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The Earned Income Tax Credit and Expected Social Security Benefits among Low-Income Mothers

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Abstract

The Earned Income Tax Credit (EITC) has been found to lead to increases in employment and earnings growth for low-educated women. That increased employment and earnings may result in a greater fraction of those women qualifying for Social Security benefits and their receiving a higher benefit in the event they do qualify. In this study, we determine the extent to which the labor supply responses to the EITC will improve the financial security of low-income women when they near retirement age. We use data from the 1993 and 1996 SIPP-SSA matched data files and the CWHS to estimate the impact of EITC expansions on employment, quarters of coverage, and earnings growth. Earlier research exploited the differential expansions in the credit for single mothers with two or more qualifying children and for single mothers with only one child. Those results, consistent with our earlier work, show that the EITC increased both employment and earnings growth of single mothers in the 5 years following expansion. We then simulate the impact of EITC expansion on the Average Indexed Monthly Earnings (AIME) amount and the Primary Insurance Amount (PIA) of a sample of low-educated women. The results show that the EITC increases the share of women who are eligible for Social Security retirement benefits by between 2% and 3%. Further, we find that lifetime earnings increase by between 6% and 17% and the AIME by a similar amount.

Keywords: EITC, Social Security, earnings, SIPP

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1. INTRODUCTION

Social Security in the United States and in other rich nations helps to keep millions of elderly and disabled workers and their children out of poverty and with more secure incomes in case of unexpected losses in earnings. While retirement benefits are the majority of payments made in most nations, disability and survivor's benefits are also very important for low-income families with children in the United States. Of the 6.5 million children in families that received Social Security in 2005, fully 1.3 million were lifted out of poverty by income from Social Security (Lavery and Reno, 2008).

Unmarried women with inconsistent market work histories and their children remain at risk for financial insecurity in old age. For married women (and divorced women who were married for at least 10 years) with inconsistent market work histories, the earnings of their husbands are taken into account when determining their Social Security benefit (with women typically receiving 50% of their spouse's benefit). A woman who never marries (including those with children) does not have the same option, leaving her at a high risk of elder poverty and lack of disability and survivors insurance now and in the future (Iams and Butrica, 1999; Smeeding, 1999). The purpose of this study is to determine whether expansions in the Earned Income Tax Credit (EITC) have helped mitigate the economic situation of unmarried women and their families in retirement (or as survivors or as disabled), by increasing the earnings and employment when young, and thereby increasing the chances of being eligible for, and receiving a higher benefit from, Social Security for themselves or their children.

Studies have found that expansions in the EITC are associated with increases in formal employment (e.g., Eissa and Liebman, 1996; Meyer and Rosenbaum, 2000, 2001) and increases in longer-term earnings growth for single mothers (Dahl, DeLeire, and Schwabish, [or DDS], 2009). In this study, we assess whether EITC expansions improved the financial security of single mothers by increasing their OASDI (Social Security) benefit as well as their children's benefits. This increase could occur through

two channels. First, as the EITC led more single mothers to work, they could have more covered quarters of employment and would be more likely to qualify for Social Security. Second, as the EITC led to increased earnings growth, the benefit amounts that those women would qualify for could increase.

In this paper, we determine the extent to which the labor supply responses to the EITC may eventually improve the financial security of older women in the United States. Using an approach that is similar to our earlier work (Dahl, DeLeire, and Schwabish, 2009) that used the 1993 and 1996 panels of the Survey of Income and Program Participation matched to administrative earnings data from the Social Security Administration (SSA), we estimate the impact of EITC expansions on employment, quarters of coverage, and earnings growth using another administrative dataset from SSA, the Continuous Work History Sample (CWHS). We do this by exploiting the differential expansions in the credit for single mothers with two or more qualifying children relative to the credit for single mothers with only one child. We then simulate the impact of EITC expansion on the Average Indexed Monthly Earnings (AIME) amount and Primary Insurance Amount (PIA) of a sample of low-educated women. The results show that the EITC increases the share of women who are eligible for Social Security retirement benefits by between 2% and 3%. Further, we find that lifetime earnings increase by between 6% and 17% and the AIME by a similar amount. Our results suggest that the EITC has a secondary impact on the financial security of women beyond the immediate impacts on employment and earnings growth in the years in which the credit is claimed. Of course, these methods could be employed in other rich nations to address similar questions for work-related social insurance program eligibility and benefits more generally.

2. BACKGROUND AND RELEVANT LITERATURE

2.1. The Earned Income Tax Credit

The EITC is a refundable tax credit that provides cash to lower income working parents and individuals through the federal income tax system.[1] The credit was established in 1975 and was greatly expanded in the 1990s. Today, the program is a major component of federal efforts to reduce poverty. In 2007, EITC refunds (the amounts by which the EITC exceeded tax liability) were $38.3 billion and in 2009 will be close to $50 billion. In comparison, food stamp outlays in 2007 were $34.9 billion and Temporary Assistance for Needy Families (TANF) outlays were $16.9 billion (U.S. Office of Management and Budget, 2008).[2]

The amount of credit the worker receives is based on the taxpayer's earnings and income (which in the case of joint filers includes income from both spouses), number of children, and marital status. In 2007, the maximum EITC was $428 for workers without qualifying children, $2,853 for working families with one qualifying child, and $4,716 for working families with two or more qualifying children. The amount of the credit initially increases as earnings increase until the maximum credit is achieved. As earnings increase beyond that point, the amount of the credit first remains constant and then decreases. Figure 1 displays how the amount of the EITC varied with earned income for non-joint filers by number of qualifying children in 2007.

The identification strategy in DDS (which we describe below in more detail) hinges on the differential treatment in the EITC of single mothers with one qualifying child and those with two or more qualifying children. Prior to the EITC expansions of the early 1990s, the treatment of parents with one child was virtually identical to those with two or more children. In 1994 the EITC increased for both

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[1] In 1993, the credit was extended to workers without children. However, the maximum credit available to this group is small.

[2] Neither food stamps nor the EITC has any direct effect on a family's official poverty status, as defined by the Census Bureau, as neither are included in income.

groups, but more so for those with two or more children (see Figure 2). And between 1994 and 1997 the EITC continued to increase for those with two or more children while remaining relatively unchanged (in real terms) for those with one child (see Figure 3). For example, in 1994 the maximum credit available to single mothers with one child was $2,819 (in 2007 dollars), while that available to single mothers with two or more children was $3,497. By 1997, the maximum credit available to single mothers with one child increased by $27 to $2,847 (in 2007 dollars), while the maximum credit available to single mothers with two or more children increased by substantially more—$1,212 to $4,709.

Other factors during this period may have also contributed to the observed increase in employment and earnings growth. The Personal Responsibility and Work Opportunity Reconciliation Act of 1996 (PRWORA) instituted fundamental changes in how the federal government provided cash assistance to poor families resulting in changes to work and earnings among poor families. Changing patterns in rates of marriage, divorce, incarceration, and mortality—during the period of policy changes to the EITC and into the future—may also impact employment and earnings growth rates. However, the DDS estimates are based on the differences in the behavior of single mothers with one child versus single mothers with two or more children. It is difficult to see how these other factors would have differential effects for these two groups.

