum potential credit value in a given state and year eliminates concerns of endogeneity of own eligibility to the outcomes of interest, but not all families are eligible for the maximum credits so this measure might not be relevant to most of the EITC-eligible population.

[14] See Falk (2014) for a history of the federal and state EITCs.

Figure 3.2 shows how our average EITC measure changed over this time period. The average simulated household tax credit increased over this time period from $275 in 1990 to $960 in 2012. Due to the variation in when states began implementing EITCs, there was also significant cross-sectional variation in the average household EITC across states over this time period. Figure 3.3 illustrates this variation, with each observation representing a different state-year combination. In any given year, the variation in the average simulated household tax credit between the most generous and least generous state was about $300.

We model the impact of an increase in average household EITC benefits in a state and year on the self-employment patterns of married women using the following form:

$$Y_{ijt} = \beta_0 + \beta_1(avgben_{st}) + \beta_2(Elig_i) + \beta_3(avgben_{st} * Elig_i) + \beta_4 X_{ist} + \beta_5 Z_{st} + \delta_s + \gamma_t + \epsilon_{ist}$$

where i indexes individuals, s indexes states, and t indexes years. Y_{ist} is the outcome of interest. These outcomes include an indicator for whether an individual has any self-employment hours, any wage and salary hours, neither, or both. We also examine self-employment earnings, the number of hours worked in self-employment and wage and salary employment per week, and transitions between employment types. We model outcomes as a function of the average EITC benefits in thousands of dollars, as measured by our simulated instrument, in a state and year ($avgben_{st}$). We construct a measure of EITC-eligibility ($Elig_i$) using family income and the number of children living in the household during the first year of the SIPP survey. Our coefficient of interest, β_3, represents the effect of an increase in the value of the average EITC in a state and year for EITC-eligible households relative to non-eligible households on outcome Y_{ist}. Our specification includes year fixed effects, which will absorb the average effect of federal changes in EITC legislation. Our coefficient of interest, β_3, is identified from variation within states over time, as well as cross-state policy differences in EITC generosity at a single point in time.

By allowing state EITC generosity to have a differential impact on the EITC population compared to the non-eligible population, we control for any other policies or events occurring at the same time as EITC implementation that may also affect the self-employment patterns within each state. Further, we allow EITC-eligible married women to have different employment levels than ineligible women by controlling for EITC-eligibility alone. The interaction of these two terms therefore captures the effect of state EITC policy changes on the working patterns of the EITC-eligible population relative to the non-eligible population.

Our identifying assumptions are that there are no other state policies or factors that differentially impact self-employment behavior by EITC eligibility status that change at

the same time as changes in the EITC and that eligible and ineligible women would have similar trends in the dependent variables in the absence of EITC changes. We provide some evidence that state level EITC changes were not related to other state policies or economic conditions in Appendix Table D.2. We find evidence that states with more generous EITCs spend more on welfare and higher education. When we limit the sample to only states that ever implement EITCs (but including all pre-EITC years), we still find a positive association between state EITC generosity and spending on welfare. We also find a positive correlation between state EITC generosity and state GDP, suggesting that states with larger economies have more generous EITCs. To reduce concerns that these state policies and economic conditions are confounding our results, we include controls for state level measures of the minimum wage, unemployment rates and the top marginal tax rate. Additionally, interpreting the estimate as the impact of increases in EITC generosity requires that our control group be unaffected by EITC increases. To the extent that married women who have incomes during the first year of the survey that make them ineligible for the EITC are also affected by the policy (or become eligible in subsequent years[15]), our estimates would be biased towards zero.

We also include a vector of individual demographic characteristics of the wife including her age, race, education level, and number of children living in the household; a vector of state-by-year level characteristics such as state unemployment rates, and the state minimum wage; state, year, and month of interview fixed effects; and state specific linear time trends. State fixed effects control for time-invariant differences across states, such as political ideology and industrial makeup that may affect self-employment rates in a given state. The year fixed effects control for national economic conditions and, state specific time trends control for differences across states in linear trends in our dependent variables. Controlling for state-year unemployment rates and minimum wages accounts for other factors at the state-year level that may be correlated with state EITC generosity that may also impact self-employment rates.

Our main analysis focuses on married women with at least one child under 19 years of age at the start of the survey.[16] As previously mentioned, the sample excludes the first calendar year of observations. Table 3.1 provides summary statistics for our main sample by EITC-eligibility based on family income in the first year of the SIPP panel. The average EITC calculated based on a nationally representative sample of married women with chil-

[15] Approximately 11% of ineligible households in the first year of each SIPP panel become eligible for the EITC in the following year. Among those eligible in the first year of each SIPPP panel, 72% are eligible in the following year, and 66% are eligible two years later.

[16] Women may divorce in later years, but we control for marital status in our analysis.

dren is around $760.[17] The average credit is slightly higher for the EITC eligible sample, likely reflecting that more generous states have higher percentages of their population that are EITC eligible. Around 8 percent of married mothers have positive self-employment hours and 65 percent have positive wage and salary hours. Women who are not EITC eligible are more likely to be employed than women who are EITC eligible. Overall, roughly a third of the sample have a high school diploma or less, a third have some college experience and a third have a bachelor's degree. The EITC eligible population is much less educated than the ineligible population; around 60 percent of individuals have no more than a high school diploma. Around one in four households are considered EITC eligible; nearly three-quarters of those eligible have family income that places them on the phase-out region of the EITC benefit schedule.

3.4 Results

Our main results show that increases in state level EITC generosity between 1990 and 2012 raised the proportion of individuals working in self-employment relative to wage and salary employment, as shown in Table 3.2. The average difference between the highest value of our EITC measure and the lowest value within a state during this time period is $690. This implies that, in that average state, increases in the EITC over our sample period increased self-employment rates by 4 percentage points or 52 percent.[18] Although not directly comparable, this estimate is similar in magnitude to the effect found in LaLumia (2009), who finds a 4 percentage point increase in self-employment rates among married filers during the expansion of the federal EITC between 1994 and 1998.[19]

The same policy-induced increase in the EITC leads to a decline in the share of wage and salary employed individuals by 2 percentage points or 3 percent although this estimate is not statistically significant. We do find a statistically significant increase of around 1 percentage point in the fraction of women reporting both positive self-employment and positive wage and salary employment hours. This result suggests that some women are simultaneously combining self-employment with wage and salary employment. However, the much larger estimated 4 percentage point effect on any self-employment hours indicates that many women are in fact switching between employment types rather than combining

[17] All figures are in 2011 dollars.

[18] Our point estimate of 0.062 is for a $1000 increase in average ETIC so scaling the effect by 0.690 gives us the effect of the $690 increase.

[19] LaLumia's analysis compared married couples with children to married couples without children. Our analysis focuses on women only and our control group includes childless married women as well as higher-income married women.

both wage and salary employment and self-employment at the same time.

We do not find evidence that higher levels of the EITC discourage work among married mothers as in Eissa and Hoynes (2004). There are several key differences between our analyses. First their empirical strategy uses a different sample restriction and measure of EITC eligibility, both of which we will explore further below. Second, they focus on a different time period 1989-1996 and use federal level variation in the EITC. Finally, their measure for employment is whether the woman is employed at all during the previous calendar year excluding households who receive most of their income from self-employment, while we are looking at any type of employment at a quarterly frequency.

In Table 3.3, we examine quarterly transitions into and out of self-employment to investigate how the EITC impacts the gross flows of workers across employment types. We find that increased EITC generosity increased both inflows to and outflows from self-employment, but it increased inflows by more. These results suggest that the EITC encouraged more married women to try self-employment. In Appendix Table D.3 we show quarterly transitions between wage and salary employment, self-employment and non-employment. We find evidence that the EITC increases transitions from both non-employment and wage and salary employment to self-employment, with a relatively stronger effect coming from non-employment. The point estimates suggest that the EITC also increased transitions out of self-employment to both wage and salary and non-employment although these effects are not statistically different from zero. These findings suggest that increases in the EITC increase transitions into and out of self-employment, and that a large fraction of the newly self-employed are coming from non-employment.

In Table 3.4, we show the effect of EITC generosity on self-employment earnings and the number of hours worked. We find no statistically significant impact of the EITC on the level of self-employment earnings, but we do find a significant increase in the number of self-employment hours as a function of EITC generosity. Our estimates indicate that the increase in the average EITC over our time period increased the hours spent in self-employment by about 1.2 hours per week. We estimate a negative effect of the EITC on the number of wage and salary hours worked, however, it is not statistically different from zero.

We would expect to find different labor supply responses to expansions of the EITC depending on where households lie on the EITC benefit structure. Individuals in the phase-in region have an incentive to increase the number of hours worked when the EITC becomes more generous because each additional dollar of earnings is associated with a larger EITC. Individuals in the phase-out region may have an incentive to decrease the number of hours worked, as each additional dollar of earnings is associated with a lower EITC benefit. For

the phase-in region, each dollar of earnings is associated with 34-45 cents in additional EITC benefits depending on the number of children in the household, while benefits phase out at a rate of 21 cents for each dollar of earnings beyond the plateau. Individuals in the plateau region have neither an incentive nor disincentive to change the number of hours worked, as small changes in earnings result in no change in EITC benefits.

Using household income from the first year of the survey, we characterize households as being located in one of these three regions. We acknowledge that households may intentionally 'bunch' at one of these kink points in order to maximize their EITC benefits, so these results should be interpreted in light of potential endogeneity of household positioning on the EITC benefit structure with respect to self-employment. Table 3.5 shows our results interacting region on the EITC benefit schedule with our instrument. We find evidence that increases in the EITC lead to increases in self-employment particularly among individuals in the phase-in and plateau regions. These individuals are precisely those who have the most to gain (or the least to lose) in EITC benefits from increasing their work effort. However, we also find positive but insignificant increases in self-employment among married mothers on the plateau and phase-out portions of the EITC schedule. An increase in self-employment behavior does not necessarily represent an increase in labor supply because many self-employed women work relatively few hours per week. In addition to the differing incentives across the regions of the EITC schedule, EITC expansions increase household income, which could allow women the financial ability to become self-employed. The results for wage and salary hours are not precisely estimated, but suggest that increases in the EITC encourages wage and salary employment for married women in the phase-in region of the credit and discourage it for women in the phase-out region. These results are consistent with the incentive structure of the EITC.

Finally, we examine the effect of the EITC on the employment decisions of married fathers, single mothers, and childless married women. In Table 3.6, we show that the EITC increases the fraction of married fathers reporting positive self-employment hours, but that most of this effect arises from men working in both wage and salary and self-employment. We estimate that the increase in ETIC generosity from 1990 to 2012 led to a 5 percentage point or 30% increase in the fraction of married fathers with positive self-employment hours. These results suggest that expansions in the EITC encouraged fathers to increase their labor supply by becoming self-employed in addition to working in wage and salary employment. We find that the EITC encourages wage and salary employment among single mothers, which is a well-established result in the literature (e.g. Eissa and Liebman (1996), Meyer and Rosenbaum (2001), Hoynes and Patel (2015)). However, we see an imprecisely estimated small positive effect on self-employment. Finally, our estimates suggest a larger

EITC encourages married women with no children under 19 years of age at home to become self-employed and discourages them from working. Households without children at home are only eligible for the EITC if they have very low earnings and the credit amount is small so these estimates arise from a very selected group.

3.5 Robustness

Our main results in Table 3.2 are not sensitive to the inclusion of state and year fixed effects or state-specific time trends as shown in Appendix Table D.4.[20] Given our implicit triple-difference strategy comparing differences between eligible and ineligible women across states over time, this is not entirely surprising. We do find that the coefficient on the effect of EITC generosity is sensitive to the fixed effects included in the models, which reveals some patterns about the types of states that have more generous EITC benefits. For instance, with no state fixed effects in the model, we find a negative association between EITC generosity and self-employment, implying that more generous states tend to have lower self-employment rates. After including year fixed effects, we still find a negative relationship between EITC generosity and self-employment, although it is attenuated and no longer statistically significant. Once controlling for state fixed effects, the relationship flips and states that increase their EITCs have higher self-employment rates. EITC eligible individuals have lower self-employment rates relative to ineligible individuals, but this difference does not depend on the fixed effect controls. Including state-specific linear time trends does little to change the coefficients on the terms of interest, but an F-test of their joint significance rejects the null hypothesis that the coefficients are zero. This suggests that the state-specific linear time trends do improve the fit of the models.

The SIPP imputes data for individuals who do not answer certain questions. As shown in Appendix Table D.5 our results are not sensitive to excluding the 9.5% of individuals with imputed wage and salary or self-employment earnings.[21]

We also investigate an alternative definition of self-employment: positive business earnings, as shown in Appendix Table D.6. Around 65 percent of individuals with positive self-employment hours report positive business earnings. Appendix Table D.6 shows that the $690 increase in EITC generosity led to a 2.5 percentage point increase in the proportion of women reporting positive business income. The percent change for these results is similar

[20] See Wolfers (2006)) and Meer and West (2013) for a discussion of how including linear time trends can produce misleading results and Heckman and Hotz (1989)) for a discussion how leaving our linear time trends can also be problematic.

[21] We exclude all imputed observations even if they were imputed from the respondents' answer during a previous SIPP wave, which are likely to be more accurate than other types of imputations.

to using the positive hours self-employment definition, suggesting that the marginally self-employed are not necessarily the self-employed with zero business earnings. Across both measures, we find suggestive evidence that increases in the EITC increase the likelihood of having both self-employment hours and earnings among married mothers.

3.6 Alternative Specifications

3.6.1 Comparison to Difference in Differences

Our empirical strategy identifies EITC eligible individuals according to the EITC schedule using the number of children and the household's income from their first calendar year in the SIPP. Households are considered EITC eligible if their 1st year income places them within the EITC schedule given their number of children. This approach differs from previous papers that have used a difference in difference approach comparing, for example, married women with children to married childless women. In order to compare the two strategies, we re-do our analysis using our measure of EITC eligibility on a sample of married women with and without children and compare it to the difference in difference specification that compares married women with children to married women without. Following Eissa and Hoynes (2004) we focus on a sample of married women with low levels of education and only include women with no more than a high school education in our sample.[22]

The key difference between these approaches is how the treated and control groups are defined. Using our measure, treated individuals will include very low-income childless women and relatively lower income women with kids, while the control group will include higher income childless women and higher income women with children. The difference in difference treated group will be married women with children and the control group includes childless married women. Table 3.7 compares the results across 5 different control and treatment groups. Column 1 uses our simulated instrument to determine EITC eligibility and estimates the effect on married women with kids subject to the sample restriction of 12 or fewer years of education. Column 2 again uses our simulated instrument, but includes childless married women. The results from these two columns show that our main result on self-employment is robust to including childless married women in our sample and restricting the sample to low educated individuals. Column 5 shows the difference in difference results using childless married women as the control group and married women with chil-

[22]Their specification focuses on women with less than a high school education, but focusing on that group makes our sample quite small. Additionally as the EITC expanded over time, more highly educated women became eligible for it because the credit extended into higher income levels.

dren as the treated group. These results show that the difference in difference specification does not estimate a positive effect of the EITC on the self-employment behavior of married women with children.

To better understand which changes to the treatment and control groups are driving the differences in the result on positive self-employment hours, we estimate two additional specifications. The first uses a very narrow definition of the control group; including only income ineligible, childless women in the control group. The second uses a broad definition of the control group and considers all childless women and income ineligible women with children as the control group. Columns 3 and 4 of Table 3.7 show the results using the narrow and broad definitions of the control groups. Both specifications have positive point estimates for the effect of the EITC on self-employment, but the broad control group is relatively closer to our main results.

In the second panel of Table 3.7 we show the same results, but for the outcome of wage and salary employment. Comparing columns 1 and 2 shows that the inclusion of childless married women in the sample makes a big difference in the estimated effect of the EITC on wage and salary employment. These results suggest that EITC eligible married women with children may have different responses to the EITC than married ETIC eligible women without children. The estimates are quite similar between our eligibility measure in column 2 and the difference in difference estimator in column 5. In the final panel of Table 3.7, we show the same specifications, but the outcome is overall employment. This outcome is particularly sensitive to the specification and is the combination of what is happening in self-employment and wage and salary employment.