2.2. Social Security

The U.S. Social Security program provides benefits based on average pre-retirement earnings. The system is progressive, meaning that lower earners receive higher benefits relative to their lifetime earnings than do higher earners. Workers must earn a minimum amount of earnings for a minimum number of years to be eligible for retirement benefits. Lifetime earnings are represented by the Average Indexed Monthly Earnings (AIME) amount, which is used to determine the Primary Insurance Amount (PIA). The PIA is the basic benefit that would be paid to a retiree were he or she to claim benefits at the Full Retirement Age.

To qualify for Social Security retirement benefits (individuals may also receive benefits for other reasons, such as disability or widow(er)hood, but we do not consider those cases in this paper), workers must earn 40 "quarters of coverage" over the course of their lifetime. In 2007, the amount of earnings required for a quarter of coverage was $1,000; thus, a worker who earned at least $4,000 in 2007 would have earned 4 quarters of coverage.[3] Since 1978, the amount of earnings needed for a quarter of coverage has increased each year with the average wage index (AWI).

The AIME averages the highest 35 years of earnings and then divides that number by 12 to generate a monthly amount. Each year of earnings is indexed to the AWI in the year in which the worker turns age 60. The indexing adjustment expresses the lifetime stream of the worker's earnings in terms of current standards of living. After age 60, earnings are not indexed to the AWI, but enter the AIME calculation in nominal terms.

Once the AIME is calculated the PIA formula determines the monthly benefit amount each retiree will receive. The PIA is a progressive formula such that, in 2007, the worker receives 90% of the first $680 of average monthly earnings, 32% of earnings between $680 and $4,100, and 15% of earnings above $4,100. The three rates—90%, 32%, and 15%—are referred to as bend rates, and the dollar cutoffs—$680 and $4,100—are referred to as bend points. The bend points are increased each year at the rate of the growth of the AWI, but the bend rates do not change. (See Figure 4).

2.3. Disability, Survivors, and Other Auxiliary Social Security Benefits

Individuals may also be eligible for certain Social Security benefits even if they do not have a high enough or long enough work history to qualify for retirement benefits. Disability insurance (DI) benefits are paid to qualifying disabled individuals; survivor benefits are paid to surviving widow(er)s of a qualified spouse; certain benefits may also be paid to living spouses of a qualified spouse; and children

[3]Prior to 1978, earnings were reported to SSA on a quarterly basis; beginning in 1978, the reporting period was modified to an annual basis and thus the qualifying amount, though still referred to as a quarter of coverage, is actually an annual amount.

may be eligible for benefits if their qualifying parent is deceased or disabled. Many of these benefits are available to qualified people at younger ages and thus will affect their future employment rates and earnings trajectories. There also exist special minimum benefits for those workers who fall below (extremely low) earnings cutoffs and a family maximum exists to cap total benefits paid to any single family. Due to data limitations at this time, we do not explore these "auxiliary" benefits and leave those complexities for further work.

Although these "auxiliary" Social Security benefits can impact the work and earnings patterns of eligible beneficiaries, their impact on the simulations we present below may be mitigated for two reasons. First, auxiliary beneficiaries are typically very low earners—median individual income among DI beneficiaries was about $9,300 in 1999 (Martin and Davies, 2003/2004). Hence, removing these individuals would leave women with slightly higher earnings (and they are also more likely to have greater labor force attachment) in our sample and thus push the estimated long-run impacts of the EITC upwards. Second, auxiliary beneficiaries tend to be older than the group of women generally eligible for the EITC; in 2008, for example, fewer than 20% of all DI beneficiaries and 5% of all spouses of retired or disabled workers in current pay status were 44 years old or younger (Social Security Administration, 2010). Furthermore, it is unclear whether these auxiliary benefits would have differential effects for single mothers with one child versus mothers with two children, which is the focus of the econometric model shown below.

2.4. Relevant Literature

The EITC, by increasing the returns to work, unambiguously encourages employment for low-income single parents. Numerous empirical studies have found evidence that the EITC does, in fact, encourage work among single mothers, especially those with less education (e.g., Eissa and Liebman, 1996; Meyer and Rosenbaum, 2000, 2001). Examining the 1987 expansion of the EITC and using a difference-in-differences strategy similar to that used in this analysis, Eissa and Liebman (1996) find an increase in labor force participation, but no change in hours of work, among women with children relative

to women without children. Similarly, by comparing single women with children to those without children, Meyer and Rosenbaum (2000, 2001) find that a substantial portion of the increase in employment of single women with children between 1991 and 1996 was the result of the EITC. Hotz, Mullin, and Scholz (2005) employ a difference-in-differences strategy in which the changes in employment of single mothers with two or more children are compared to those with exactly one child. Examining welfare recipients in California, they find that the EITC expansion of the early 1990s increased the employment of single mothers with two or more children relative to those with one child in the late 1990s.

In earlier work (DDS, 2009), we examined whether the jobs taken by single mothers as a result of the EITC incentives are "dead-end" jobs or jobs that have the potential for earnings growth. Using a panel of administrative earnings data linked to nationally representative survey data, we found no evidence that the EITC expansions between 1994 and 1996 induced single mothers to take "dead-end" jobs. If anything, the increase in earnings growth during the mid-to-late 1990s for single mothers who were particularly affected by the EITC expansion was higher than it was for other similar women. (We describe the model in detail in the next section).

Prior to 1996 and welfare reform, substantial numbers of single mothers worked off the books to avoid the penalties associated with on-the-books employment. Edin and Lein (1997) documented that of every dollar low-income parents spent, about 20% was coming from off-the-books or informal work. The expanded EITC and the end of welfare as we knew it both pulled and pushed women into the formal labor market. To our knowledge, no one has quantified the positive effects of this increased market work on insurance or longer-term benefit eligibility.

According to Lavery and Reno (2008), 6.5 million children under age 18—or nearly 9% of all U.S. children—received part of their family income from Social Security in 2005. These include 3.1 million children who receive benefits directly as dependents of deceased, disabled, or retired workers and 3.4 million other children who do not themselves receive Social Security but live with relatives who do. Of the 6.5 million children in families that received Social Security, fully 1.3 million were lifted out of

poverty by Social Security income (see also Hertel-Fernandez, 2010). This effect is about the same as the EITC on children's poverty (Blank and Schoeni, 2003). Social Security is especially helpful for minority children and is the largest source of cash transfer income for bottom quintile children (Folbre, 2008, 1994).

The debate about the value of Social Security for low-income Americans and minorities recognizes that low-income minorities tend to have a higher mortality rate than high-income people (Congressional Budget Office, 2008a). This factor would result in a lower value of Social Security retirement benefits for low-income workers *if* no other factors came into play. But this misses the larger picture. Social Security has a highly progressive benefit formula. Workers with relatively low earnings receive a much higher proportion of their wages as a retirement benefit than do high-wage earners (Schwabish and Topoleski, 2009). As a result, low-wage workers get back their payroll tax contributions in substantially fewer years than do high-wage earners (Duggan, Gillingham, and Greenlees, 1995). Further, minorities and their families are disproportionately more likely to receive disability and survivor's benefits than are non-minority workers owing to poorer health status and early mortality (Aaron and Shoven, 1999). Hence, Social Security benefits are important to the economic security of low-income families, especially those with children.