Taken together these results suggest that income ineligible mothers respond to increases in the EITC by decreasing their wage and salary employment, but they do not increase and may even decrease their self-employment. While we consider these individuals ineligible for the EITC, and therefore part of the control group in our analysis, increases in the EITC do lead to a further bowed out budget constraint, which could cause some households above the phase-out threshold to improve their welfare by reducing labor supply in response to the larger credit. While this could motivate an overall reduction in labor supply among these women, the differences between columns 4 and 5 might be too large to reasonably suspect that this is the only explanation. In contrast, childless married women who are EITC eligible, according to their 1st year SIPP income, respond to EITC increases by reducing their wage and salary employment and increasing their self-employment. Childless married women are only eligible for the EITC if their household income is very low and the credit they are eligible for is at most around $500 making this large estimated response to changes in the EITC puzzling. Around 4% of childless married women have at least one

child in the following years of the SIPP panel so some of the effect could be coming from higher realized future EITC amounts.

We believe that our measure may do a better job of identifying EITC eligible families than the difference in difference specification. In the less educated sample, our measure categorizes around 35% of the women as EITC eligible, while the difference in difference strategy would consider 65% of the women EITC eligible. Among married women with children, who are all EITC eligible under the difference in difference specification, our measure characterizes only 46% of them as EITC eligible. Income ineligible married women with children have average family incomes of nearly $70,000. When we compare our results to Eissa and Hoynes (2004), we are able to replicate their negative finding on wage and salary employment using a similar sample in both our main specification and their difference in difference specification (columns 2 and 5). However, the two methodologies yield different results for the impact of the EITC on self-employment. Further investigation of the responses of married mothers with income above the phase-out threshold would be useful to confirm and explore differences in their employment behavior relative to married mothers with household incomes located within the EITC schedule.

3.6.2 Reduced Form Specification

Finally, we look at the reduced form effect of EITC generosity on self-employment rates among married mothers. The specification does not use our measure of EITC eligibility so the results can be interpreted as the effect of increases in the average EITC on self-employment rates. Table 3.8 shows the results for married women with children and married men with children. The estimates for married mothers remain positive and statistically significant, but are larger than our main estimates from Table 3.2. The reduced form estimates for fathers are not similar to our main specification from Table 3.6. The reduced form estimates are a combination of the impact of higher levels of the EITC on both eligible and ineligible individuals, and therefore are a combination of the average EITC coefficient and the interaction coefficient in our main specifications. As can be seen from Tables 3.2 and 3.6, ineligible married mothers have higher self-employment rates when there are higher average EITC levels while ineligible married fathers have lower self-employment rates in states and years with higher average ETIC levels. The point estimate on the average EITC from our main specifications is more sensitive to SIPP imputations (Appendix Table D.5) and the inclusion of fixed effects in the model (Appendix Table D.4). The comparison of the reduced form estimates to our main estimates suggests that our strategy of comparing ineligible individuals to eligible individuals may be controlling for important changes

in self-employment behavior that are not being fully captured by the fixed effects in the model.

3.7 Conclusion

In this paper, we examine the relationship between the EITC and self-employment among married mothers. Our main results find that increases in EITC generosity between 1990 and 2012 resulted in around a 4 percentage point increase in self-employment rates among married mothers. As a small share of the total labor force is self-employed, these effects represents a relatively large increase in self-employment behavior.

These findings corroborate previous work indicating an increase in reporting of self-employment earnings associated with the EITC by showing an increase in work effort as well (LaLumia (2009)). This is in contrast to the findings in Kuka (2013), who estimates much smaller increases in self-employment behavior when using survey data. The author focuses on unmarried individuals, who in our sample are far less likely to be self-employed perhaps making it more difficult to find a precise estimate using survey data. Indeed, in our own analysis of single mothers, we find no significant increase in self-employment among those eligible for the EITC as a function of EITC generosity. Our analysis also differs from previous work in that we are able to measure self-employment patterns at a more frequent interval (quarterly) than that in annual datasets. Because self-employment transitions are relatively common, assessing employment at the annual level may be too crude a measurement for capturing short spells in self-employment.

Our paper provides evidence that the EITC encourages self-employment among married women with children. Future work should focus on further distinguishing between the tax evasion motivation and the income effect. If the credit induces women to become self-employed to avoid taxes and better maximize their credit that would provide further evidence that the EITC distorts labor supply. However, if it is the increase in income that allows women to pursue self-employment, then these results might suggest the presence of credit constraints.

Finally, our analysis uses a different source of exogenous variation in EITC generosity and a different empirical strategy than previous work on the ETIC, self-employment and married women's labor supply, and we find somewhat different results. LaLumia (2009), Kuka (2013), and Eissa and Hoynes (2004) all utilize federal variation in the EITC from the early 1990s, with different associated treatment and control groups. While this paper has speculated on some of the differences between various empirical strategies for estimating the effect of the EITC on employment behavior, we leave it to future work to more

deeply investigate the underlying reasons for the mixed evidence on the EITC and married women's employment.

Tables and Figures

Figure 3.1: 2014 EITC Benefit Structure by Number of Children

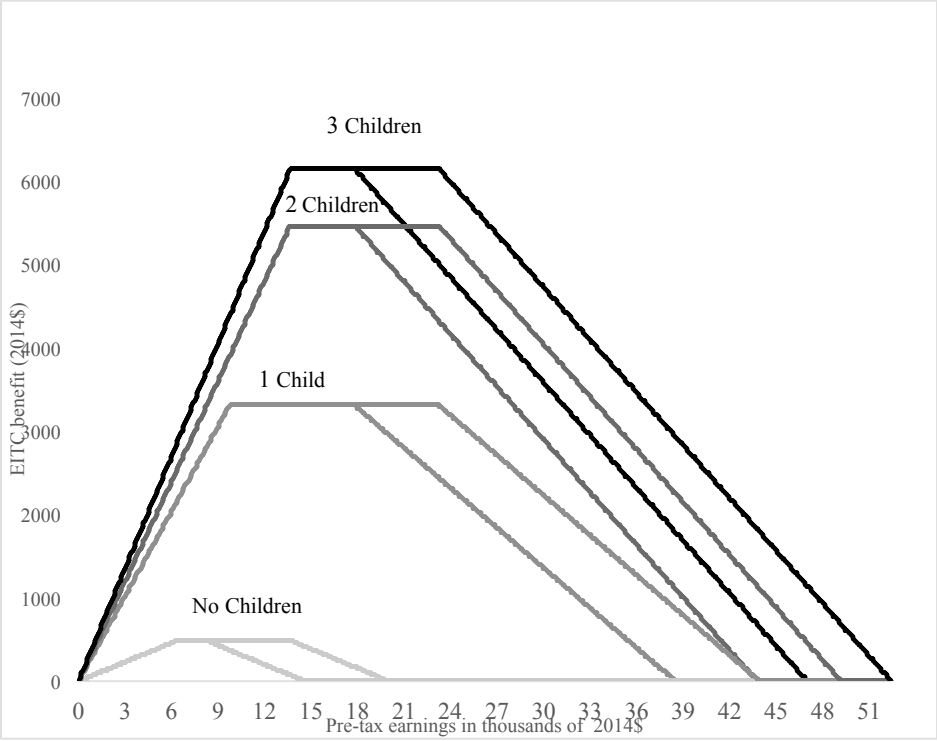


Figure 3.2: Average Household EITC by Year; Simulated Instrument

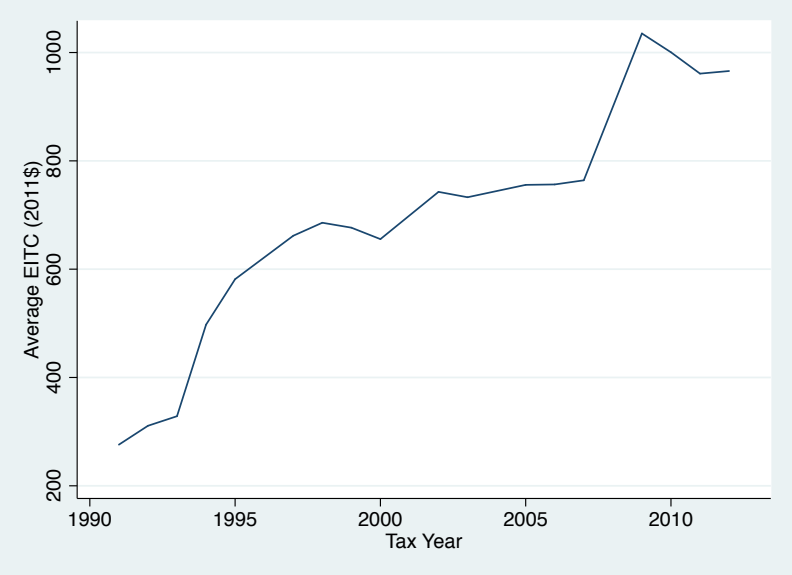


Figure 3.3: Average Household EITC by State and Year; Simulated Instrument

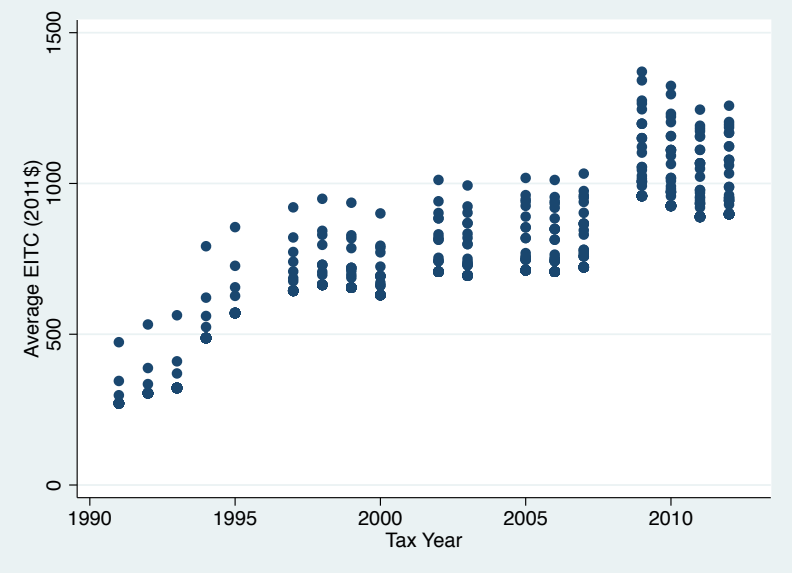


Table 3.1: Summary Statistics by EITC-eligibility

	All	EITC-eligible	Not EITC-eligible
Average EITC-simulated instrument (2011$)	761.80	772.14	757.82
Fraction of Sample:			
EITC-eligible	0.28	1.00	0.00
On Phase-in or Plateau	0.09	0.30	0.00
On Phase-out	0.19	0.70	0.00
Self-Employed: Positive Hours	0.083	0.065	0.090
Self-Employed: Positive Earnings	0.048	0.034	0.053
Wage and Salary Employed: Positive Hours	0.654	0.496	0.714
Both Self-Employed and Wage and Salary Employed: Positive Hours	0.024	0.015	0.027
High School or Less	0.36	0.60	0.27
Some College	0.34	0.30	0.35
College Degree	0.30	0.10	0.38
Monthly Self-Employment Earnings (2011$)	107.17	45.78	130.55
Weekly Self-Employment Hours	1.60	1.14	1.77
Weekly Wage and Salary Hours	23.62	17.12	26.10
Number of Children Under 19	2.0	2.1	1.9
Number of Person-Quarter Observations	261,781	70,555	191,226

Notes: Sample includes married women 18-55 years of age with at least one child under 19 living with them during their first year in the SIPP. Data come from the 1990-1993, 1996, 2001, 2004, and 2008 panels of the SIPP. Observations exclude the first calendar year of data and only include the reference month for the survey. Estimates are weighted using monthly weights.

Table 3.2: Effect of Average EITC on Likelihood of Different Employment Types: Married Mothers

	Self-Employed (Hours)	**Wage & Salary Employed (Hours)**	**Both Self-Employed and Wage & Salary Employed (Hours)**	**Working**
Average EITC ($1,000s)[1]	0.079**	0.048	0.028	0.098
	(0.036)	(0.124)	(0.03)	(0.133)
EITC-eligible[2]	-0.055***	-0.144***	-0.016***	-0.183***
	(0.013)	(0.032)	(0.005)	(0.029)
Average EITC*EITC-eligible	0.062***	-0.029	0.016**	0.017
	(0.017)	(0.042)	(0.006)	(0.038)
Mean of Dependent Variable	0.083	0.654	0.024	0.710
State Fixed Effects	X	X	X	X
Year Fixed Effects	X	X	X	X
Month Fixed Effects	X	X	X	X
State-Specific Linear Time Trends	X	X	X	X
Number of Observations	261,781	261,781	261,781	261,781

Notes: Sample includes married women 18-55 of age with at least one child under 19 living with them during their first year in the SIPP. Data come from the 1990-1993, 1996, 2001, 2004, and 2008 panels of the SIPP. Individuals with negative earnings in their first year of the survey were dropped from the sample. Observations exclude the first calendar year of data and only include the reference month for the survey. Estimates are weighted and standard errors are clustered at the state level. All regressions control for the state minimum wage, unemployment rate, and top state marginal income tax rate. *p<0.1, **p<0.05, ***p<0.01

[1] Average EITC is calculated for each state and year using the state level EITC rules applied to a nationally representative sample using TAXSIM.

[2] Eligibility for the EITC is determined using income and family structure from the first year of the survey. Households with no earned income are considered eligible for the EITC.

Table 3.3: Effect of Average EITC on Quarterly Transitions To and From Self-Employment: Married Mothers

	Transitions to Self-Employment	**Transitions From Self-Employment**
Average EITC ($1,000s)	0.0203**	-0.0063
	(0.0070)	(0.0133)
EITC-eligible	-0.0079***	-0.0040**
	(0.0021)	(0.0019)
Average EITC*EITC-eligible	0.0106***	0.0050**
	(0.0026)	(0.0023)
Mean of Dependent Variable	0.0073	0.0075
State Fixed Effects	X	X
Year Fixed Effects	X	X
Month Fixed Effects	X	X
State-Specific Linear Time Trends	X	X
Number of Observations	261,781	261,781

Notes: Indicators for self-employment are dummy variables equal to one if the respondent reports positive hours of work in that type of employment, zero otherwise. Sample includes married women 18-55 of age with at least one child under 19 living with them during their first year in the SIPP. Data come from the 1990-1993, 1996, 2001, 2004, and 2008 panels of the SIPP. Individuals with negative earnings in the first year were dropped from the sample. Observations exclude the first calendar year of data and only include the reference month for the survey. Estimates are weighted and standard errors are clustered at the state level. All regressions control for the state minimum wage, unemployment rate, and top state marginal income tax rate. *p<0.1, **p<0.05, ***p<0.01

Table 3.4: Effect of Average EITC on Self-Employment Earnings and Hours Worked: Married Mothers

	Monthly Self-Employment Earnings ($1,000s)	**Self-Employment Hours**	**Wages and Salary Hours**
Average EITC ($1,000s)[1]	238.92**	1.69	1.84
	(110.67)	(1.45)	(4.56)
EITC-eligible[2]	-46.70	-1.51***	-5.965***
	(33.95)	(0.53)	(1.36)
Average EITC*EITC-eligible	4.48	1.72**	-1.53
	(40.19)	(0.66)	(1.70)
Mean of Dependent Variable	98.00	1.74	35.52
State Fixed Effects	X	X	X
Year Fixed Effects	X	X	X
Month Fixed Effects	X	X	X
State-Specific Linear Time Trends	X	X	X
Number of Observations	261,781	261,781	261,781

Notes: Sample includes married women 18-55 of age with at least one child under 19 living with them during their first year in the SIPP. Data come from the 1990-1993, 1996, 2001, 2004, and 2008 panels of the SIPP. Individuals with negative earnings in the first year were dropped from the sample. Observations exclude the first calendar year of data and only include the reference month for the survey. Estimates are weighted and standard errors are clustered at the state level. All regressions control for the state minimum wage, unemployment rate, and top state marginal income tax rate. *p<0.1, **p<0.05, ***p<0.01

[1] Average EITC is calculated for each state and year using the state level EITC rules applied to a nationally representative sample using TAXSIM.

[2] Eligibility for the EITC is determined using income and family structure from the first year of the survey. Households with no earned income are considered eligible for the EITC.