3. DATA SOURCES, RESEARCH DESIGN, AND BENEFIT SIMULATIONS

Our analysis is divided into two parts. In the first, we describe the process that we use to estimate the extent to which the expansions of the EITC during the early 1990s led to an increase in the number of Social Security quarters of coverage and to an increase in earnings growth among women eligible for the EITC. In the second part, we employ a simulation method to gauge whether the long-run earnings and employment effects—as estimated in the first part—lead to more quarters of coverage and higher Social Security benefits.

3.1. Data

In order to estimate the impact of the 1990 expansions in the EITC on employment and earnings growth, we use the 1993 and 1996 panels of the SIPP, which have been matched with longitudinal earnings records from the Social Security Administration's Detailed Earnings Records (DER).[4] The sample includes unmarried (widowed, divorced, or never married) women ages 19 to 44 who are not disabled (according to the survey) and not in school with at least one child. From the 1993 and 1996 panels of the SIPP, the sample is made up of single mothers in January 1993, 1994, 1995, March 1996, January 1997, 1998, 1999, and November 1999. Those women are then matched to their earnings records in the DER, obtaining detailed demographic information on a large sample of single mothers as well as their earnings from 1984 to 2005. Within the 1993 and the 1996 panel, some of these single mothers will appear more than once and the standard errors are adjusted accordingly. Earnings are adjusted for inflation using the CPI-U-RS.

Not all women in the SIPP match to the administrative earnings records; the match rate varied from 83% to 87% between 1993 and 2000. Individuals in the SIPP may not be matched to their administrative earnings record because of erroneous or missing Social Security Numbers. Cristia and Schwabish (2009) show that the roughly 80% match rate in the 1996 panel does not introduce significant bias to the sample. Those that do not match are not included in the analysis.

In order to simulate the labor supply effects of the EITC on Social Security benefits, we use a sample of low-educated women from the Continuous Work History Supplement (CWHS), a longitudinal administrative earnings dataset provided by SSA. The CWHS is a 1% random sample of all Social Security Numbers and contains longitudinal earnings records from the worker's W-2. Earnings, as defined in the CWHS, include wage and salary earnings, tips, and some other forms of compensation. For

[4]We use the combined SIPP-SSA file to examine earnings, as opposed to relying solely upon earnings data from the SIPP. Since the SIPP panels are relatively short, it is not possible to examine longer-term earnings histories using those data alone.

this analysis, they exclude self-employment income and deferred compensation such as contributions to 401(k) accounts. Earnings are available from 1978 to 2007 and, where appropriate, are inflated to 2007 dollars using the CPI-U-RS.

In this part of the analysis, the CWHS sample is restricted to women who were born in 1953; these women were 25 years old in 1978 and 54 years old in 2007, thereby taking advantage of all available years of data. Although the simulations track the earnings patterns of a single birth cohort, we are able to capture 30 years of earnings data for these women. We identify low-educated and high-educated women in the CWHS approximating the methods used by the Congressional Budget Office (CBO) in construction of its long-term microsimulation model (CBO, 2008b). We describe these methods in the Appendix.

Although treated here as the benchmark source of earnings data, the CWHS data (and, for that matter, the DER) are not infallible. Aside from age and sex, the CWHS contains very little additional demographic information. Further, all earnings records are recorded as either zero or positive; there is no distinction made between those workers who did not work in that year or, say, were not in the country (see Schwabish, 2009). There also exists the distinct possibility of recording error; in fact, previous research has found that some records between 1978 and 1982 are multiples of 100 relative to other earnings fields (see Schwabish, 2009; and Kopzcuk, Saez, and Song, 2007).[5] However, there are two main advantages to using the CWHS: First, it contains a sufficiently long sample to estimate close proxies of lifetime earnings patterns and estimates of Social Security benefits that would result from those earnings. Second, the CWHS contains a large number of observations—over 8,000 women in the low-educated group alone.

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[5]Some of these multiples appear to be due to recording errors by the SSA where for certain records the decimal place was accidentally moved two spaces to the right. We cannot fully account for these errors, so we adjust the sample by dropping people in the top 1 percent of the earnings distribution in 1978 and 1979. Further, after this 1 percent trim, earnings above $60,000 in both 1978 and 1979 are divided by two. With access to more data and larger samples, Kopzcuk, Saez, and Song (2007), and to a similar extent Schwabish (2009), employ a more complex method to adjust earnings in these early years.

3.2. Research Design

To estimate the effect of the EITC on Social Security quarters of coverage and on future earnings, we follow DDS (2009) and Hotz, Mullin, and Scholz (2005) and estimate a set of "difference-in-differences" models. These models are specified as:

$$(1) \quad Emp_{i,t} = \beta_0 + \sum_{t-1995}^{2000} \gamma_t \left(year_{i,t} = t \right) \times \left(kids_{i,t} \geq 2 \right) + \sum_{t-1995}^{2000} \beta_t \left(year_{i,t} = t \right) + \gamma_0 \left(kids_{i,t} \geq 2 \right) + \Theta X_{i,t} + \varphi_s + \varepsilon_{i,t}$$

where:

$Emp_{i,t}$ is employment in period t;

$Year_{it}$ is an indicator variable for the year in which demographics are measured;

$kids_{it} \geq 2$ is an indicator variable for having 2 or more children (versus exactly one child);

φ_s is a set of state indicator variables; and

$X_{i,t}$ is a vector of individual-level controls, including: marital status (widowed, divorced, never married); race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, non-Hispanic other); education (less than high school, high school, beyond high school); presence of children under age 6; age; and age-squared. Also estimated by DDS and used in the simulations to follow is the relationship between the one-year change in earnings and demographic characteristics of the sample, as in:

$$(2) \quad (E_{i,t+1} - E_{i,t}) = \beta_0 + \sum_{t=1994}^{2000} \gamma_t \left(year_{i,t} = t \right) \times \left(kids_{i,t} \geq 2 \right) + \sum_{t=1994}^{2000} \beta_t \left(year_{i,t} = t \right) + \gamma_0 \left(kids_{i,t} \geq 2 \right) + \Theta X_{i,t} + \varphi_s + \varepsilon_{i,t}$$

where:

$(E_{i,t+1} - E_{i,t})$ is the one-year change in log annual earnings and all other variables are defined as above.

Demographic characteristics, including marital status and number of children, are measured at the time of the survey. Some single mothers may marry. Some with one child may have additional children.

While these types of changes may be correlated with labor force decisions, changes that occur outside the survey window are not observable. In some specifications, state fixed effects are included to help control for geographic differences in the condition of local labor markets.

The coefficients on the interactions between the year variables and the indicator for having two or more children yield the "difference-in-differences" estimates. These estimates yield two quantities: (1) the effect of the EITC on the number of quarters of coverage (employment) over a 5-year period and (2) the effect of the EITC on earnings growth over a 5-year period.