Table 3.5: Effect of Average EITC on Likelihood of Different Employment Types by EITC Region: Married Mothers

	Self-Employed (Hours)	**Wage & Salary Employed (Hours)**	**Both Self-Employed and Wage & Salary Employed (Hours)**	**Working**
Average EITC ($1,000s)	0.087***	0.047	0.031	0.104
	(0.036)	(0.125)	(0.029)	(0.136)
Phase in	-0.049	-0.243***	-0.027**	-0.265***
	(0.032)	(0.047)	(0.011)	(0.051)
Average EITC*Phase in	0.086**	0.081	0.033**	0.135*
	(0.042)	(0.059)	(0.016)	(0.067)
Plateau	-0.123**	-0.131	-0.025**	-0.229***
	(0.049)	(0.079)	(0.012)	(0.082)
Average EITC*Plateau	0.157**	-0.030	0.033*	0.095
	(0.070)	(0.095)	(0.017)	(0.100)
Phase-out	-0.028*	-0.042	-0.005	-0.064*
	(0.016)	(0.041)	(0.007)	(0.036)
Average EITC*Phase out	0.025	-0.086	0.002	-0.063
	(0.021)	(0.052)	(0.009)	(0.045)
Mean of Dependent Variable	0.083	0.654	0.024	0.710
State Fixed Effects	X	X	X	X
Year Fixed Effects	X	X	X	X
Month Fixed Effects	X	X	X	X
State-Specific Linear Time Trends	X	X	X	X
Number of Observations	261,781	261,781	261,781	261,781

Notes: Sample includes married women 18-55 of age with at least one child under 19 living with them during their first year in the SIPP. Data come from the 1990-1993, 1996, 2001, 2004, and 2008 panels of the SIPP. Individuals with negative earnings in their first year of the survey were dropped from the sample. Observations exclude the first calendar year of data and only include the reference month for the survey. Estimates are weighted and standard errors are clustered at the state level. All regressions control for the state minimum wage, unemployment rate, and top state marginal income tax rate. *p<0.1, **p<0.05, ***p<0.01

[1] Average EITC is calculated for each state and year using the state level EITC rules applied to a nationally representative sample using TAXSIM.

[2] Eligibility for the EITC is determined using income and family structure from the first year of the survey. Households with no earned income are considered eligible for the EITC.

Table 3.6: Effect of Average EITC on Likelihood of Different Employment Types: Married Fathers, Married Childless Women, and Single Mothers

	Self-Employed (Hours)	Wage & Salary Employed (Hours)	Both Self-Employed and Wage & Salary Employed (Hours)	Working
Married Fathers				
Average EITC ($1,000s)[1]	-0.189*	-0.031	-0.102	-0.117**
	(0.106)	(0.061)	(0.061)	(0.051)
EITC-eligible[2]	-0.045	-0.156***	-0.058***	-0.143***
	(0.029)	(0.032)	(0.011)	(0.019)
Average EITC*EITC-eligible	0.077**	0.034	0.067***	0.044*
	(0.034)	(0.037)	(0.015)	(0.024)
Mean of Dependent Variable	0.162	0.824	0.049	0.937
Number of Observations	244,933	244,933	244,933	244,933
Single Mothers				
Average EITC ($1,000s)[1]	-0.073	0.093	-0.046	0.066
	(0.078)	(0.212)	(0.034)	(0.177)
EITC-eligible[2]	-0.013	-0.172***	-0.013*	-0.172***
	(0.014)	(0.040)	(0.008)	(0.038)
Average EITC*EITC-eligible	0.026	0.111**	0.013	0.123***
	(0.017)	(0.047)	(0.009)	(0.045)
Mean of Dependent Variable	0.042	0.693	0.014	0.721
Number of Observations	127,546	127,546	127,546	127,546
Childless Married Women				
Average EITC ($1,000s)[1]	0.059	-0.106	-0.012	-0.034
	(0.072)	(0.167)	(0.042)	(0.173)
EITC-eligible[2]	-0.064***	-0.021	-0.02	-0.064
	(0.023)	(0.056)	(0.042)	(0.053)
Average EITC*EITC-eligible	0.090***	-0.138*	0.023	-0.071
	(0.030)	(0.069)	(0.017)	(0.061)
Mean of Dependent Variable	0.080	0.709	0.024	0.775
Number of Observations	145,120	145,120	145,120	145,120
State Fixed Effects	X	X	X	X
Year Fixed Effects	X	X	X	X
Month Fixed Effects	X	X	X	X
State-Specific Linear Time Trends	X	X	X	X

Notes: Sample includes individuals 18-55 of age. Married fathers and single mothers have at least one child under 19 living with them during their first year in the SIPP. Data come from the 1990-1993, 1996, 2001, 2004, and 2008 panels of the SIPP. Individuals with negative earnings in their first year of the survey were dropped from the sample. Observations exclude the first calendar year of data and only include the reference month for the survey. Estimates are weighted and standard errors are clustered at the state level. All regressions control for the state minimum wage, unemployment rate, and top state marginal income tax rate. *p<0.1, **p<0.05, ***p<0.01

[1] Average EITC is calculated for each state and year using the state level EITC rules applied to a nationally representative sample using TAXSIM.

[2] Eligibility for the EITC is determined using income and family structure from the first year of the survey. Households with no earned income are considered eligible for the EITC.

Table 3.7: Effect of Average EITC on Likelihood of Self-Employment: Married Women with 12 or Fewer Years Education; Comparing Different Control Groups

	(1)	(2)	(3)	(4)	(5)
	Simulated Instrument-Married Women with Kids	**Simulated Instrument-Married Women**	**Narrow**	**Broad**	**Diff in Diff**
EITC Eligibility Group					
Income Ineligible; Childless	Excluded	Control	Control	Control	Control
Income Eligible; Childless	Excluded	Treated	Treated	Control	Control
Income Ineligible: With Children	Control	Control	Treated	Control	Treated
Income Eligible; With Children	Treated	Treated	Treated	Treated	Treated
Dependent Variable: Self-Employed (Hours)					
Average EITC ($1,000s)[1]	0.004	0.030	0.031	0.044	0.052
	(0.082)	(0.060)	(0.065)	(0.060)	(0.062)
EITC-eligible[2]	-0.067***	-0.068***	-0.026	-0.055***	-0.004
	(0.021)	(0.018)	(0.017)	(0.019)	(0.017)
Average EITC*EITC-eligible	0.071**	0.079***	0.033	0.055**	-0.001
	(0.028)	(0.024)	(0.021)	(0.026)	(0.021)
Mean of Dependent Variable	0.065	0.065	0.065	0.065	0.065
Dependent Variable: Wage and Salary Employment (Hours)					
Average EITC ($1,000s)[1]	-0.070	-0.077	-0.043	-0.095	-0.088
	(0.151)	(0.138)	(0.141)	(0.136)	(0.147)
EITC-eligible[2]	-0.179***	-0.115***	0.052	-0.142***	0.084***
	(0.044)	(0.025)	(0.032)	(0.034)	(0.028)
Average EITC*EITC-eligible	0.000	-0.089***	-0.186***	-0.013	-0.0814**
	(0.057)	(0.030)	(0.040)	(0.044)	(0.038)
Mean of Dependent Variable	0.593	0.593	0.593	0.593	0.593
Dependent Variable: Working					
Average EITC ($1,000s)[1]	-0.108	-0.086	-0.051	-0.092	-0.078
	(0.144)	(0.138)	(0.136)	(0.134)	(0.144)
EITC-eligible[2]	-0.228***	-0.168***	-0.031	-0.184***	0.0824***
	(0.037)	(0.020)	(0.031)	(0.032)	(0.028)
Average EITC*EITC-eligible	0.054	-0.022	-0.153***	0.031	-0.080**
	(0.050)	(0.027)	(0,040)	(0.043)	(0.038)
Mean of Dependent Variable	0.644	0.644	0.644	0.644	0.644
State Fixed Effects	X	X	X	X	X
Year Fixed Effects	X	X	X	X	X
Month Fixed Effects	X	X	X	X	X
State-Specific Linear Time Trends	X	X	X	X	X
Number of Observations	102,178	157,555	157,555	157,555	157,555

Notes: Sample includes married women 18-55 of age who have a high school education or less. Data come from the 1990-1993, 1996, 2001, 2004, and 2008 panels of the SIPP. Individuals with negative earnings in their first year of the survey were dropped from the sample. Observations exclude the first calendar year of data and only include the reference month for the survey. Estimates are weighted and standard errors are clustered at the state level. All regressions control for the state minimum wage, unemployment rate, and top state marginal income tax rate. *p<0.1, **p<0.05, ***p<0.01

[1] Average EITC is calculated for each state and year using the state level EITC rules applied to a nationally representative sample using TAXSIM.

[2] Eligibility for the EITC is determined using income and family structure from the first year of the survey. Households with no earned income are considered eligible for the EITC.

Table 3.8: Effect of Average EITC on Likelihood of Different Employment Types: Married Mothers; Reduced Form Specification

	Self-Employed (Hours)	**Self-Employed (Earnings)**	**Wage & Salary Employed (Hours)**	**Both Self-Employed and Wage & Salary Employed (Hours)**	**Working**
Married Mothers:					
Average EITC ($1,000s)[1]	0.092**	0.093***	0.014	0.031	0.075
	(0.038)	(0.028)	(0.116)	(0.029)	(0.125)
Number of Observations	261,781	261,781	261,781	261,781	261,781
Married Fathers:					
Average EITC ($1,000s)[1]	-0.170	-0.024	-0.041	-0.088	-0.122**
	(0.103)	(0.072)	(0.064)	(0.061)	(0.061)
Number of Observations	244,933	244,933	244,933	244,933	244,933
State Fixed Effects	X	X	X	X	X
Year Fixed Effects	X	X	X	X	X
Month Fixed Effects	X	X	X	X	X
State-Specific Linear Time Trends	X	X	X	X	X

Notes: Sample includes married individuals 18-55 of age with at least one child under 19 living with them during their first year in the SIPP. Data come from the 1990-1993, 1996, 2001, 2004, and 2008 panels of the SIPP. Individuals with negative earnings in their first year of the survey were dropped from the sample. Observations exclude the first calendar year of data and only include the reference month for the survey. Estimates are weighted and standard errors are clustered at the state level. All regressions control for the state minimum wage, unemployment rate, and top state marginal income tax rate. *p<0.1, **p<0.05, ***p<0.01

[1] Average EITC is calculated for each state and year using the state level EITC rules applied to a nationally representative sample using TAXSIM.

APPENDIX A

Additional Tables and Figures Chapter 1

Table A.1: Top Occupations Among Self-Employed Women Over Time

All Women

1980		1990		2000		2012	
	Share		**Share**		**Share**		**Share**
Managers	10.4	Childcare Worker	12.5	Childcare Workers	11.8	Childcare Workers	7.7
Hairdressers	9.3	Hairdresser	7.1	Hairdressers	6.6	Hairdressers	6.5
Sales Supervisors	7.5	Sales Supervisor	5.7	Housekeepers	5.7	Housekeepers	4.9
Childcare Workers	6.4	Managers	4.5	Sales Supervisors	4.5	Real Estate Agents	4.8
Farmers	5.8	Bookkeepers	4.3	Real Estate Agents	3.4	Secretaries	4.1
Bookkeepers	5.3	Farmers	4.0	Bookkeepers	3.1	Sales Supervisor	4.0
Real Estate Agents	3.8	Real Estate Agents	4.0	Salesperson	2.9	Bookkeepers	3.1
Secretaries	3.5	Secretaries	3.1	Secretaries	2.7	Managers	2.7
Other Teachers	3.4	Salesperson	2.7	Farmers/Ranchers	2.7	Designers	2.5
Salesperson	3.1	Designers	2.5	Designers	2.4	Other Teachers	2.5
Door to Door Sales	2.6	Janitors	2.5	Other Teachers	2.0	Salesperson	2.2
Designers	2.0	Other Teachers	2.2	Accountants	1.6	Accountants	2.0
	63.1		55.1		49.5		46.9

Women with Bachelor's Degree

1980		1990		2000		2012	
	Share		**Share**		**Share**		**Share**
Other Teachers	8.8	Managers	5.6	Lawyers	4.7	Real Estate Agents	5.4
Physicians	8.3	Other Teachers	5.3	Other Teachers	4.4	Other Teachers	4.9
Managers	6.9	Real Estate Agents	5.1	Designers	4.2	Designers	4.0
Lawyers	6.9	Sales Supervisors	5.1	Real Estate Agents	4.0	Accountants	4.0
Psychologists	5.3	Childcare Workers	4.4	Sales Supervisors	3.9	Lawyers	3.9
Sales Supervisors	4.3	Designers	4.3	Childcare Workers	3.9	Sales Supervisor	3.5
Artists	3.9	Lawyers	3.9	Accountants	3.7	Management Analysts	3.3
Real Estate Agents	3.8	Psychologists	3.6	Management Analysts	3.4	Physicians/Surgeons	3.2
Authors	3.6	Physicians	3.5	Psychologists	3.0	Managers	3.1
Designers	2.9	Artists	3.0	Physicians/Surgeons	2.9	Childcare Workers	3.1
Farmers	2.0	Accountants	2.9	Writers/Authors	2.6	Psychologists	2.7
Management Analysts	2.0	Bookkeepers	2.6	Salesperson	2.5	Secretaries	2.1
	58.7		49.2		43.0		43.2

Notes: 1980, 1990, and 2000 data come from the Census 5% sample and 2012 data come from the ACS. Data were downloaded from IPUMS and estimates include all self-employed women ages 18-65 and are weighted using person weights.

Table A.2: Second Stage Parameters and Identifying Variation

Parameter	Description	Main Source of Identifying Variation
	Utility Parameters	
β_1^{ws}	Marginal Utility Consumption Wage and Salary Employment	Differences in wage and salary employment rates by similar women with different earning spouses.
β_1^{se}	Marginal Utility Consumption Self-Employment	Differences in self-employment rates by similar women with different earning spouses.
β_2^{ws}	Cost Wage and Salary Employment	Conditional on earnings; identified by the overall share of women selecting wage and salary employment relative to non-employment
β_2^{se}	Cost Self-Employment	Conditional on earnings; identified by the overall share of women selecting self-employment relative to non-employment.
β_3^{ws}	Cost Wage and Salary Employment Associated with Youngest Child 0-5	Identified by differences in wage and salary employment rates between similar women with a youngest child aged 0-5 and those without a child under 10 years of age.
β_3^{se}	Cost Self-Employment Associated with Youngest Child 0-5	Identified by differences in self-employment rates between similar women with a youngest child aged 0-5 and those without a child under 10 years of age.
β_4^{ws}	Cost of Wage and Salary Employment Associated with Youngest Child 6-9	Identified by differences in wage and salary employment rates between similar women with a youngest child aged 6-9 and those without a child under 10 years of age.
β_4^{se}	Cost of Self-Employment Associated with Youngest Child 6-9	Identified by differences in self-employment rates between similar women with a youngest child aged 6-9 and those without a child under 10 years of age.
β_5^{se}	Entry Cost of Self-Employment	Identified by fraction ever becoming self-employed.
β_6	Linear Term Utility Children	Identified by distribution of number of children
β_7	Quadratic Term Utility Children	Identified by distribution of number of children
ρ	Measure of Variance of epsilon	Identified by extent to which observed decisions differ from predictions from the model net of epsilon shocks.
	Earnings Parameters	
γ_0	Intercept	Identified by average earnings in data
γ_1	Unemployment	Identified by differences in earnings of similar women in years with different economic conditions
$f(D_t^{ws}, D_t^{se}, D_t^{ne})$	Piece-wise Linear Terms for Experience Levels	Identified by differences in earnings across similar women with different experience levels
$\boldsymbol{\gamma}$	Education	Identified by average differences in earnings for women with similar experience levels but different education
	Type Specific Parameters	
β_6^k	Linear Term Utility Children	Differences across types are identified by the distribution of the number of children conditional on the opportunity cost of children for that type.
β_7^k	Quadratic Term Utility Children	Differences across types are identified by the distribution of the number of children conditional on the opportunity cost of children for that type.
γ_0^k	Earnings Intercept	Differences across types are identified by differences in average earnings and choices persistent over time for an individual.

Table A.3: Always Married Versus Divorced Individuals

	Always Married	**Divorced**	**P-Value Equality**
Age	36.1	34.2	0.000
Age at Marriage	25.2	22.2	0.000
Number of Kids	1.9	1.9	0.621
High School or Less	43.0	54.6	0.000
Some College	22.5	25.8	0.081
Bachelor's Degree	34.5	19.5	0.000
Person-Year Observations	23,851	19,077	
N	1,035	979	
Choices			
Wage and Salary No Birth	63.0	61.3	0.000
Wage and Salary Birth	3.6	3.3	0.219
Self-Employment No Birth	6.2	5.5	0.003
Self-Employment Birth	0.4	0.4	0.611
Not Employed No Birth	23.2	25.3	0.000
Not Employed Birth	3.7	4.2	0.004

Notes: Column 2 shows summary statistics for the estimation sample, which includes women who are always married. Column 3 shows the same statistics for women who divorce in the data for the years in which they are married. Column 4 provides the p-value for a test of equality of means.

Table A.4: Weekly Child Care Expenditures; Positive Payment and Weekly Amount

Variables	Marginal Effects Probability of Payment	Conditional Expenditure (2000$)
Youngest Child 0-1	0.391**	50.63 **
	[0.009]	[1.526]
Youngest Child 2-5	0.397**	35.69 **
	[0.008]	[1.292]
2 Children	–0.038**	15.20 **
	[0.007]	[1.004]
3 Children	–0.113**	8.53 **
	[0.009]	[1.647]
4+ Children	–0.153**	8.36 **
	[0.012]	[2.166]
Self-Employed	–0.252**	–5.86 *
	[0.011]	[2.601]
Mother's Age	0.029**	4.44 **
	[0.004]	[0.662]
Mother's Age Squared	-4E-4**	–0.05 **
	[6E-5]	[0.010]
Some College	0.045**	7.39 **
	[0.008]	[0.010]
Bachelor's Degree	0.128**	24.50 **
	[0.008]	[1.264]
Year Since 1985	–0.006**	1.75 **
	[0.001]	[0.092]
Constant		–68.04 **
		[10.618]
N	42,463	16,923
R^2		0.156

Notes: Column 1 shows the marginal effects evaluated at the mean values of the independent variables from a probit where the dependent variable is an indicator for positive child care expenditures. The dependent variable in column 2 is the total weekly expenditure on child care services. Data are from SIPP panels 1984-2008. The sample includes employed married women living with at least one child under 10. Standard errors are clustered at the individual level and *p<0.05, **p<0.01

Table A.5: Husband's Log Income (2000$); Predicted by Wife's Characteristics

	Estimate	Standard Error
Linear Spline in Age		
18-24	0.070*	[0.012]
25-29	0.032*	[0.006]
30-34	0.016*	[0.006]
35-39	0.017*	[0.006]
40 Plus	0.002	[0.004]
Linear Spline in Age X College Educated		
18-24	–0.045	[0.037]
25-29	0.038*	[0.015]
30-34	0.021*	[0.010]
35-39	–0.006	[0.010]
40 Plus	0.011*	[0.006]
Unemployment Rate	–0.029*	[0.005]
Person-Year Observations	13,865	
R^2	0.59	

Notes: Dependent variable is the log of husband's annual earnings; independent variables are characteristics of the wife. Regressions include individual fixed effects. Sample includes women from the NLSY79 who are never observed to be divorced during the sample period. Only estimation years are included in the regression and standard errors are clustered at the individual level. *p<0.05

Table A.6: Log Earnings Residuals by Children and Employment Type

	Residuals (Data-Predicted)
Youngest Child 0-5	–0.162*
	[0.027]
Youngest Child 6-9	–0.160*
	[0.025]
Youngest Child 0-5	–0.174
***Self-Employed**	[0.123]
Youngest Child 6-9	0.024
***Self-Employed**	[0.133]
Self-Employed	0.068
	[0.101]

Notes: Regression to investigate systematic mis-predictions of earnings by presence of youngest child and employment type. I regress indicators for having a youngest child in each age category and interactions with self-employment status on the residuals from the log earnings predictions from the model. Standard errors are clustered at the individual level.

Table A.7: Fraction of Workers with Schedule Flexibility by Broad Occupation Group

Occupation Group	Fraction With Schedule Flexibility		Fraction of Workers in Occupation	
	Wage & Salary	Self-Emp.	Wage & Salary	Self-Emp.
Forestry, Fisher, Hunter/Trapper	37	34	0.1	0.5
Social, Recreation and Religious Workers	35	69	0.9	0.4
Mathematical/Computer Scientists, Nat Scientists	34	54	1.2	0.8
Lawyers and Judges	32	41	0.5	2.0
Writers, Artists, Entertainers and Athletes	28	51	1.2	4.9
Postsecondary Teachers	28	.	0.7	0.0
Non-Retail Sales	26	42	4.2	13.1
Social Scientists	23	62	0.3	0.6
Executive, Administrative and Managerial	22	42	9.3	14.2
Engineers, Architects, and Surveyors	22	70	1.9	0.7
Farmers-Related Agricultural	21	55	1.9	11.8
Technologists-Non-Health	21	51	2.2	0.8
Management Related	18	47	3.6	2.3
Retail Sales	18	46	6.7	5.2
Private Household Services	16	68	0.9	0.7
Health Assessment and Treating, Therapists	15	34	2.1	0.6
Health Diagnosing	14	31	0.5	3.3
Other Service-Cleaning, Other Personal Services	14	29	3.5	9.6
Administrative Support	13	55	16.4	3.7
Supervisors Administrative	11	100	0.5	0.0
Transportation and Material Moving	11	43	4.3	3.0
Food Service	10	27	4.3	0.8
Protective Services	9	44	1.8	0.1
Construction	9	45	3.8	10.3
Health Technologists	9	67	1.3	0.1
Mechanics and Repairers	8	40	4.2	4.0
Health Service	8	33	2.0	0.2
Handlers, Equipment Cleaners and Laborers	7	40	4.1	0.6
Precision Production	7	46	3.1	2.2
Extractive	6	12	0.1	0.1
Plant and Systems Operators	5	100	0.3	0.0
Teachers Not Postsecondary and Librarians	5	41	4.1	1.7
Machine Operators, Assemblers and Inspectors	4	49	8.1	1.8
Mean Across Occupations	0.17	0.49		
Standard Deviation	0.10	0.18		
Mean in Estimation Sample	0.15	0.47		
Standard Deviation	0.07	0.11		

Notes: Data from May 1989 CPS supplement and show fraction of individuals answering that they are able to change when they work. Mean values across occupations are average with equal weight to each occupation, while mean values in estimation sample are mean values across the women in the estimation sample based on their assigned occupation.

Table A.8: Fraction of Part-Time Workers by Broad Occupation Group

Occupation Group	Fraction of Workers Part Time		Fraction of Workers in Occupation	
	Wage & Salary	Self-Emp.	Wage & Salary	Self-Emp.
Food Service	47	19	6.6	1.5
Private Household Services	44	64	2.2	1.1
Retail Sales	44	53	9.1	8.2
Other Service-Cleaning, Other Personal Services	40	36	4.0	18.8
Postsecondary Teachers	40	.	0.6	0.0
Transportation and Material Moving	38	35	0.8	0.7
Farmers-Related Agricultural	34	39	0.7	6.2
Health Service	26	32	3.6	0.8
Handlers, Equipment Cleaners and Laborers	26	37	1.7	0.4
Writers, Artists, Entertainers and Athletes	26	42	1.2	7.1
Protective Services	24	28	0.6	0.0
Health Technologists	23	32	2.1	0.3
Health Assessment and Treating, Therapists	23	36	3.7	1.1
Forestry, Fisher, Hunter/Trapper	23	32	0.0	0.1
Administrative Support	20	46	28.5	10.9
Construction	19	39	0.2	0.9
Teachers Not Postsecondary and Librarians	18	68	6.0	2.8
Social, Recreation and Religious Workers	17	49	1.0	0.3
Precision Production	16	42	1.2	2.7
Social Scientists	15	43	0.3	1.1
Technologists-Non-Health	13	37	1.4	0.4
Health Diagnosing	13	20	0.2	1.2
Non-Retail Sales	12	21	2.9	12.7
Machine Operators, Assemblers and Inspectors	12	39	7.7	1.4
Lawyers and Judges	11	17	0.3	0.9
Executive, Administrative and Managerial	10	22	7.1	14.9
Mathematical/Computer Scientists, Nat Scientists	9	31	0.8	0.4
Management Related	9	32	3.5	2.6
Mechanics and Repairers	9	38	0.3	0.4
Plant and Systems Operators	7	21	0.0	0.0
Extractive	7	41	0.0	0.0
Engineers, Architects, and Surveyors	6	33	0.3	0.2
Supervisors Administrative	6	27	0.3	0.2
Mean Across Occupations	0.20	0.35		
Standard Deviation	0.13	0.13		
Mean in Estimation Sample	0.22	0.39		
Standard Deviation	0.12	0.12		

Notes: Data come from the monthly CPS 1980-1999 and tabulate the fraction of childless women that work fewer than 35 hours per week. The mean values across occupations is the average providing equal weight to each occupation, while the mean values in the estimation sample are the mean values across the women in the estimation sample based on their assigned occupation.

Table A.9: Occupational Code Crosswalk

Broad Codes	Description	Standardized NLSY Codes Included
1	Executive, Administrative and Managerial Occupations	3, 4, 7, 8, 13, 14, 15, 16, 17, 18, 19, 21, 22
2	Management Related Occupations	23, 24, 25, 26, 27, 28, 29, 33, 34, 35, 36, 37
3	Engineers, Architects, and Surveyors	43, 44, 45, 47, 48, 53, 55, 56, 57, 59
4	Mathematical and Computer Scientists, Natural Scientists	64, 65, 66, 67, 68, 69, 73, 74, 75, 76, 77, 78, 79, 83
5	Health Diagnosing Occupations	84, 85, 86, 87, 88, 89
6	Health Assessment and Treating Occupations and Therapists	95, 86, 97, 98, 99, 103, 104, 105, 106
7	Teachers Postsecondary	113, 114, 115, 116, 118, 119, 123, 125, 127, 128, 139, 145, 149, 150, 154
8	Teachers Not Postsecondary and Librarians	155, 156, 157, 158, 159, 163, 164, 165
9	Social Scientists	166, 167, 168, 169, 173
10	Social, Recreation and Religious Workers	174, 175, 176
11	Lawyers and Judges	178, 179
12	Writers, Artists, Entertainers, and Athletes	183, 184, 185, 186, 187, 188, 189, 193, 195, 198, 199, 200
13	Health Technologists	203, 204, 205, 206, 207, 208
14	Technologists-Not Health	213, 214, 215, 217, 218, 223, 224, 226, 227, 228, 229, 233, 234, 235
15	Sales Non-retail	243, 253, 243, 255, 256, 258
16	Sales Retail	274, 275, 276, 277, 283
17	Supervisors Admin	303
18	Administrative Support	308, 313, 314, 315, 316, 317, 318, 319, 323, 326, 328, 329, 336, 337, 338, 343, 344, 345, 346, 347, 348, 349, 355, 356, 357, 359, 361, 364, 365, 368, 373, 376, 377, 378, 379, 383, 384, 385, 386, 387, 389
19	Private Household Services	405, 407
20	Protective Services	415, 417, 418, 423, 425, 426, 427
21	Other Service-Food	434, 435, 436, 438, 439, 443, 444
22	Other Service-Health	445, 446, 447
23	Other Service-Cleaning, Other Personal Services	448, 453, 454, 455, 456, 457, 458, 459, 461, 462, 463, 464, 465, 468, 469, 748
24	Farmers-Related Agricultural Occupations	473, 474, 475, 476, 479, 483, 484, 485, 486, 487, 488, 489
25	Forestry-Fisher, hunter, trapper	496, 498
26	Mechanics and Repairers	503, 505, 507, 508, 509, 516, 518, 519, 523, 525, 526, 527, 533, 534, 535, 536, 538, 539, 543, 544, 549
27	Construction	558, 563, 567, 576, 575, 577, 579, 583, 584, 585, 588, 589, 593, 594, 595, 596, 597, 598, 599
28	Extractive Occupations	614, 615, 616, 617
29	Precision Production Occupations	628, 634, 637, 643, 644, 645, 646, 649, 653, 657, 658, 659, 666, 667, 668, 669, 674, 675, 677, 679, 684, 686, 687, 688, 693
30	Plant and Systems Operators	694, 695, 696, 699
31	Machine Operators, Assemblers and Inspectors	703, 706, 708, 709, 713, 717, 719, 723, 724, 726, 727, 728, 729, 733, 734, 735, 736, 738, 739, 743, 744, 745, 747, 749, 753, 754, 755, 756, 757, 759, 763, 764, 765, 766, 768, 773, 774, 779, 783, 784, 785, 789, 796, 799
32	Transportation and Material Moving Occupations	803, 804, 808, 809, 813, 823, 824, 825, 829, 834, 844, 848, 853, 859
33	Handlers, Equipment Cleaners and Laborers	865, 866, 869, 874, 875, 876, 877, 878, 883, 885, 887, 888, 889
34	Military	905

Notes: Standardized NLSY codes follow the categories in Meyer and Osborne (2005). Broad occupation codes follow the broad codes from the 1990s occupational codes from the BLS http://www.bls.gov/nls/quex/r1/y97r1cbka1.pdf.

APPENDIX B

Dataset Construction for Chapter 1

B.0.1 NLSY79 Dataset Construction

Sample Creation

The original NLSY sampling design included a nationally representative sample, an oversample of minorities, and a military sample. My analysis includes non-Black, non-Hispanic women from the nationally representative sample only and includes data through the 2012 survey year. Next, I restrict the sample to women who have observations above the age of 18, after they are no longer enrolled in school and who are observed to marry. I eliminate individuals who have more than one child within a year during the sample, and women who have fewer than five years of data during the estimation period. This sample of 2,078 women makes up the ever married sample of women. My primary sample of always married women, excludes women who are observed to divorce and includes 1,064 women. Finally, 29 additional women are eliminated because they have no spousal income information, which is necessary to estimate the model of husband's income. This leaves a final sample of 1,035 women.

Table B.1 shows how each sample restriction affects the sample size.

Employment, Fertility, Earnings, Demographic Variable Construction

Education

I used both the highest grade attended to assign women into three education categories: high school or less, some college, and a Bachelor's degree or higher. The some college category includes women who had fewer than 4 years of completed college. I assign the highest education level observed in the survey to each woman for all years of the estimation. Around 23% of my sample re-enroll in school after the estimation begins according to the school enrollment variable, but for 77% of those years the women are characterized as working.

Employment

I use the weekly arrays on labor force status created by the NLSY79 staff to characterize women's weekly activity. For each year, I assign the most common status among the weeks in that year. I consider women who were unemployed or out of the labor force to be not employed. I classify women into self-employment and wage and salary employment according to the job they worked at the longest during that year. Ties are broken by assigning the earliest job.

Earnings

Women's earnings are the sum of their weekly earnings across all of their jobs. I use the hourly wage and usual hours worked to construct weekly earnings for each job. I add up the earnings across weeks to get annual earnings. In years when women are self-employed, I take out the employer portion of the payroll tax to make the pre-tax self-employment earnings comparable to the pre-tax wage and salary earnings. The self-employed have to pay both the employee and employer portion of the payroll tax, while the wage and salary earnings are net of the employer portion.

I winsorize hourly wages above $1,000 per hour and below $1 per hour. This change affects around 2.4% of person-years, but it might only affect one of the jobs worked at during that year. I winsorize annual hours of work at 5,200 hours, which affects only 0.1% of person-years.

The alternative earning measure uses the average wage at jobs throughout the year and the total annual hours worked at all jobs. This measure does not apply each job's wage rate to the hours worked at that job, but gets around missing data that arises in the survey because it doesn't collect hours and earnings information from non-main jobs with relatively low levels of hours. The main earnings data are missing for 6.6% of years and the alternative measure is missing for 2.5%. Figures B.1 and B.2 show the distributions for the two earnings measures within wage and salary employment and self-employment. The measures are very similar in years where the individual is wage and salary employed, but a bit different in self-employment years. This is likely because years of self-employment are more likely to have multiple simultaneous jobs and multiple jobs throughout the year. These make the missing data problem more severe and make applying the average wage to all hours worked that year perhaps more inaccurate. Earnings under the alternative measure are higher both because they include the hours worked at very low hour dual jobs and because they apply an average wage rate to all annual hours. Self-employment hourly wages are on average lower than wage and salary hourly wages so this measure of an average

annual wage may be applying too high of a wage to hours worked in self-employment.

I use information on spousal earnings to estimate a model of husband's earnings. Husband's earnings are the sum of spousal income from wage and salary work and business income in each interview year. The top coding rules for income changed over time in the NLSY yielding vastly different maximum values of income across years. In order to make these measures consistent, I follow Armour et al. (2014) and fit a Pareto distribution to the top 20% of incomes by year and assign the estimated mean of the top coded values to all top coded observations.