3.3. Benefit Simulations

In the second part of the analysis, we apply the earnings and employment elasticities—as estimated in the first part of the analysis—to the CWHS to gauge the increase in quarters of coverage and Social Security benefits attributable to the EITC. The simulation requires five separate steps. We must first impute educational attainment to the CWHS sample of women born in 1953 to separate the sample into the group of women potentially eligible for the EITC (the low educated) and those who are not (the high educated). This step follows the procedure the CBO uses in its long-term microsimulation model (CBO, 2008b) and is described in the Appendix. Second, we adjust the employment rate among low-educated women in our sample by applying the employment elasticities estimated in equation (1). Third, we apply the earnings growth elasticities from equation (2) to the sample to push earnings upwards during the first few years (years for which estimated elasticities exist) in the sample. Fourth, we then apply annual earnings growth rates from the high-educated group to the low-educated group to raise earnings over the remainder of the simulation period. In a separate approach, we shift upwards earnings over the remainder of the simulation period for each woman using her actual annual change in earnings, but base that growth on the new, higher earnings level as estimated using the elasticities from equation (2). Finally, we estimate AIMEs and PIAs for both high-educated and low-educated women and compare the results across the two groups. We then compare the benefits for low-educated women before and after the application of the employment and earnings elasticities to assess whether the EITC expansions had an

effect on Social Security quarters of coverage and benefits among eligible women, including earlier qualification for benefits. Earlier qualification might cover non-retirement benefits such as disability and survivor benefits for children.

3.3.1. Employment reassignment

Having assigned educational attainment in the CWHS, the elasticities estimated using equation (1) are used to adjust the employment rate among the sample of low-educated women. Those estimates were based on an initial change in earnings between 1992 and 1993 and, as in the quarters of coverage equation shown above (in equation [1]), generate elasticities for seven other year-to-year changes from 1993 to 2000. Thus, since our CWHS sample starts in 1978, we base the employment and earnings assignment in that year and the next and begin reassigning earnings and employment in 1980. The application of those elasticities therefore ends in 1986. For this analysis, consistent with the estimation of these employment factors, we classify positive earnings as being in the labor force. We also include those factors that are not statistically significant, which will have the effect of pushing employment and earnings up slightly relative to the case in which we use only statistically significant coefficients.

The employment reassignment method randomly chooses a set of women that will make the employment rate match that of the original employment rate in the CWHS plus the elasticity we have estimated previously. Having chosen the women to "employ," we assign them earnings from between the 40^{th} and 60^{th} percentiles of the distribution of earnings among low-educated woman who moved from unemployment to employment during that same span. That is, when targeting the employment rate in 1983 the distribution of earnings is estimated from the women who were unemployed in 1982 and employed in 1983. The 40^{th} percentile was chosen because it is above the minimum quarters of coverage level in each year. That is, our employment reassignment method forces the newly employed woman to have at least four quarters of coverage.

3.3.2. Earnings reassignment

Estimated earnings elasticities (from equation [3] below and denoted as ε) are used to reassign earnings among low-educated women between 1980 and 1986, inclusive. Adjusted earnings during these seven years are calculated by multiplying the sum of two factors to the previous year's earnings:

1. the percentage change in original earnings between year *t-1* and year *t;*
2. the percentage growth adjustment factor from equation (2) in year *t*.

Thus, earnings in time *t* are calculated as:

$$(3) \qquad e_t = \max\{e_t, e_{t-1}, [1 + \varepsilon_t + ((e_t - e_{t-1})/e_{t-1}))] \times e_{t-1}\}$$

The maximum function is used to assure that zero earnings in years *t* (estimated) or *t-1* are not carried through to replace original, positive earnings in year *t*.

For earnings in years after the earnings elasticities are applied (1987–2007), we present two different scenarios. In the first, we calculate the median percentage change in earnings among women with high education. (See Table 3.) Then, in each year for the 1987–2007 period, we adjust earnings among the low educated such that new earnings are the maximum of her original earnings or original earnings times the median percentage change adjustment factor. That is:

$$(4) \qquad e_t^{low} = \max\left[e_t^{low}, e_t^{low} \times \left(1 + median\left(\frac{e_t^{high} - e_{t-1}^{high}}{e_{t-1}^{high}} \right) \right) \right]$$

where the *low* and *high* superscripts refer to levels of educational attainment. In this manner, we force earnings among the low educated to look more like those in the high-educated group.

In the second scenario, for each low-educated woman, we calculate the year-to-year percentage change in earnings during the 1987–2007 period as observed in the original CWHS data. Beginning in 1987, we then apply those percentage changes to grow earnings at the same observed year-to-year rate, but the level of earnings is now higher because of the application of the ε-elasticities in the first step (see equation [3]). For example, suppose a woman has actual earnings of $50 in 1986 and $75 in 1987; a 50% increase. After applying the elasticities in the first few years of the simulation, this woman has new

earnings that are, for example, equal to $100 in 1986. We then apply the original 50% increase between 1986 and 1987 to this new $100 base, which yields a new earnings level of $150 in 1987. Subsequent earnings are calculated in a similar way and thus the annual percentage change in earnings for each woman is the same as it is originally observed in the data, but now generates a higher level of earnings because of the application of the ε–elasticities through 1986.

3.4. Calculating Social Security Benefits: The AIME and PIA

To estimate expected Social Security benefits for women born in this cohort, we estimate a modified Average Indexed Monthly Earnings (AIME) and Primary Insurance Amount (PIA). Because we do not have a full 35 years of earnings with which to estimate the true AIME and PIA—as defined under current Social Security law—we use a modified AIME/PIA calculation that uses all of the thirty years of earnings available to us in the CWHS (1978–2007). Under current law, when the AIME is calculated, earnings are indexed to the average wage index in the year in which the worker turns 60. However, because this cohort turns 60 in 2013, we cannot know the average wage index in that year. Therefore, we index earnings to the most recent year of observed earnings in 2007; and similarly, we use the PIA bendpoints in 2007 ($680 and $4,100; see Figure 4) and do not further adjust benefits for cost-of-living adjustments (COLAs). Although this modification will not result in 'true' Social Security benefits, the relative values of the AIME and PIA will be maintained because everyone's earnings will be indexed to the same year.

4. RESULTS

4.1. Effects of EITC Expansions on Employment and Earnings Growth

Our earnings growth model shows that, in response to the 1993–1996 expansions of the EITC, employment rates and earnings growth among single mothers with two or more children increased faster than those among single mothers with one child.

The difference-in-difference estimates of the change in earnings growth and in the change in employment of single mothers with two or more children versus single mothers with exactly one child are reported in Table 1. These are identical to what we reported in DDS (2009). The coefficient on "two or more children" is -0.050 in column (1) (not statistically significant), suggesting that prior to the EITC expansion, earnings among mothers with two or more children grew, if anything, more slowly than earnings among single mothers with one child.

The coefficients on the interaction terms tell the impact of the EITC; by 1997 the coefficient on the interaction term is 0.191, suggesting that the EITC increased the earnings growth rate by 19 percentage points faster between 1992–1993 and 1996–1997 for single mothers with two or more children than for single mothers with only one child. This larger earnings growth rates are also evident in 1998 and in 2000. Adding state fixed effects barely changes these results (see column [2])).

The employment models are reported in columns (3) and (4). These estimates suggest that after conditioning on demographic variables, the employment rates of single mothers with two or more children were roughly 8 percentage points lower than those of single mothers with one child. However, by 1997, the employment rate of single mothers with two or more children had increased by 8 percentage points more than those of single mothers with only one child. The increases in employment between 1993 and 1999 and between 1993 and 2000 were also larger for single mothers with two or more children relative to those with one child.