Fertility

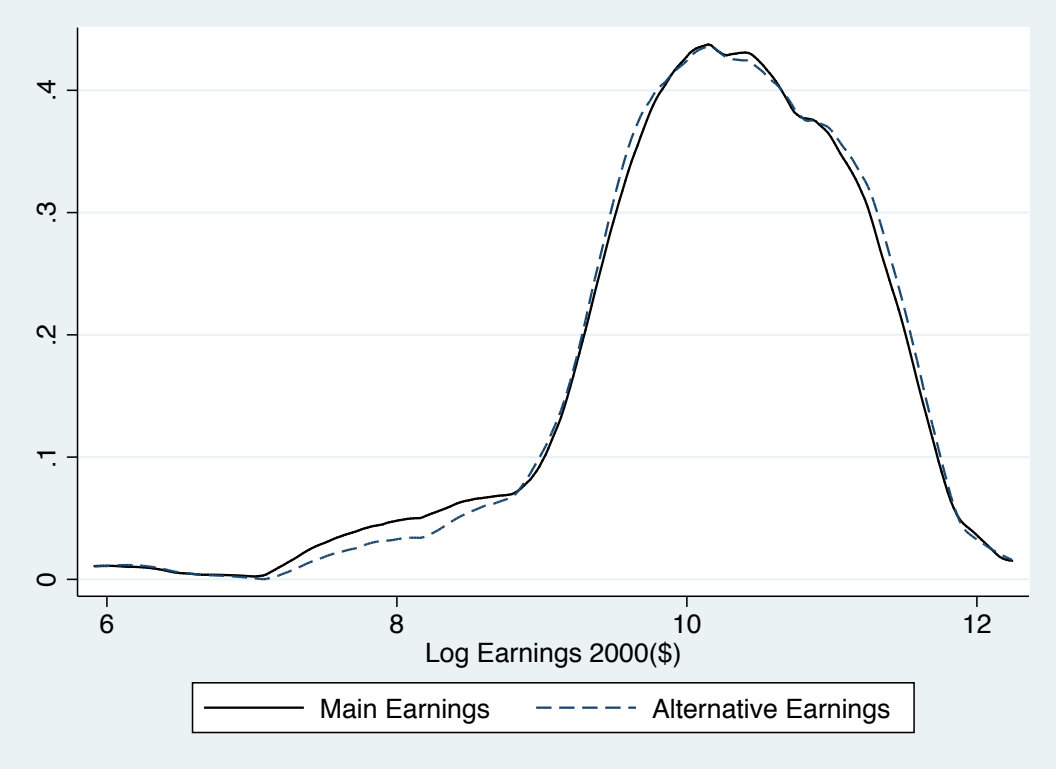
Using the NLSY79 fertility history on children's birth month and year, I assign children born between January and June of year t to that year and children born between July and December of year t to the following year $t + 1$. As previously mentioned, I do not include women in the sample who have more than one child within one year. I do include children born after age 18 but prior to the estimation period. Around 13% of women have children prior to the beginning of estimation so they begin the estimation with children.

Table B.1: Effect of Sample Restrictions on Sample Size

	Sample Size
Full NLSY79 Sample Women	6,283
Eliminate Individuals:	
Military Subsample	5,827
Supplementary Subsample	3,108
Black and Hispanic	2,477
No Observations Over 18, Post Schooling	2,441
Never Marry	2,226
Multiple Births in One Year	2,178
Fewer than 5 Estimation Years	2,078
Ever Divorce in Estimation Period	1,064
No Spousal Income Information	1,035

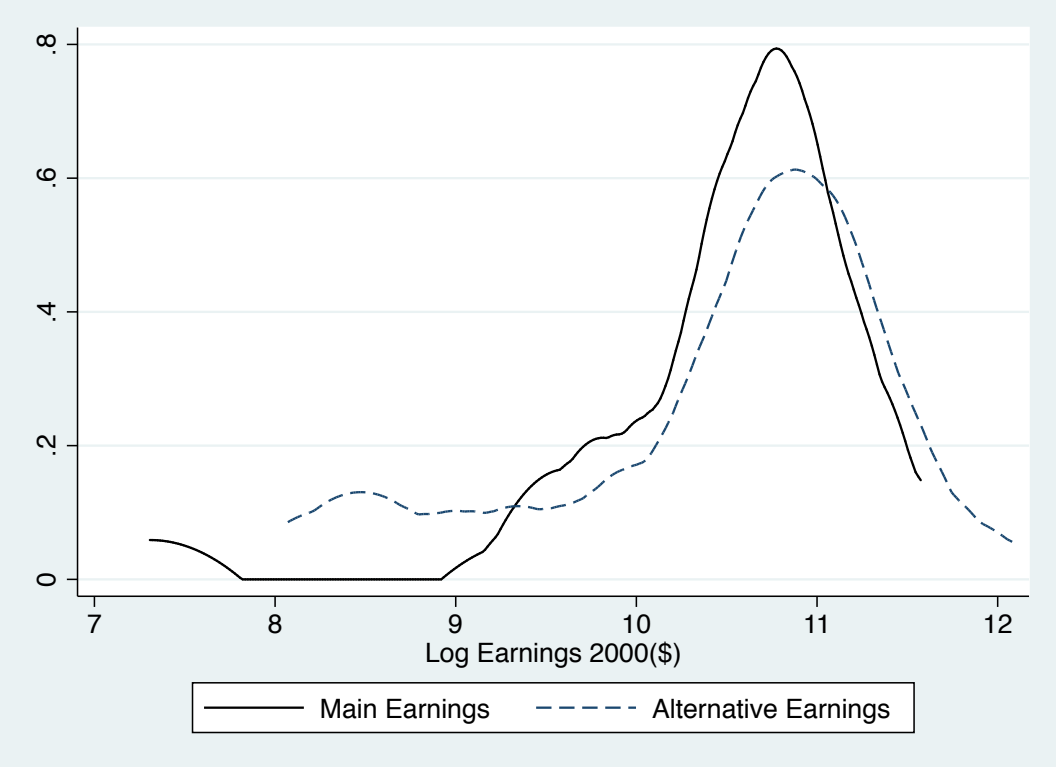
Notes: Data are from the NLSY79.

Figure B.1: Density of Log Earnings in Wage and Salary Employment for Main and Alternative Earnings Measures



Notes: Figure shows the density of log earnings in wage and salary employment for women using two alternative measures of earnings. Data are from the NLSY and sample is estimation sample of married white women.

Figure B.2: Density of Log Earnings in Self-Employment for Main and Alternative Earnings Measures



Notes: Figure shows the density of log earnings in self-employment for women using two alternative measures of earnings. Data are from the NLSY and sample is estimation sample of married white women.

B.0.2 SIPP Child Care Expenditure Dataset Construction

Child care expenditure questions have been asked in SIPP topical modules in all panels. See Table B.2 for details on which month child care questions were asked across panels. I focus on creating a consistent measure of weekly expenditures on child care for all children. The SIPP asks whether monetary payment is usually made and for families who make a monetary payment the survey asks for the total expenditures for a typical week. If the survey asks about payments for each child individually, I sum up the payments. Child care expenditures are only available consistently for employed mothers. Additionally, my analysis limits the sample to women with at least one child under the age of 10. Other covariates used from the SIPP include the age of the woman's youngest child, the number of children, her own age, education level and race, the year of the survey and the self-employment status of the mother. Women are considered self-employed if they worked in their own business more hours than they worked at a wage and salary job.

Table B.2: SIPP Child Care Data Used

SIPP Panel Year	Wave	Month, Year Interview
1984	5	May 1986
1985	6	Jan 1987
1986	3,6	Jan 1987, Jan 1988
1987	3,6	Jan 1988, Jan 1989
1988	3,6	Jan 1989, Jan 1990
1989	3	Jan 1990
1990	3	Jan 1991
1991	3	Jan 1992
1992	6,9	Jan 1994, Jan 1995
1993	3,6	Jan1994, Jan 1995
1996	4,10	Jul 1997, Jul 1999
2001	4	May 2002
2004	4	May 2005
2008	5,8	Apr 2010, Apr 2011

Notes: Data from these SIPP waves were used to construct the child care models described in Table A.4

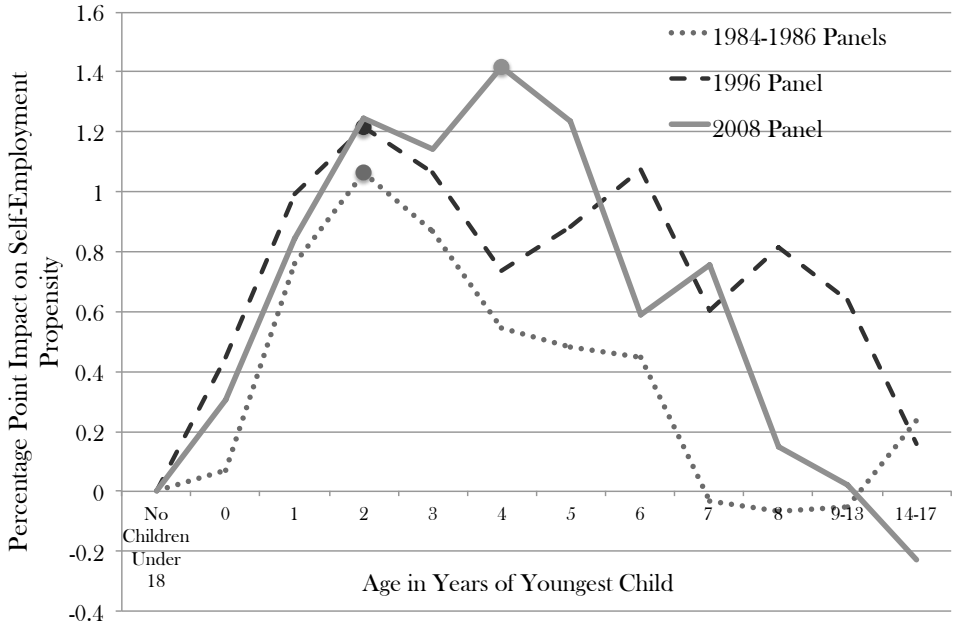
B.0.3 Other Data

National level annual unemployment rates come from the Bureau of Labor Statistics. Specifically state unemployment rates are from the local area unemployment statistics database and the national unemployment rates are from the CPS database.

APPENDIX C

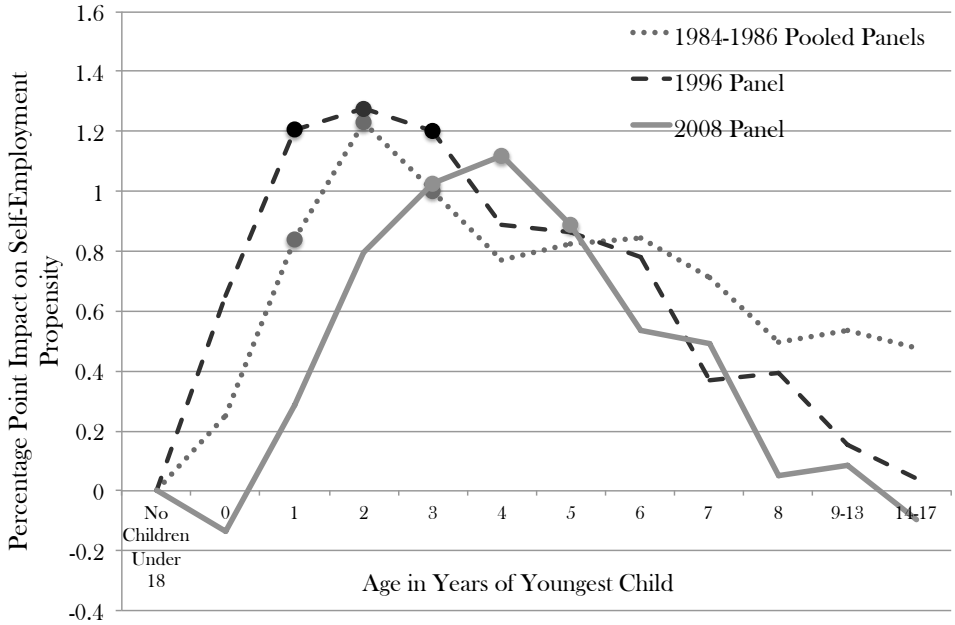
Additional Tables and Figures Chapter 2

Figure C.1: Female Self-Employment Rates and the Age of the Youngest Child; SIPP Full Panel Respondents Using Final Panel Weights



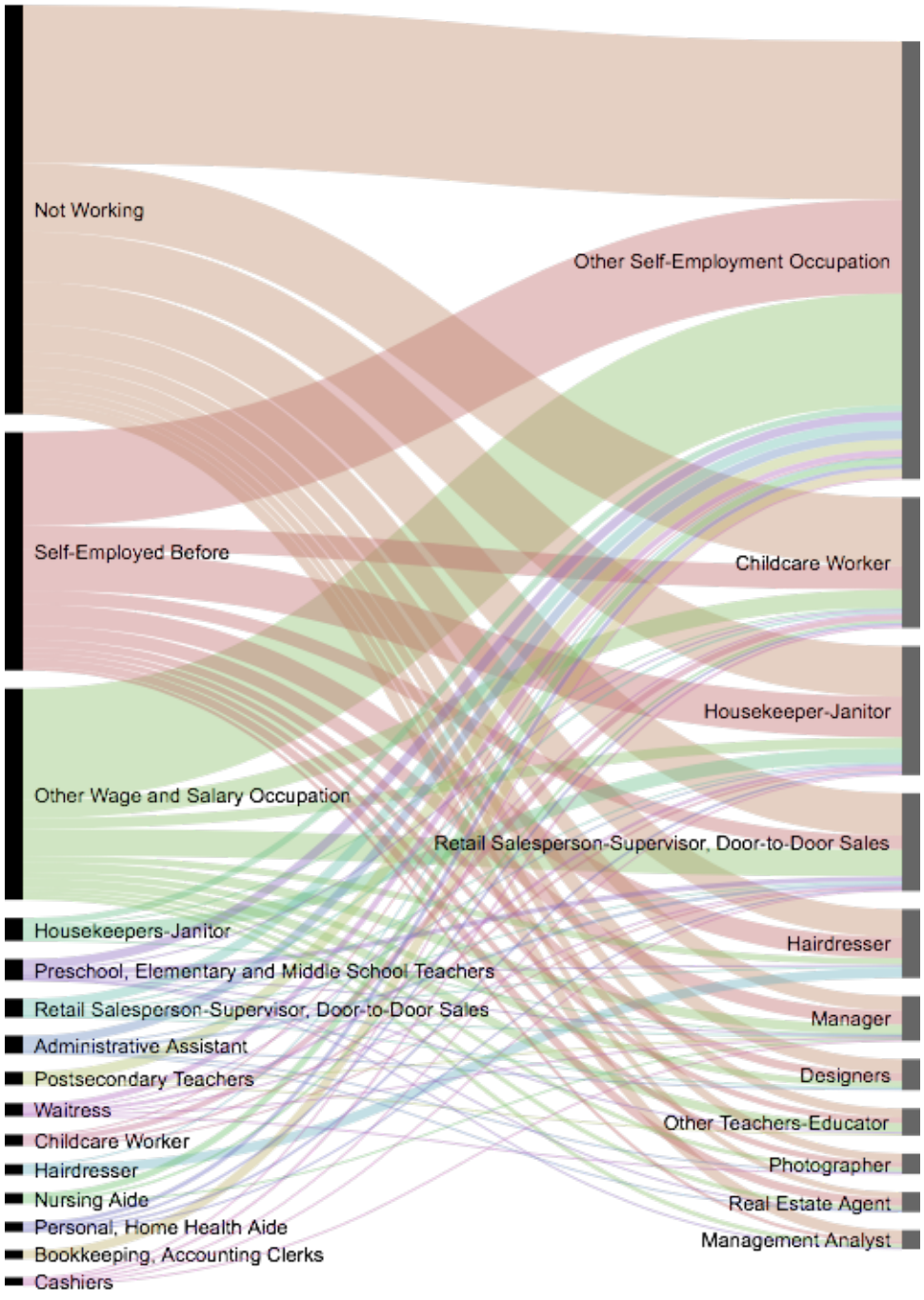
Notes: The three lines are plots of the coefficients on the age of the youngest child from regressions using different SIPP panels. The regressions predict self-employment status controlling for age, marital status, number of children, and fixed effects with standard errors clustered at the individual level. The markers denote statistical significance at the 5% level. The estimation sample includes women ages 18-55 who are present in the first wave of each SIPP panel who are observed during every month of the survey. Observations are weighted using the final panel weight for the individual, with the exception of the 2008 panel which uses the 2012 longitudinal weights, which are the most recent weights available.

Figure C.2: Female Self-Employment Rates and the Age of the Youngest Child; SIPP Wave 1 Respondents Unweighted



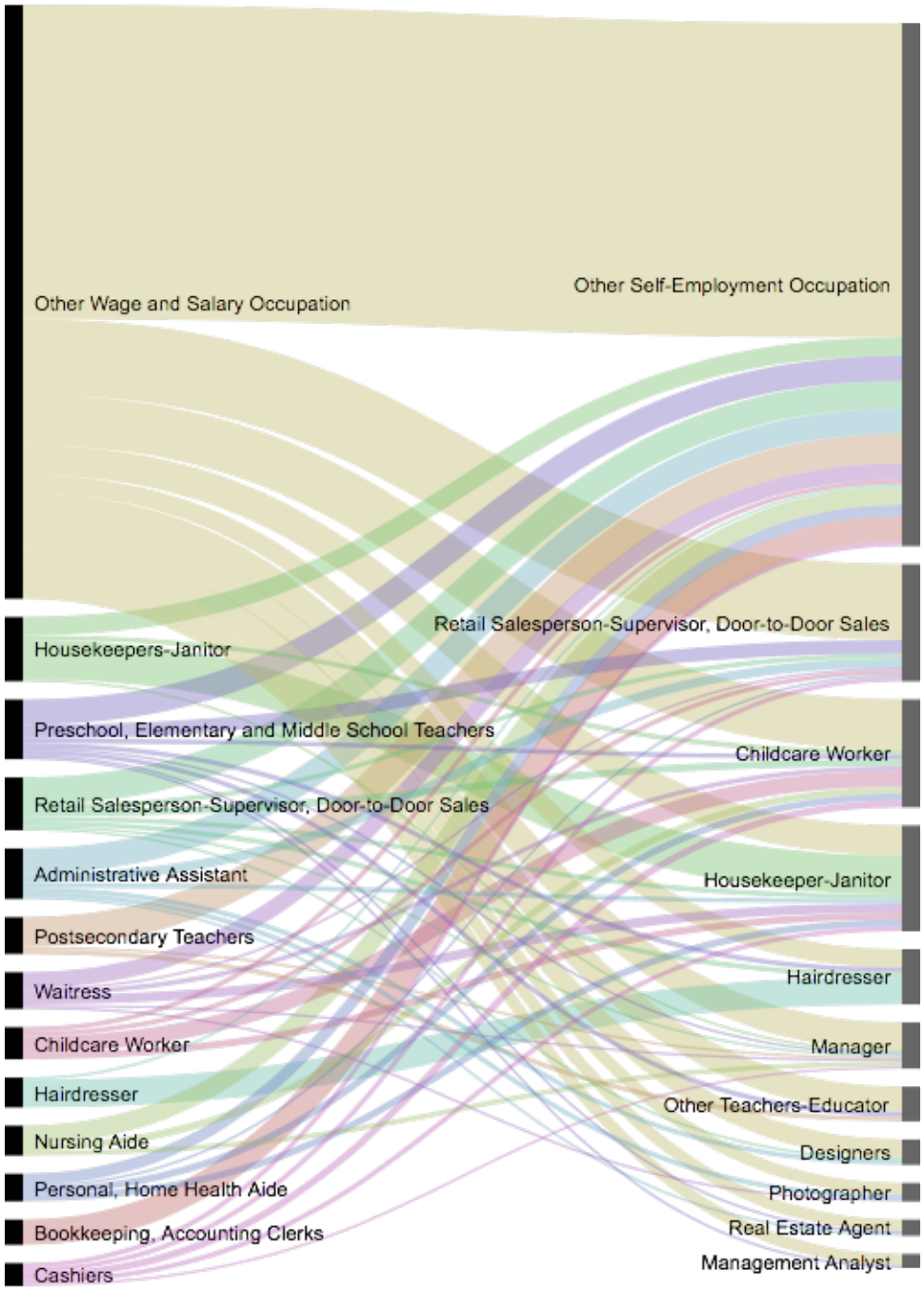
Notes: The three lines are plots of the coefficients on the age of the youngest child from regressions using different SIPP panels. The regressions predict self-employment status controlling for age, marital status, number of children, and fixed effects with standard errors clustered at the individual level. The markers denote statistical significance at the 5% level. The estimation sample includes women ages 18-55 who are present in the first wave of each SIPP panel. Observations are unweighted.

Figure C.3: Specific Occupation Transitions Among All Women Transitioning to Self-Employment



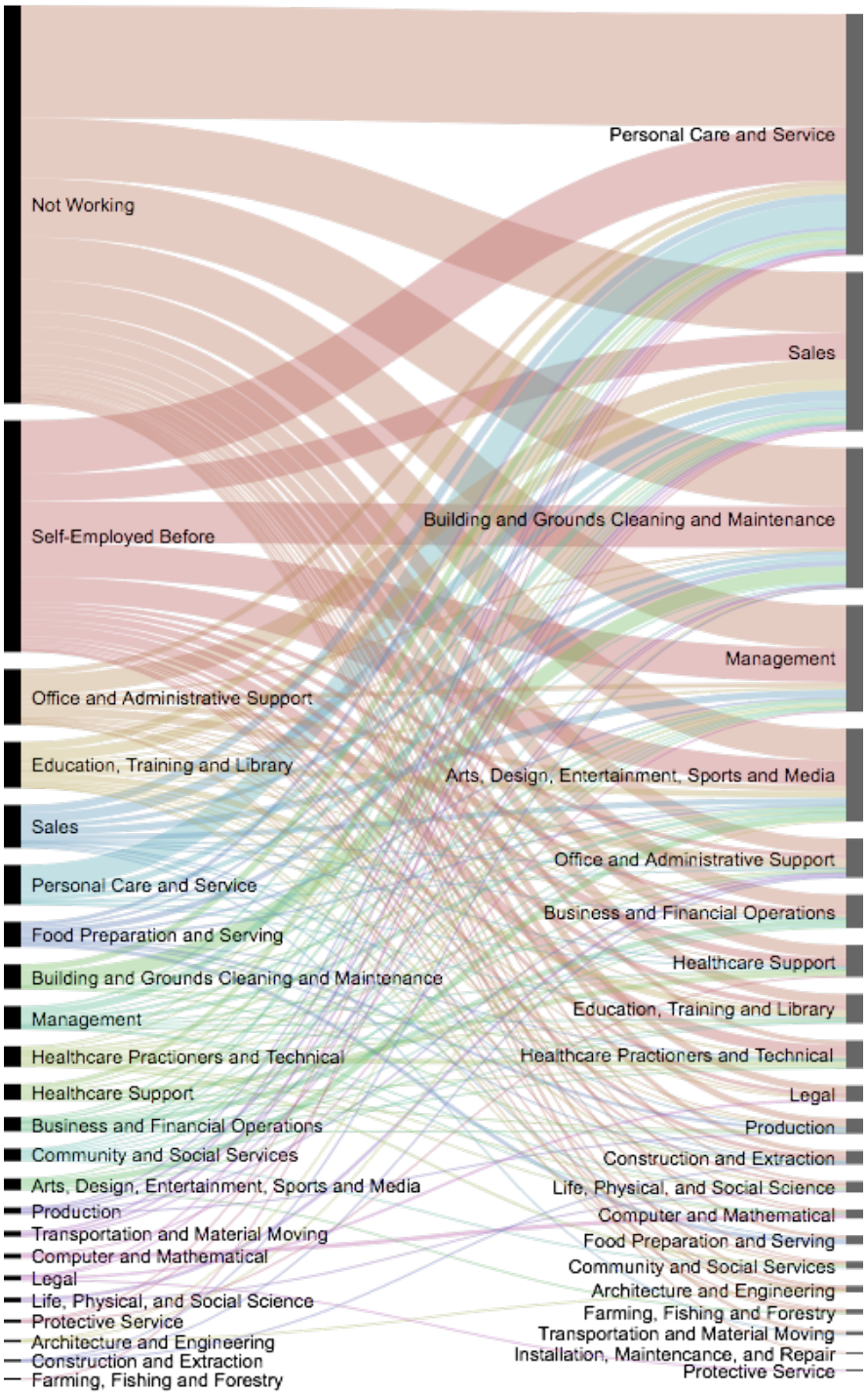
Notes: Occupations on the left are from the most recent wage and salary employment in the previous six months. Occupations on the right are the most common 3 digit self-employment occupations. The sample includes women ages 18-55 present in the first wave of the 2008 SIPP panel who become self-employed while they have a child under 13.

Figure C.4: Specific Occupation Transitions Among Previously Wage and Salary Employed Women Transitioning to Self-Employment



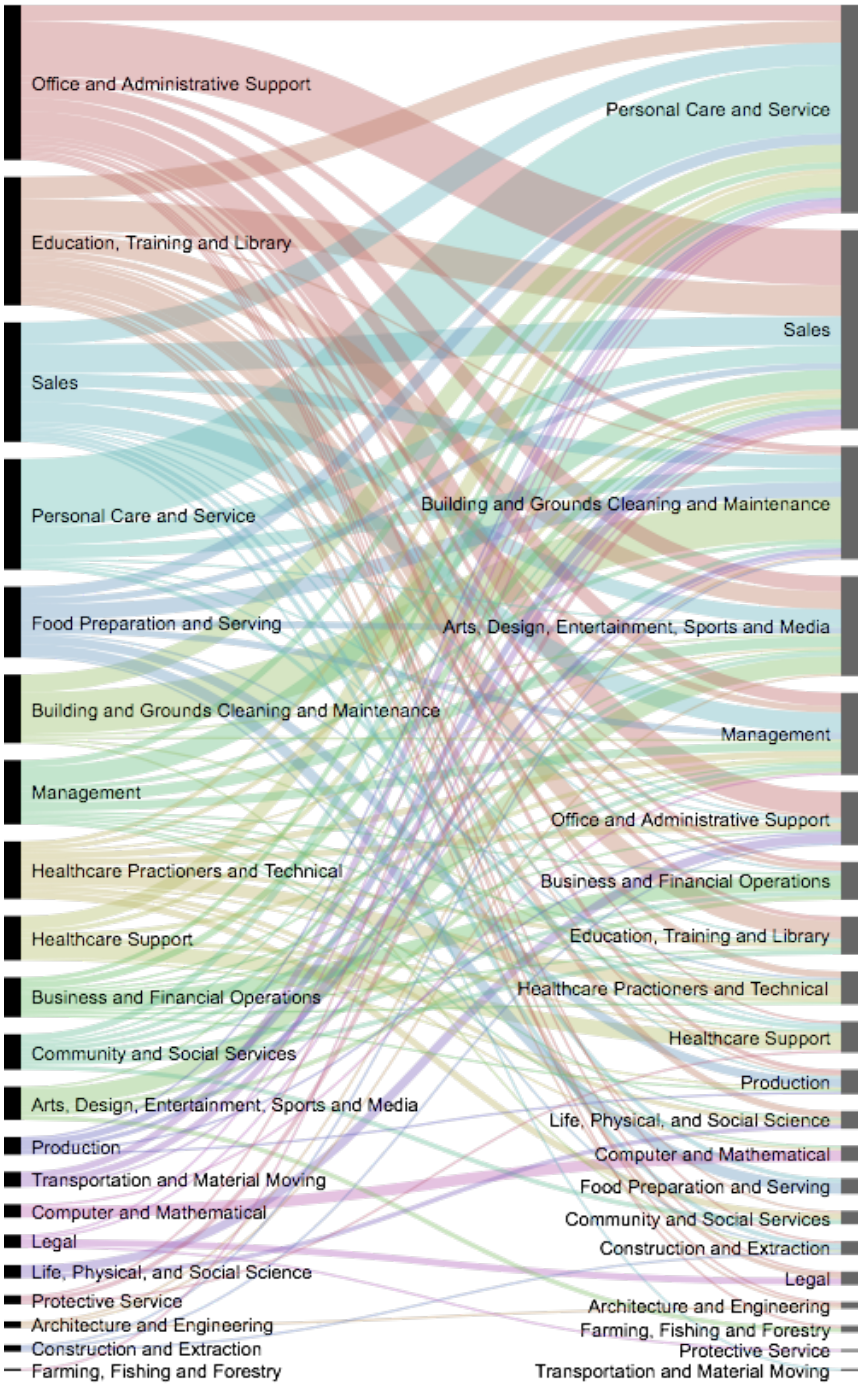
Notes: Occupations on the left are from the most recent wage and salary employment in the previous six months. Occupations on the right are the most common 3 digit self-employment occupations. The sample includes women ages 18-55 present in the first wave of the 2008 SIPP panel who become self-employed while they have a child under 13 and who worked in wage and salary employment during the 6 months prior to the transition to self-employment.

Figure C.5: Broad Occupation Transitions Among All Women Transitioning to Self-Employment



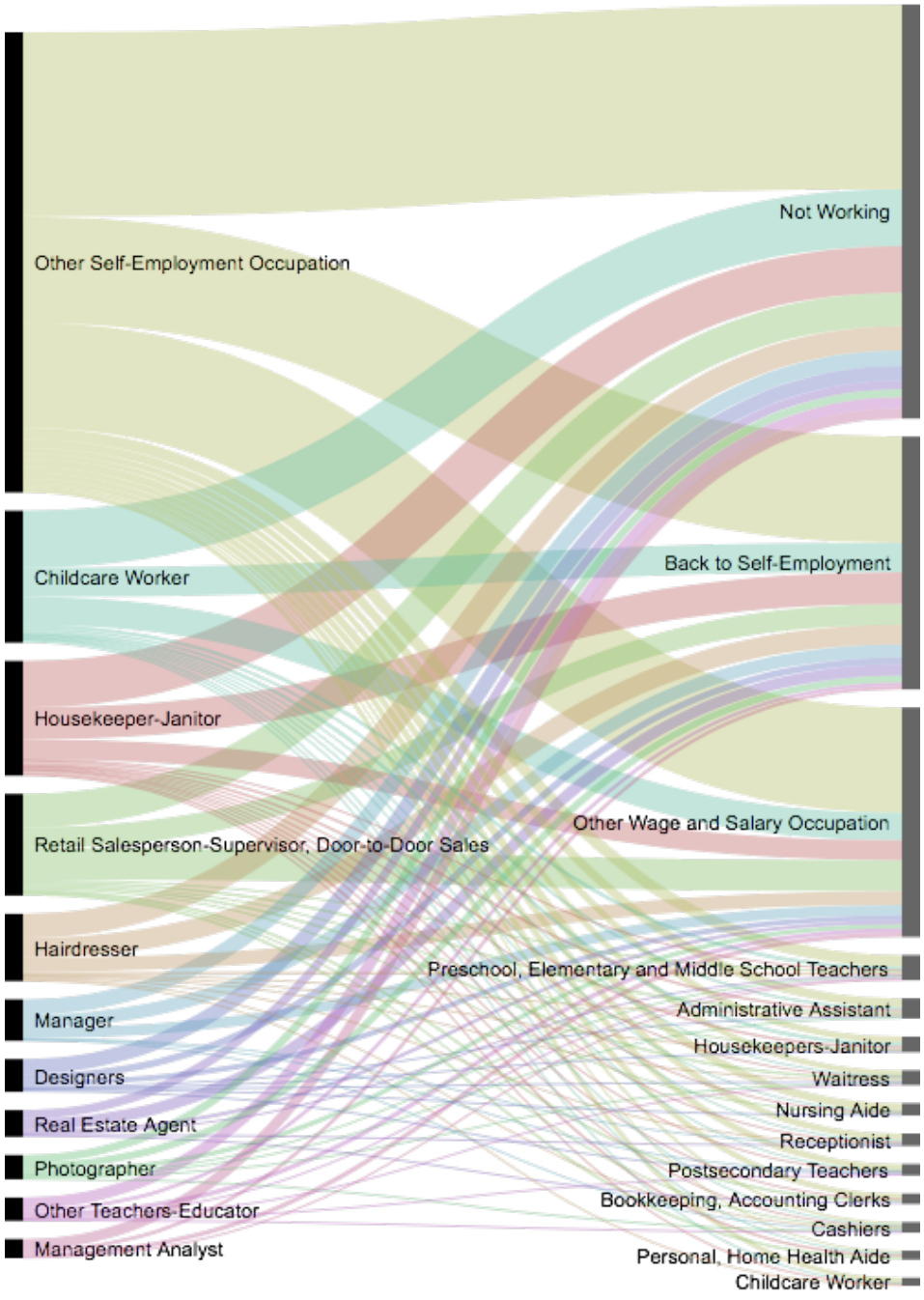
Notes: Occupations on the left are from the most recent wage and salary employment in the previous six months. Occupations on the right are the most common 2 digit self-employment occupations. The sample includes women ages 18-55 present in the first wave of the 2008 SIPP panel who become self-employed while they have a child under 13.