These results suggest that the expansions in the EITC that occurred between 1994 and 1996 led to an increase in the employment rates of single mothers and to an increase in their earnings growth rates. These two factors may have led to an increase in their eligibility for and benefits under Social Security.

4.2. Benefit Simulation

As we described in Section 3 above, we simulate the impact of EITC expansions on a sample of low-educated women from the CWHS, all of whom were born in 1953, from age 25 in 1978 to age 54 in 2007. We increase the employment rates and earnings growth rates of these women from age 27 (1980) to

33 (1986) using the elasticities from equation (2) and reported in Table 1 (and in DDS). We then use the median annual percentage change in earnings among the high-educated group to grow earnings of low-educated women at this different rate. This method, in essence, allows the EITC to affect a woman's employment and earnings for 7 years; after that her earnings grow at a rate comparable to the median woman with higher levels of educational attainment.

The simulated increase in the employment rates of our sample of low-educated women is presented in Table 2. The EITC is estimated to have increased the employment rate of low-educated women by 1.7 percentage points in the first year following expansion (from 44.7% to 46.4%) and by up to 8.6 percentage points 6 years following expansion (from 45.8% to 54.4%).

The impact of the EITC on earnings growth is reported in Table 3. For each woman in the first 7 years following expansion, her earnings are increased using the elasticities from Table 1 (which range from 8.4% to a 19.1% increase). From year 8 onward, we increase earnings using one of two methods. We grow earnings by applying the median percentage change in earnings among high-educated women (which are reported in the last column of Table 3) or we allow earnings to grow at the same rate as observed in the original data, but applied to the new, higher level of earnings in 1986.

The impact of both the increases in employment and earnings growth on lifetime earnings of low-educated women are reported in Tables 4–7. We report the results of two methods of adjustment: The differences between the two methods are solely due to how earnings growth is treated in the "out-years"—years 7 through 27. In method 1, we use the median growth rates of high-educated women while in method 2 we apply each woman's original annual growth rates to the higher earnings base. In practice, the latter approach tends to yield higher lifetime earnings.

The mean and various percentiles of the lifetime earnings distribution for low-educated and high-educated women (for comparison) are reported in Table 4. We calculate lifetime earnings as average earnings over the 1978–2007 period (including years of zero earnings), inflated to 2007 dollars using the AWI. The mean lifetime earnings from age 25 to 54 among low-educated women is only $7,790, compared with $31,730 for high-educated women. The percentiles of lifetime earnings range from $400

at the 10th percentile and $6,250 at the median to $17,700 at the 90th percentile for low-educated women. In column (2), we report the distribution of lifetime earnings of low-educated women adjusted for the impact of the EITC using method 1, and in column (3) we report the percentage change in these statistics. Column (4) reports the distribution of lifetime earnings using adjustment method 2 and column (5) reports the percentage change. According to the first method, mean lifetime earnings increased by 6.5% as a result of the EITC. These increases are largest in the bottom half of the lifetime earnings distribution and are substantially larger at lower points in the distribution. For example, the 10th percentile of lifetime earnings increases by 33.7% while the median increases by 9.3%. According to the second method, mean lifetime earnings increase by 16.8% and, once again, percentage increases are larger towards the bottom of the distribution though, in the case of method 2, to a lesser extent.

Not all of these women will qualify for Social Security, however, as they may have fewer than 40 quarters (10 years) of earnings. Only roughly 60% of low-educated workers will qualify based on their own earnings compared with 92% of high-educated women. In the lower panel of Table 4, we report the lifetime earnings distribution of women who qualify for Social Security. The mean lifetime earnings among these women are higher: $11,860 for low-educated women and $33,960 for high-educated women.

Once we condition on Social Security eligibility, the impact of the EITC on lifetime earnings is smaller. Mean lifetime earnings increase by 3.1% using method 1 and the increases rise across the distribution from 1.5% at the 10th percentile to 3.6% at the 90th percentile. Under method 2, average lifetime earnings increase by 13.5% and again, these changes are higher for those with higher levels of average lifetime earnings.

The AIME is closely related to our measure of lifetime earnings. We report the impact of the EITC on AIMEs in Table 5. Not surprisingly, we see similar impacts on the AIME as we did for lifetime earnings.

The impact of the EITC on quarters of coverage and, therefore, on eligibility for Social Security is reported in Table 6. The earnings and employment effects increase the percentage of low-educated women who qualify for Social Security based on their own earnings histories by 2.3% under method 1

and by a slightly higher 2.6% using method 2. These results illustrate the secondary impact of the EITC beyond affecting the work and earnings patterns of women primarily eligible for the credit in that there are around 2% more women eligible to claim Social Security benefits on their own earnings history.

The impact of the EITC on the PIA of low-educated women is slightly more complicated because of two factors. (See Table 7.) First, not all women qualify for Social Security, so an increase in AIME may not lead to an increase in PIA if a woman continues to not qualify for Social Security. Second, there is a nonlinear relationship between AIME and PIA for those women who do qualify (see again Figure 4). Our results suggest between a 5% and 10% increase in PIAs as a result of the EITC. Restricting the increase to those who qualify (one's PIA is usually meaningless if one does not qualify for retirement benefits), there is a more modest increase in the mean PIA using method 1—1.7%—but a larger increase of 6.9% using method 2. As with AIMEs, the distribution of these percentage increases in PIAs is roughly equal across the earnings distribution.

5. DISCUSSION

Unmarried mothers are in particular need of social insurance. They have little to fall back on other than means-tested benefits in time of need. They have no bequest for their children in case of premature death. They have low or nonexistent private pensions. Indeed, based on pre-1996 patterns of work, the Social Security MINT benefit simulation model (Iams and Butrica, 1999; Smeeding, 1999) projects higher future poverty rates for divorcees and single older women. Social Security eligibility drastically changes this picture: It brings survivors benefit protection for their children, the possibility of Disability Insurance, and a better retirement income.

Given what appears to be large employment and earnings growth impacts of the EITC on single mothers, we find a notable increase in the share of low-educated women who are eligible for Social Security benefits on their own records because of the EITC expansions. Not only are more women projected to be eligible for Social Security benefits, but we also find that lifetime earnings are markedly

higher for these women, by between 3% and 14%. That increase directly translates to higher Social Security benefits, which, at the mean, are higher by between about $130 and $560 per year.

There are several limitations to our analysis. First, we do not consider the spousal benefit. This would, we suspect, lower the implied increase in benefits even further as those women who qualify for a spousal benefit would be unlikely to have their benefit affected by the EITC. Second, we do not consider disability benefits. Many women will eventually qualify for Social Security via the disability program, which requires far fewer quarters of coverage. However, as noted, we do not believe incorporating these types of benefits into the model would dramatically change the overall results.

6. CONCLUSION

The EITC increases employment and increases earnings growth. These translate into increases in lifetime earnings on average and, especially, at the bottom of the distribution. Such increases therefore directly affect Social Security benefits, which, under our various simulation methods, are predicted to rise by a considerable amount.