Figure C.6: Broad Occupation Transitions Among Wage and Salary Employed Women Transitioning to Self-Employment



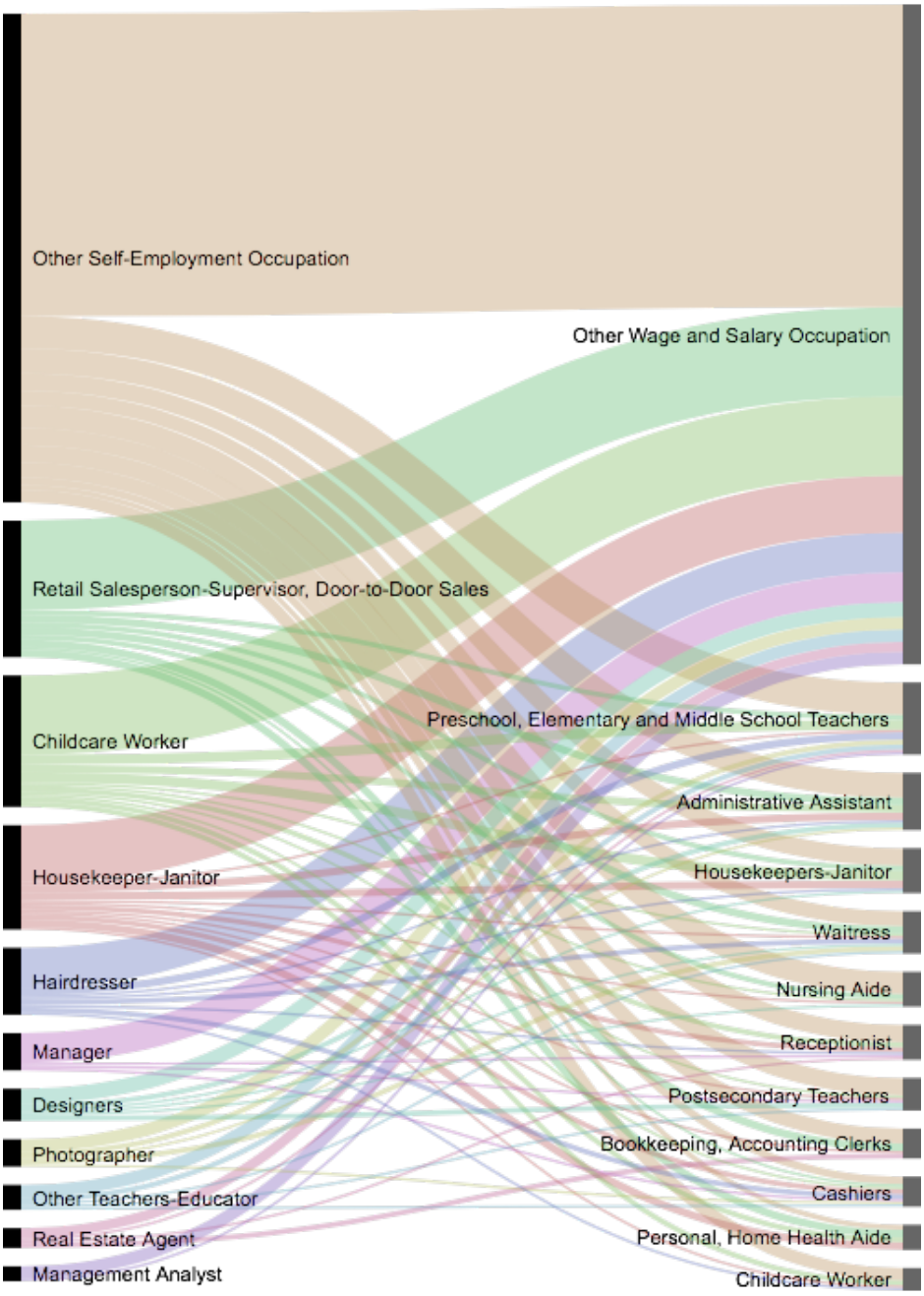
Notes: Occupations on the left are from the most recent wage and salary employment in the previous six months. Occupations on the right are the most common 2 digit self-employment occupations. The sample includes women ages 18-55 present in the first wave of the 2008 SIPP panel who become self-employed while they have a child under 13 and who worked in wage and salary employment during the 6 months prior to the transition to self-employment.

Figure C.7: Specific Occupation Transitions Among All Women Transitioning From Self-Employment



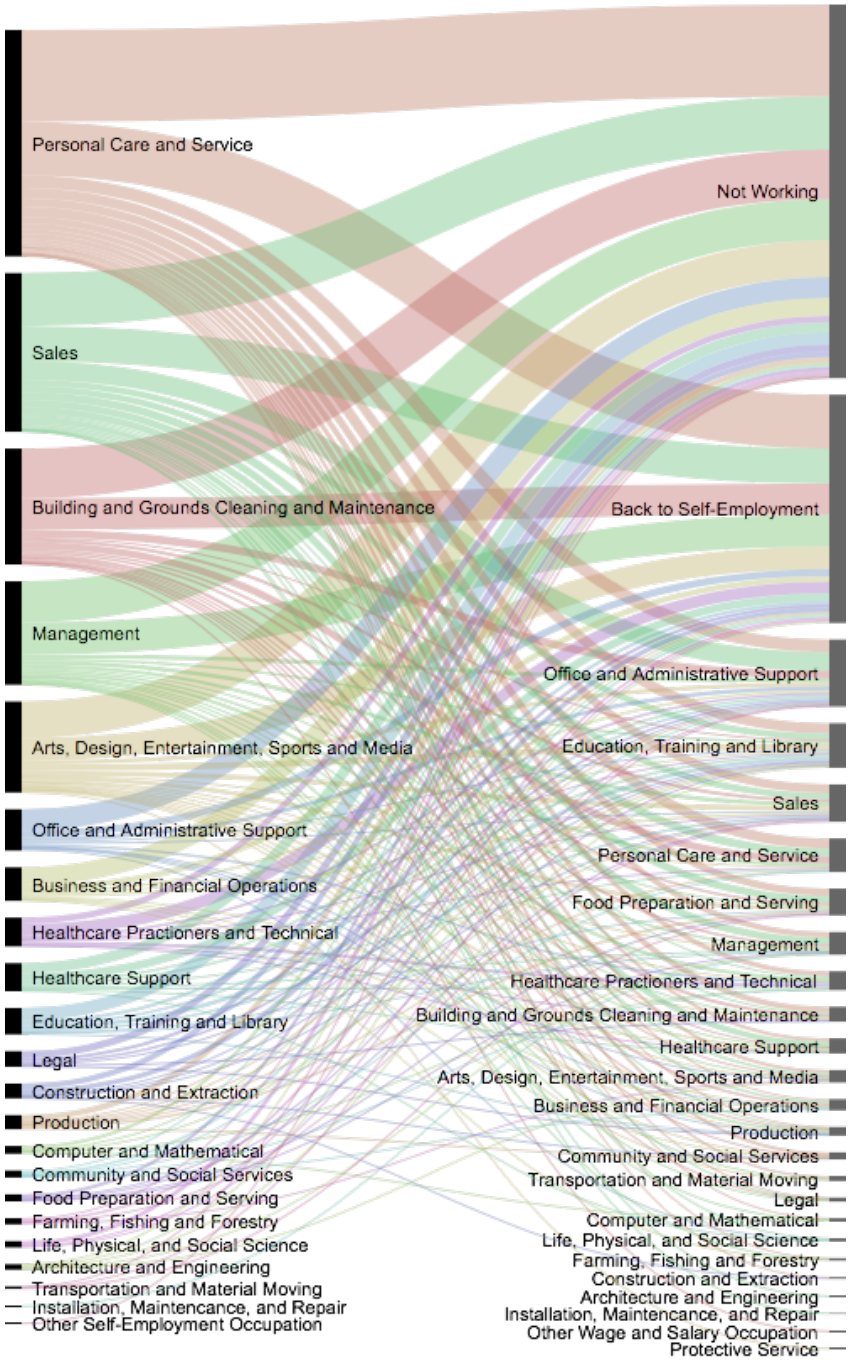
Notes: Occupations on the left are the most common pre-transition 3 digit self-employment occupations. Occupations on the right come from the first wage and salary employment in the following six months. The occupations on the right are the most common 3 digit self-employment occupations. The sample includes women ages 18-55 present in the first wave of the 2008 SIPP panel who become self-employed while they have a child under 13.

Figure C.8: Specific Occupation Transitions Among Women Transitioning From Self-Employment who Move to Wage and Salary Employment



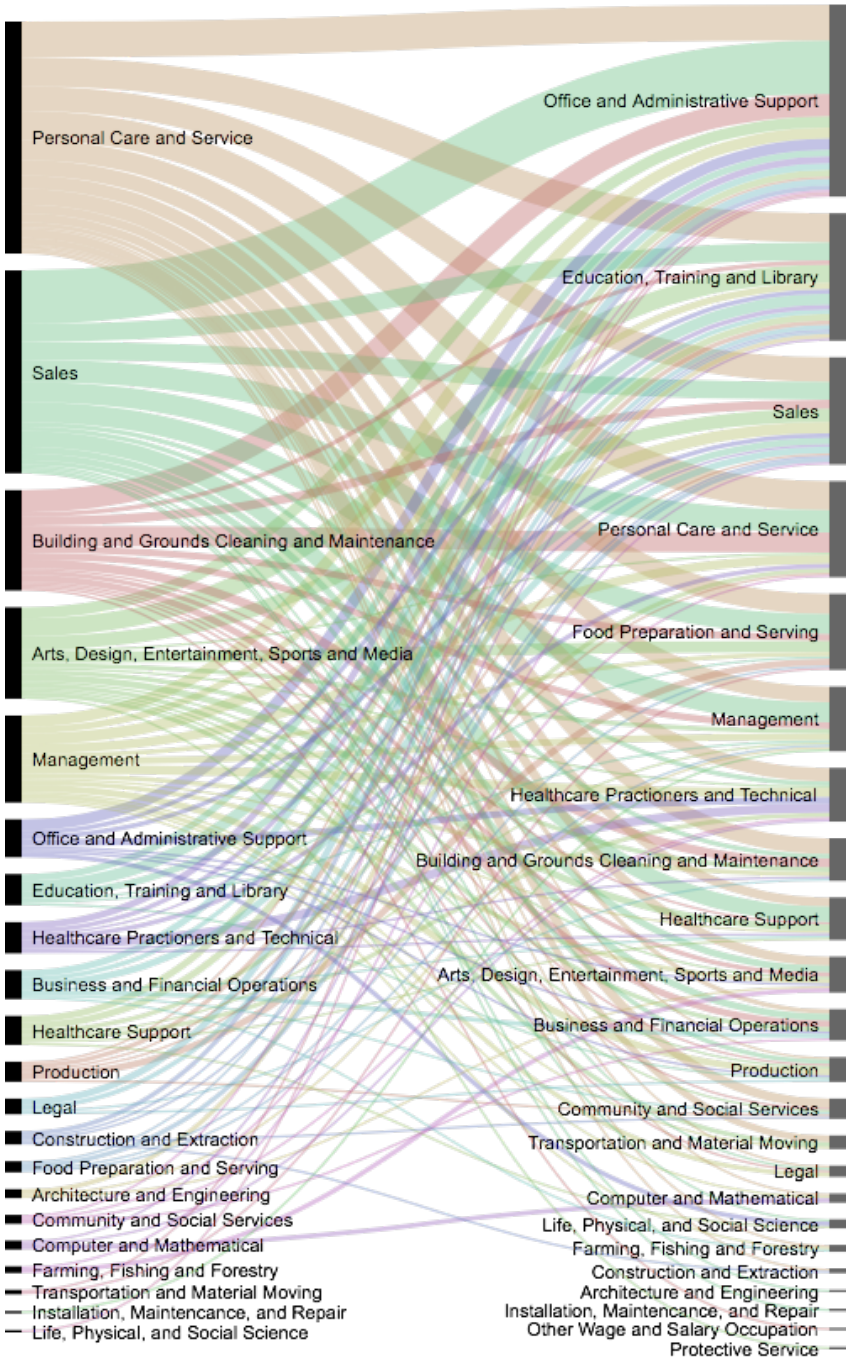
Notes: Occupations on the left are the most common pre-transition 3 digit self-employment occupations. Occupations on the right come from the first wage and salary employment in the following six months. The sample includes women ages 18-55 present in the first wave of the 2008 SIPP panel who become self-employed while they have a child under 13 and who worked in wage and salary employment during the 6 months following the transition from self-employment.

Figure C.9: Broad Occupation Transitions Among All Women Transitioning From Self-Employment



Notes: Occupations on the left are the most common pre-transition 2 digit self-employment occupations. Occupations on the right come from the first wage and salary employment in the following six months. The occupations on the right are the most common 3 digit self-employment occupations. The sample includes women ages 18-55 present in the first wave of the 2008 SIPP panel who become self-employed while they have a child under 13.

Figure C.10: Broad Occupation Transitions Among Women Transitioning From Self-Employment who Move to Wage and Salary Employment



Notes: Occupations on the left are the most common pre-transition 2 digit self-employment occupations. Occupations on the right come from the first wage and salary employment in the following six months. The sample includes women ages 18-55 present in the first wave of the 2008 SIPP panel who become self-employed while they have a child under 13 and who worked in wage and salary employment during the 6 months following the transition from self-employment.

Figure C.11: Joint Distribution of Hours Worked and Hours Spent Supervising Children; Wage and Salary Employed Women With Children Under 13

	Hours of Children Supervision													
Hours of Work	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12 or More**	
0	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%	0.3%	0.2%	0.2%	0.3%	0.3%	0.3%	0.7%	**2.9%**
1	0.1%	0.1%	0.2%	0.2%	0.3%	0.4%	0.3%	0.4%	0.3%	0.5%	0.4%	0.4%	0.9%	**4.5%**
2	0.0%	0.1%	0.2%	0.2%	0.2%	0.3%	0.3%	0.2%	0.2%	0.4%	0.3%	0.3%	0.6%	**3.4%**
3	0.1%	0.2%	0.2%	0.2%	0.3%	0.2%	0.3%	0.3%	0.2%	0.2%	0.2%	0.2%	0.3%	**2.9%**
4	0.1%	0.2%	0.3%	0.3%	0.4%	0.4%	0.4%	0.3%	0.2%	0.3%	0.2%	0.1%	0.4%	**3.7%**
5	0.1%	0.3%	0.5%	0.4%	0.4%	0.5%	0.3%	0.4%	0.3%	0.2%	0.1%	0.1%	0.2%	**3.9%**
6	0.2%	0.5%	0.8%	0.8%	0.8%	0.8%	0.7%	0.4%	0.2%	0.1%	0.1%	0.1%	0.2%	**5.8%**
7	0.2%	1.2%	1.6%	2.0%	1.8%	1.5%	0.9%	0.4%	0.2%	0.1%	0.1%	0.1%	0.2%	**10.4%**
8	0.7%	3.6%	5.0%	5.5%	5.8%	3.6%	1.6%	0.8%	0.3%	0.1%	0.1%	0.1%	0.3%	**27.6%**
9	0.5%	2.5%	3.3%	3.6%	2.4%	1.6%	0.9%	0.3%	0.2%	0.1%	0.0%	0.0%	0.2%	**15.7%**
10	0.4%	2.0%	2.4%	1.9%	1.5%	0.6%	0.2%	0.1%	0.1%	0.0%	0.0%	0.0%	0.1%	**9.5%**
11	0.4%	1.3%	1.3%	0.7%	0.6%	0.2%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.1%	**4.8%**
12 or More	0.6%	1.7%	1.1%	0.7%	0.3%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	**4.9%**
	3.6%	**13.9%**	**17.0%**	**16.8%**	**15.0%**	**10.5%**	**6.6%**	**4.0%**	**2.6%**	**2.3%**	**1.8%**	**1.7%**	**4.3%**	**100.0%**

Notes: The sample includes wage and salary employed mothers of children under 13 years of age who are 18-55 years in age from the ATUS 2003-2012. The sample is limited to mothers who spent positive minutes supervising children and working.