These methods can be expanded to other 'work-conditioned' programs and to other nations. In addition to the retirement income advantages earned by low-earning parents whose market earnings have risen, there will also be a positive effect on reaching eligibility for Social Security Disability and Survivors benefits. These increases in earnings and hours will also increase eligibility and benefit levels for unemployment and worker compensation, and perhaps other work-conditioned social insurance benefits.

More than half of OECD countries also have "in work" benefits designed to top up earnings for low-income households (OECD, 2009, 2010). And many of these programs work like the U.S. EITC to subsidize increased "on-the-books" work effort by low-income people. And so we would expect similar effects in other nations.

Both of these types of extensions are liable to have positive earnings-related social insurance effects similar to what we find here for retirement incomes alone. These effects are beyond the horizon of this paper, but are topics for additional research.

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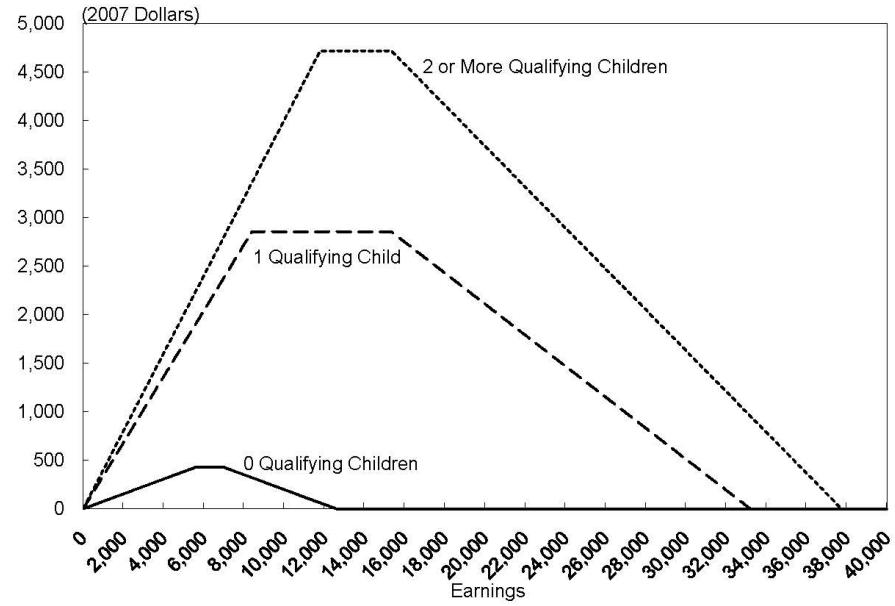
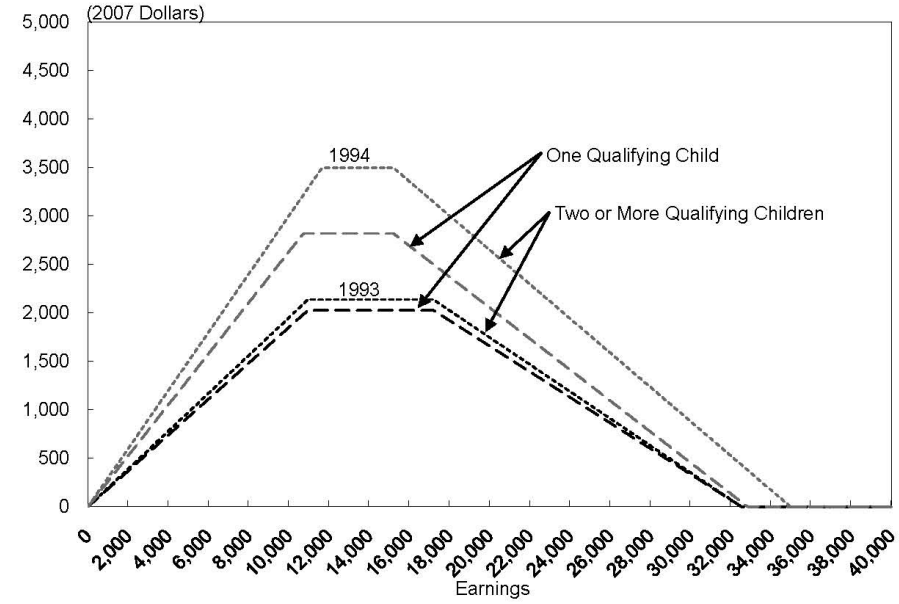
Figure 1.
EITC for Non-Joint Filers in 2007, by Number of Qualifying Children



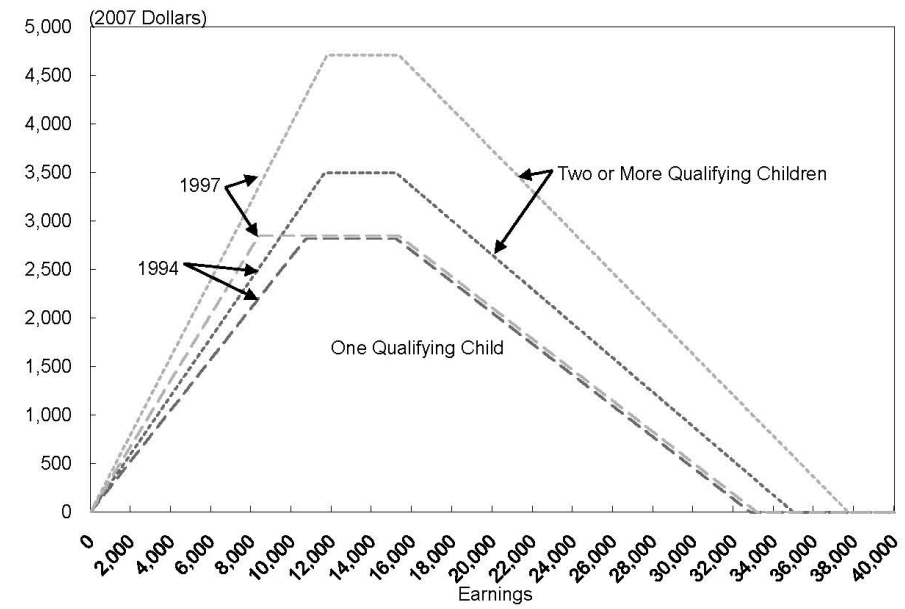
Source: Tax Policy Center, Urban Institute and Brookings Institution

Figure 2.
EITC for Non-Joint Filers with One or Two or More Qualifying Children, 1993 and 1994



Source: Tax Policy Center, Urban Institute and Brookings Institution

Figure 3.
EITC for Non-Joint Filers with One or Two or More Qualifying Children, 1994 and 1997



Source: Tax Policy Center, Urban Institute and Brookings Institution

Figure 4. Social Security Benefit Formula, 2007

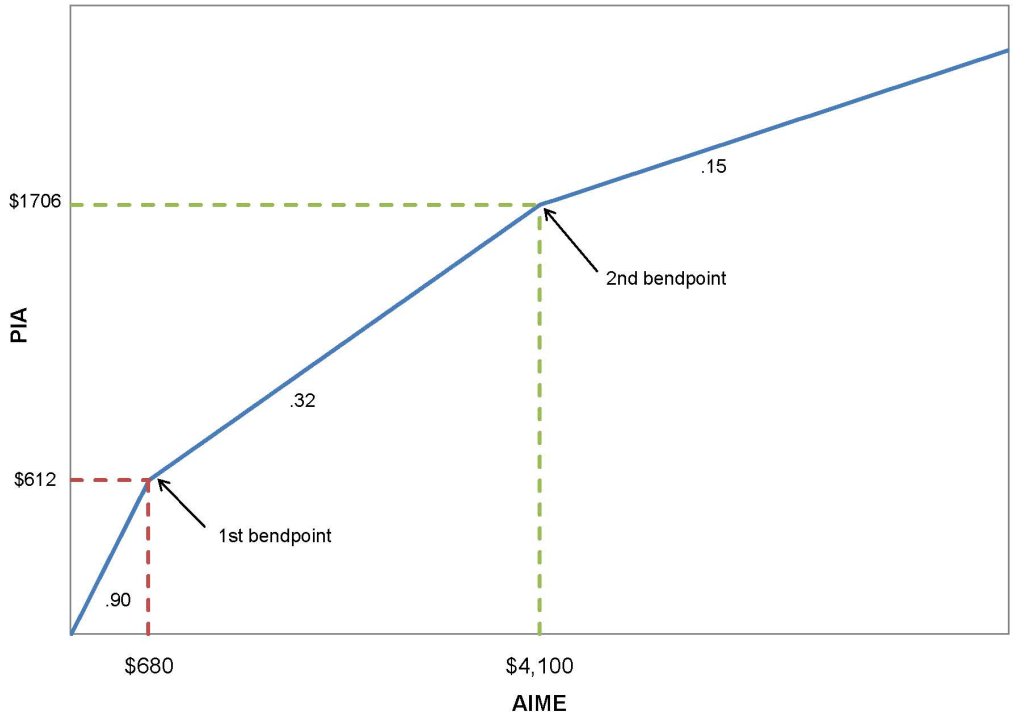


Table 1
The Effects of the EITC on Earnings Growth and Employment of Single Mothers

	Year-over-Year Earnings Growth		Employment	
	(1)	(2)	(3)	(4)
2+ Kids in 1994	0.098	0.093	0.017	0.021
	(0.094)	(0.094)	(0.024)	(0.025)
2+ Kids in 1995	0.100	0.099	-0.015	-0.01
	(0.090)	(0.090)	(0.028)	(0.028)
2+ Kids in 1996	0.099	0.096	0.036	0.042
	(0.075)	(0.075)	(0.027)	(0.027)
2+ Kids in 1997	0.191	0.185	0.081	0.086
	(0.072)**	(0.072)*	(0.027)**	(0.026)**
2+ Kids in 1998	0.133	0.129	0.035	0.038
	(0.073)+	(0.073)+	(0.027)	(0.027)
2+ Kids in 1999	0.084	0.082	0.086	0.086
	(0.072)	(0.072)	(0.027)**	(0.026)**
2+ Kids in 2000	0.135	0.132	0.062	0.062
	(0.072)+	(0.072)+	(0.027)*	(0.026)*
No. Qualifying Kids ≥ 2	-0.050	-0.050	-0.077	-0.081
	(0.062)	(0.062)	(0.023)**	(0.022)**
Demographic controls	Yes	Yes	Yes	Yes
Year dummy variables	Yes	Yes	Yes	Yes
State dummy variables	No	Yes	No	Yes
Observations	10,414	10,414	12,923	12,923
R-squared	0.02	0.02	0.08	0.09

Robust standard errors in parentheses
+ significant at 10%; * significant at 5%; ** significant at 1%
Notes:
Employment is defined as those with positive annual earnings.
Year-over-Year Earnings Growth is the difference in log annual earnings.
Sample: Single women, age 19 to 44, not in school, not disabled, with a person age 18 or younger or age 19 to 24 and enrolled in school in the family. Sample drawn in January 1993, 1994, 1995, March 1996, January 1997, 1998, 1999, and November 1999.
Demographic controls include marital status (widowed, divorced, never married [excluded]), race/ethnicity (non-Hispanic white [excluded], non-Hispanic black, Hispanic, non-Hispanic other), education (less than high school [excluded], high school, beyond high school), presence of children under age 6, age and age squared.
Source: Authors' calculations from the SIPP-SSA matched sample. See Dahl, DeLeire, and Schwabish (2009) for full discussion of these regression results.

Table 2
Employment Rates Among Low Educated Women: Before and After Assignment of Employment Elasticities

Year Post-Expansion in Simulation	Year in CWHS	Estimated Employment Elasticity from Table 1	Original Employment Rate	Adjusted Employment Rate
1	1980	0.017	44.7	46.4
2	1981	-0.015	43.1	41.6
3	1982	0.036	39.6	43.2
4	1983	0.081	41.5	49.6
5	1984	0.035	43.3	46.8
6	1985	0.086	45.8	54.4
7	1986	0.062	46.4	52.6

Source: CWHS and authors' calculations.

Table 3
Earnings Elasticities and Median Percent Change in Earnings, 1980-2007

Year Post-Expansion in Simulation	Year t	Year t+1	Estimated Earnings Elasticity from Table 1	Median Percent Change in Earnings Among High Educated Women
1	1979	1980	0.098	----
2	1980	1981	0.100	----
3	1981	1982	0.099	----
4	1982	1983	0.191	----
5	1983	1984	0.133	----
6	1984	1985	0.084	----
7	1985	1986	0.135	----
8	1986	1987	----	3.04
9	1987	1988	----	2.33
10	1988	1989	----	1.83
11	1989	1990	----	1.47
12	1990	1991	----	1.85
13	1991	1992	----	3.20
14	1992	1993	----	1.39
15	1993	1994	----	1.95
16	1994	1995	----	2.17
17	1995	1996	----	1.55
18	1996	1997	----	2.31
19	1997	1998	----	3.28
20	1998	1999	----	2.02
21	1999	2000	----	1.25
22	2000	2001	----	1.31
23	2001	2002	----	1.85
24	2002	2003	----	0.92
25	2003	2004	----	0.48
26	2004	2005	----	-1.09
27	2005	2006	----	-0.02
28	2006	2007	----	0.43

Source: CWHS and authors' calculations.

Table 4
Distribution of Lifetime Earnings (2007 AWI dollars)

All Workers

	(1)	(2)	(3)	(4)	(5)	(6)
		Method 1		Method 2		
Percentile	Low Educated, Pre-Adjustment	Low-Educated, Post-Adjustment	Percent Difference	Low-Educated, Post-Adjustment	Percent Difference	High Educated
10	400	530	32.5	550	37.5	10,090
20	1,320	1,590	20.5	1,580	19.7	16,270
30	2,680	3,080	14.9	3,110	16.0	21,220
40	4,360	4,760	9.2	4,880	11.9	25,220
50	6,250	6,830	9.3	7,030	12.5	29,450
60	8,350	8,930	6.9	9,300	11.4	33,900
70	10,810	11,470	6.1	12,070	11.7	39,030
80	13,650	14,410	5.6	15,360	12.5	46,200
90	17,700	18,540	4.7	20,310	14.7	56,460
Mean	7,790	8,300	6.5	9,100	16.8	31,730

Workers With Sufficient Work History to Qualify for Social Security

	(1)	(2)	(3)	(4)	(5)	(6)
		Method 1		Method 2		
Percentile	Low Educated, Pre-Adjustment	Low-Educated, Post-Adjustment	Percent Difference	Low-Educated, Post-Adjustment	Percent Difference	High Educated
10	5,190	5,270	1.5	5,330	2.7	14,650
20	6,640	6,810	2.6	6,950	4.7	19,460
30	7,950	8,170	2.8	8,420	5.9	23,480
40	9,370	9,610	2.6	9,980	6.5	27,200
50	10,880	11,180	2.8	11,670	7.3	31,120
60	12,470	12,910	3.5	13,580	8.9	35,370
70	14,400	14,920	3.6	15,910	10.5	40,690
80	16,750	17,410	3.9	18,960	13.2	47,460
90	19,880	20,600	3.6	23,150	16.4	57,550
Mean	11,860	12,230	3.1	13,460	13.5	33,960

Source: CWHS and authors' calculations.
Note: All earnings inflated to 2007 dollars using the Average Wage Index (AWI).