Figure C.12: Joint Distribution of Hours Worked and Hours Spent Supervising Children; Self-Employed Women With Children Under 13

	Hours of Children Supervision													
Hours of Work	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12 or More**	
0	0.0%	0.2%	0.1%	0.1%	0.3%	0.5%	0.4%	0.6%	0.4%	0.4%	0.5%	0.6%	0.9%	**4.9%**
1	0.0%	0.5%	0.2%	0.2%	0.9%	0.7%	0.7%	0.6%	0.6%	0.7%	0.3%	0.6%	1.9%	**7.9%**
2	0.1%	0.3%	0.3%	0.2%	0.4%	0.5%	0.7%	0.3%	0.5%	0.5%	0.4%	0.5%	1.2%	**5.9%**
3	0.0%	0.1%	0.1%	0.7%	0.4%	0.5%	0.7%	0.2%	0.5%	0.5%	0.3%	0.3%	0.6%	**5.0%**
4	0.3%	0.0%	0.3%	0.4%	0.5%	0.7%	0.2%	0.2%	0.4%	0.4%	0.3%	0.3%	0.7%	**4.8%**
5	0.3%	0.1%	0.5%	0.6%	1.0%	1.0%	0.6%	0.6%	0.8%	0.1%	0.2%	0.4%	0.7%	**6.8%**
6	0.1%	0.5%	0.6%	1.4%	0.7%	1.0%	0.6%	0.4%	0.2%	0.5%	0.1%	0.2%	0.8%	**7.0%**
7	0.1%	0.9%	1.7%	1.2%	2.8%	1.1%	0.9%	0.2%	0.5%	0.0%	0.0%	0.1%	0.6%	**10.2%**
8	0.6%	1.3%	2.7%	1.7%	2.2%	1.3%	0.1%	0.6%	0.4%	0.4%	0.0%	0.1%	1.1%	**12.4%**
9	0.1%	1.5%	1.7%	1.7%	1.5%	1.1%	0.4%	0.2%	0.2%	0.1%	0.2%	0.1%	0.7%	**9.4%**
10	1.0%	2.4%	1.7%	1.5%	1.2%	0.4%	0.2%	0.1%	0.0%	0.0%	0.2%	0.0%	0.9%	**9.6%**
11	0.3%	1.6%	1.6%	1.6%	0.6%	0.4%	0.3%	0.0%	0.0%	0.2%	0.1%	0.1%	0.9%	**7.6%**
12 or More	0.8%	2.0%	1.8%	0.9%	0.6%	0.1%	0.3%	0.0%	0.0%	0.2%	0.2%	0.0%	1.6%	**8.5%**
	3.6%	**11.5%**	**13.4%**	**12.1%**	**12.9%**	**9.3%**	**6.0%**	**4.0%**	**4.5%**	**4.0%**	**2.7%**	**3.3%**	**12.5%**	**100.0%**

Notes: The sample includes self-employed mothers of children under 13 years of age who are 18-55 years in age from the ATUS 2003-2012. The sample is limited to mothers who spent positive minutes supervising children and working.

Table C.1: Self-Employment Propensity

Dependent Variable: Self-Employment Status			
		All Panels Pooled	
	Main	Year Prior to Birth Indicator	Income Controls
Youngest Child Indicators:			
Age 0	0.398	0.380	0.702*
	[0.264]	[0.294]	[0.284]
Age 1	0.858**	0.845***	1.062**
	[0.300]	[0.311]	[0.317]
Age 2	1.326***	1.316***	1.632***
	[0.304]	[0.311]	[0.322]
Age 3	1.259***	1.250***	1.391***
	[0.303]	[0.308]	[0.320]
Age 4	1.080***	1.073***	1.084***
	[0.306]	[0.310]	[0.322]
Age 5	1.021***	1.015***	1.063***
	[0.314]	[0.316]	[0.329]
Age 6	0.800**	0.800**	0.840**
	[0.318]	[0.319]	[0.332]
Age 7	0.628**	0.624**	0.565
	[0.315]	[0.316]	[0.326]
Age 8	0.415	0.412	0.339
	[0.301]	[0.301]	[0.312]
Aged 9-13	0.354	0.352	0.321
	[0.270]	[0.270]	[0.279]
Aged 14-17	0.137	0.136	−0.057
	[0.207]	[0.207]	[0.212]
Pre-Birth Year		−0.036	
		[0.171]	
Other Income (2015$):			
Current Month			0.289***
			[0.078]
One Month Prior			0.062
			[0.047]
Two Months Prior			0.080**
			[0.037]
Observations	2,891,234	2,891,234	1,844,584
Number of Individuals	84,214	84,214	76,305

Notes: Regressions predict self-employment status; additional controls include the state unemployment rate, and year, month of interview, and individual fixed effects. Coefficients are multiplied by 100 for ease of interpretation. The sample includes women ages 18-55 who are present in wave 1 of the panel. Results are weighted by the monthly weight of the woman's final observation and standard errors are clustered at the individual level. Additional income controls for the regression in the third column include lagged monthly income for three, four, and five months prior as well as a control for income six months to 11 months prior. The point estimates are small and not statistically significant and are available from the author upon request.
*** p<0.01, ** p<0.05, * p<0.1

Table C.2: Differences in Time Use Associated with Self-Employment: Multivariate Regressions

Time Spent in Activity	ATUS Two Digit Code	Women Children Under 6		Men Children Under 6	
		Mean	Multivariate	Mean	Multivariate
Personal Care	1	-10.1	-0.9	8.0	12.0*
Household Activities	2	39.7*	18.8*	1.3	-4.4
Caring for and Helping Household Members	3	28.8*	6.3	6.2	3
Caring for and Helping Nonhousehold Members	4	-0.4	-0.2	-0.2	-0.01
Work and Work-Related Activities	5	-59.8*	-17.2	1.8	3.2
Education	6	-5.9*	-5.4*	-2.6*	-0.9
Consumer Purchases	7	-1.1	-3.7	-5.6*	-5.3*
Professsional and Personal Care Services	8	1.5	1.2	-0.7	-0.8
Household Services	9	-0.03	-0.2	0.2	0.2
Government Services and Civic Obligations	10	-0.3*	-0.2*	-0.04	0.07
Eating and Drinking	11	4.6*	0.4	-0.3	-1.5
Socializing, Relaxing and Leisure	12	-4.9	-1	-12.5	-8.8
Sports, Exercise & Recreation	13	3.5	2.6	2.7	2.9
Religious and Spiritual Activities	14	5.2*	4.5*	4.1*	3.5*
Volunteer Activities	15	2.3	-0.3	2.4	1.5
Telephone Calls	16	1.4	1.5	-0.06	0.02
Traveling	18	-7.4*	-8.2*	-2.5	-2.6

Notes: The sample for column 1 includes women ages 18-55 in the ATUS 2003-2012. In column 2, the sample is restricted to women with a child under the age of 6. Regressions include controls for respondents' education, race, age, number of children, hours worked, employment status and a self-employment indicator. Coefficients reported represent the effect of being self-employed relative to working in a wage and salary position.

APPENDIX D

Additional Tables and Figures Chapter 3

Table D.1: States Earned Income Tax Credits

State	Year of Implementation
Rhode Island	1986
Vermont	1988
Wisconsin[1]	1989
Iowa	1990
Minnesota[2]	1991
New York	1994
Massachusetts	1997
Oregon	1997
Kansas	1998
Maryland	1998
Colorado	1999
DC	2000
Illinois	2000
Maine	2000
New Jersey	2000
Oklahoma	2002
Indiana	2003
Nebraska	2003
Delaware	2006
Virginia	2006
New Mexico	2007
North Carolina	2008
Michigan	2008
Louisiana	2008
Connecticut	2011
Washington	2008 (announced; unfunded)
Ohio	2013

Source: Leigh (2010), "Who Benefits from the Earned Income Tax Credit? Incidence among Recipients, Coworkers and Firms," The B.E. Journal of Economic Analysis & Policy

1: Wisconsin has a system based on the number of children in the household.

2: Minnesota has a system based on whether there are any children living in the household, and after 1997, household earnings.

Table D.2: Test Exogeneity of State EITC Benefits

Dependent Variable:	**State EITC generosity**	
Sample:	**All States**	**Conditional on Ever Having a State EITC**
Mean Dependent Variable:	5.36	2.77
VARIABLES	(1)	(2)
State GDP per Capita (in $1000s)	0.31	1.06
	(0.313)	(1.042)
Lagged State GDP per Capita (in $1000s)	0.03	0.25*
	(0.040)	(0.115)
Unemployment Rate	0.00	0.02
	(0.003)	(0.009)
Lagged Unemployment Rate	0.00	0.00
	(0.003)	(0.007)
Top Marginal Income Tax Rate	0.00	-0.01
	(0.005)	(0.013)
Lagged Top Marginal Income Tax Rate	-0.01	-0.04
	(0.008)	(0.03)
Real Minimum Wage	0.00	0.01
	(0.003)	(0.015)
Lagged Real Minimum Wage	0.00	-0.01
	(0.005)	(0.019)
Maximum Family of 3 Monthly Welfare Benefits (in $100s)	0.002*	0.017*
	(0.007)	(0.007)
Lagged Maximum Family of 3 Monthly Welfare Benefits (in $100s)	0.01	0.02
	(0.015)	(0.017)
Spending on Higher Education	0.01*	0.01
	(0.005)	(0.009)
State and Year Fixed Effects	X	X
R-squared	0.861	0.845
Observations	1000	320

Source: State-level data from 1992-2013. State-level unemployment rates from Bureau of Labor Statistics. State GDP from Burea of Economic Analysis regional data. State top tax bracket from the National Bureau of Economic Research. State-level minimum wage from the Tax Policy Center's Tax Facts. State-level spending on higher education from the State Higher Education Executive Officers. State-level welfare benefits from the Urban Institute's Welfare Rules Database. *** p<.01 ** p<.05 * p<.10

Table D.3: Effect of Average EITC on Quarterly Transitions Between Employment Types: Married Mothers

	Wage and Salary to Self-Employment	Wage and Salary Employment to Non-Employment	Self-Employment to Wage and Salary Employment	Self-Employment to Non-Employment	Non-Employment to Wage and Salary Employment	Non-Employment to Self-Employment
Average EITC ($1,000s)	0.0123**	0.0072	0.0082	-0.0054	0.0201	0.0081*
	(0.0057)	(0.0201)	(0.0087)	(0.0057)	(0.0124)	(0.0044)
EITC-eligible	-0.0031*	0.0110**	-0.0029	-0.0013	0.0129***	-0.0048***
	(0.0017)	(0.0049)	(0.0022)	(0.0013)	(0.0040)	(0.0015)
Average EITC*EITC-eligible	0.0038*	-0.0046	0.0044	0.0017	-0.0026	0.0068***
	(0.0020)	(0.0059)	(0.0028)	(0.0015)	(0.0054)	(0.0019)
Mean of Dependent Variable	0.0041	0.0225	0.0054	0.0030	0.0236	0.0032
State Fixed Effects	X	X	X	X	X	X
Year Fixed Effects	X	X	X	X	X	X
Month Fixed Effects	X	X	X	X	X	X
State-Specific Linear Time Trends	X	X	X	X	X	X
Number of Observations	261,781	261,781	261,781	261,781	261,781	261,781

Notes: Indicators for self-employment and wages and salary employment are dummy variables equal to one if the respondent reports positive hours of work in that type of employment, zero otherwise. Transitions between wage and salary employment and self-employment include switching transitions or transitions to both types of employment. Sample includes married women 18-55 of age with at least one child under 19 living with them during their first year in the SIPP. Data come from the 1990-1993, 1996, 2001, 2004, and 2008 panels of the SIPP. Individuals with negative earnings in their first year of the survey were dropped from the sample. Observations exclude the first calendar year of data and only include the reference month for the survey. Estimates are weighted and standard errors are clustered at the state level. All regressions control for the state minimum wage, unemployment rate, and top state marginal income tax rate. *p<0.1, **p<0.05, ***p<0.01

Table D.4: Effect of Average EITC on Likelihood of Self-Employment with Different Levels of Fixed Effects: Married Mothers

	Self-Employed (Hours)	**Self-Employed (Hours)**	**Self-Employed (Hours)**	**Self-Employed (Hours)**
Average EITC ($1,000s)[1]	-0.042***	-0.049	0.055*	0.079**
	(0.014)	(0.035)	(0.028)	(.036)
EITC-eligible[2]	-0.054***	-0.053***	-0.053***	-0.055***
	(0.012)	(0.012)	(0.013)	(.013)
Average EITC*EITC-eligible	0.061***	0.060***	0.060***	0.062***
	(0.016)	(0.016)	(0.017)	(.017)
Mean of Dependent Variable	0.082	0.082	0.082	0.082
State Fixed Effects			X	X
Year Fixed Effects		X	X	X
Month Fixed Effects		X	X	X
State-Specific Linear Time Trends				X
Number of Observations	261,781	261,781	261,781	261,781

Notes: Sample includes married women 18-55 of age with at least one child under 19 living with them during their first year in the SIPP. Data come from the 1990-1993, 1996, 2001, 2004, and 2008 panels of the SIPP. Individuals with negative earnings in their first year of the survey were dropped from the sample. Observations exclude the first calendar year of data and only include the reference month for the survey. Estimates are weighted and standard errors are clustered at the state level. All regressions control for the state minimum wage, unemployment rate, and top state marginal income tax rate. *p<0.1, **p<0.05, ***p<0.01

[1] Average EITC is calculated for each state and year using the state level EITC rules applied to a nationally representative sample using TAXSIM.

[2] Eligibility for the EITC is determined using income and family structure from the first year of the survey. Households with no earned income are considered eligible for the EITC.

Table D.5: Effect of Average EITC on Likelihood of Different Employment Types: Married Mothers No Imputed Earnings

	Self-Employed (Hours)	**Wage & Salary Employed (Hours)**	**Both Self-Employed and Wage & Salary Employed (Hours)**	**Working**
Average EITC ($1,000s)[1]	0.045	0.048	0.023	0.070
	(0.038)	(0.149)	(0.032)	(0.142)
EITC-eligible[2]	-0.055***	-0.132***	-0.015***	-0.172***
	(0.014)	(0.035)	(0.005)	(0.031)
Average EITC*EITC-eligible	0.063***	-0.059	0.013**	-0.010
	(0.019)	(0.046)	(0.006)	(0.041)
Mean of Dependent Variable	0.077	0.624	0.021	0.680
State Fixed Effects	X	X	X	X
Year Fixed Effects	X	X	X	X
Month Fixed Effects	X	X	X	X
State-Specific Linear Time Trends	X	X	X	X
Number of Observations	236,891	236,891	236,891	236,891

Notes: Sample includes married women 18-55 of age with at least one child under 19 living with them during their first year in the SIPP.. Individuals with imputed earnings were dropped from this analysis. Data come from the 1990-1993, 1996, 2001, 2004, and 2008 panels of the SIPP. Individuals with negative earnings in their first year of the survey were dropped from the sample. Observations exclude the first calendar year of data and only include the reference month for the survey. Estimates are weighted and standard errors are clustered at the state level. All regressions control for the state minimum wage, unemployment rate, and top state marginal income tax rate. *p<0.1, **p<0.05, ***p<0.01

[1] Average EITC is calculated for each state and year using the state level EITC rules applied to a nationally representative sample using TAXSIM.

[2] Eligibility for the EITC is determined using income and family structure from the first year of the survey. Households with no earned income are considered eligible for the EITC.

Table D.6: Effect of Average EITC on Likelihood of Self-Employment Using Alternative Definition: Married Mothers

	Self-Employed (Hours)	**Self-Employed (Earnings)**
Average EITC ($1,000s)[1]	0.079**	0.086***
	(0.036)	(0.027)
EITC-eligible[2]	-0.055***	-0.035***
	(0.013)	(0.010)
Average EITC*EITC-eligible	0.062***	0.035***
	(0.017)	(0.012)
Mean of Dependent Variable	0.082	0.049
State Fixed Effects	X	X
Year Fixed Effects	X	X
Month Fixed Effects	X	X
State-Specific Linear Time Trends	X	X
Number of Observations	261,781	261,781

Notes: Sample includes married women 18-55 of age with at least one child under 19 living with them during their first year in the SIPP. Data come from the 1990-1993, 1996, 2001, 2004, and 2008 panels of the SIPP. Individuals with negative earnings in their first year of the survey were dropped from the sample.. Observations exclude the first calendar year of data and only include the reference month for the survey. Estimates are weighted and standard errors are clustered at the state level. All regressions control for the state minimum wage, unemployment rate, and top state marginal income tax rate. *p<0.1, **p<0.05, ***p<0.01

[1] Average EITC is calculated for each state and year using the state level EITC rules applied to a nationally representative sample using TAXSIM.

[2] Eligibility for the EITC is determined using income and family structure from the first year of the survey. Households with no earned income are considered eligible for the EITC.

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