Table 5
Distribution of AIME

All Workers

	(1)	(2)	(3)	(4)	(5)	(6)
		Method 1		Method 2		
Percentile	Low Educated, Pre-Adjustment	Low-Educated, Post-Adjustment	Percent Difference	Low-Educated, Post-Adjustment	Percent Difference	High Educated
10	33	44	33.7	46	38.9	841
25	164	192	16.8	194	17.8	1,570
50	521	569	9.3	586	12.5	2,454
75	1,014	1,069	5.5	1,129	11.4	3,534
90	1,475	1,545	4.8	1,693	14.8	4,705
Mean	649	691	6.6	758	16.9	2,644

Workers With Sufficient Work History to Qualify for Social Security

	(1)	(2)	(3)	(4)	(5)	(6)
		Method 1		Method 2		
Percentile	Low Educated, Pre-Adjustment	Low-Educated, Post-Adjustment	Percent Difference	Low-Educated, Post-Adjustment	Percent Difference	High Educated
10	432	440	1.6	444	2.7	1,221
25	607	627	3.2	641	5.6	1,805
50	906	932	2.8	973	7.3	2,594
75	1,292	1,339	3.6	1,445	11.8	3,652
90	1,657	1,716	3.6	1,929	16.4	4,796
Mean	988	1,019	3.1	1,122	13.5	2,830

Source: CWHS and authors' calculations.
Note: All earnings inflated to 2007 dollars using the Average Wage Index (AWI).

Table 6
Percent of Workers Covered by Social Security
(Percent above minimum quarters of coverage threshold)

	Method 1		
	Low Education	High Education	All
Before Reassignment	59.6%	92.0%	78.7%
After Reassignment	61.9%	92.0%	79.6%
Difference	2.3%	0.0%	1.0%

	Method 2		
	Low Education	High Education	All
Before Reassignment	59.6%	92.0%	78.7%
After Reassignment	62.1%	92.0%	79.7%
Difference	2.6%	0.0%	1.1%

Source: CWHS and authors' calculations.

Table 7
Distribution of PIA

All Workers

	(1)	(2)	(3)	(4)	(5)	(6)
		Method 1		Method 2		
Percentile	Low Educated, Pre-Adjustment	Low-Educated, Post-Adjustment	Percent Difference	Low-Educated, Post-Adjustment	Percent Difference	High Educated
10	30	40	33.9	41	38.9	664
25	148	173	16.8	174	17.8	897
50	469	512	9.3	527	12.5	1,180
75	719	736	2.5	756	5.1	1,525
90	866	889	2.6	936	8.1	1,991
Mean	457	480	5.1	504	10.3	1,253

Workers With Sufficient Work History to Qualify for Social Security

	(1)	(2)	(3)	(4)	(5)	(6)
		Method 1		Method 2		
Percentile	Low Educated, Pre-Adjustment	Low-Educated, Post-Adjustment	Percent Difference	Low-Educated, Post-Adjustment	Percent Difference	High Educated
10	389	396	1.6	400	2.7	785
25	546	564	3.2	577	5.6	972
50	684	693	1.2	706	3.1	1,224
75	808	823	1.9	857	6.1	1,563
90	925	944	2.1	1,012	9.4	2,034
Mean	677	688	1.7	723	6.9	1,327

Source: CWHS and authors' calculations.

Appendix A. Imputing educational attainment to the CWHS

To estimate the effect of the EITC on long-run earnings growth, we must first identify those women who are likely to have received the EITC. Because the CWHS contains limited demographic information, we do not have individual-level characteristics that would imply EITC receipt, such as marital status or number of young children. Instead, we impute educational attainment to each person in the CWHS using their longitudinal earnings record and then consider low-educated women as the treatment group and women with high levels of educational attainment as the control group.

The method to impute educational attainment to the CWHS compares the longitudinal earnings patterns in the CWHS to average age-earnings profiles estimated from pooled March Current Population Survey (CPS) files. The procedure is similar to that presented in CBO (2008), which was used to impute educational attainment to CBO's long-term microsimulation model. The imputation method proceeds in three steps: estimate age-earnings profiles from the CPS; compare earnings in the CWHS at each age to the CPS age-earnings profiles; and make a final adjustment to people yet unassigned a level of educational attainment.

In the first step, we estimate a regression of earnings on a quadratic in age for women born in 1953 for each of four education levels: less than high school, high school graduate, some college, and college graduate. The regression is based on pooled CPS data from (calendar years) 1978 to 2008 and is weighted using the CPS sample weights; top-coded earnings have been adjusted using draws from a Pareto distribution, parameters from which are estimated in the CWHS.[6] From these regressions, we calculate the predicted earnings and the standard error at each age for each level of educational attainment. These parameters enable us to generate an average age-earnings profile for each age and

[6]See Schwabish (2010).

educational attainment category, and to build a "band" around each at plus or minus 5-standard errors. (See Appendix Figure 1.)[7]

In the second step, we compare the earnings for each person in the CWHS to the predicted earnings from the CPS regressions at each age. Each time the person's CWHS earnings falls within an education-earnings band, we assign them a value of 1 for less than high school, 2 for high school graduate, 3 for some college, and 4 for college graduate. We then take the mean of this series for each individual and assign ultimate educational attainment accordingly.[8]

Finally, there are some people whose earnings never fall within an education-earnings band, either because their earnings are too high, too low, or just fall between the bands. Such people are reassigned as high school graduates, because doing so makes the distribution of educational attainment similar to that observed distribution in the CPS.

To illustrate how the educational attainment imputation works, consider a very simple example with a worker who has $6,500 of earnings at age 25; that amount falls within the $6,123 to $10,544 range of earnings among high school dropouts and thus, at age 25, that person is assigned the value of *one*, a high school dropout. Now, at age 26, her earnings rise to $13,000, which falls within the high school graduate range ($12,036 to $14,937); thus she is imputed to be a high school graduate at age 26. Continue this process for each age—notice that years of zero earnings are included—and then take the mean across all of those imputations; that final number is this worker's imputed level of educational attainment.

Overall, the imputation method generates a distribution of educational attainment that is fairly close to that found in the pooled March CPS file and the average earnings-age patterns are, at least ordinally, as expected. (See Appendix Figure 1.) Additionally, because we aggregate the two lower

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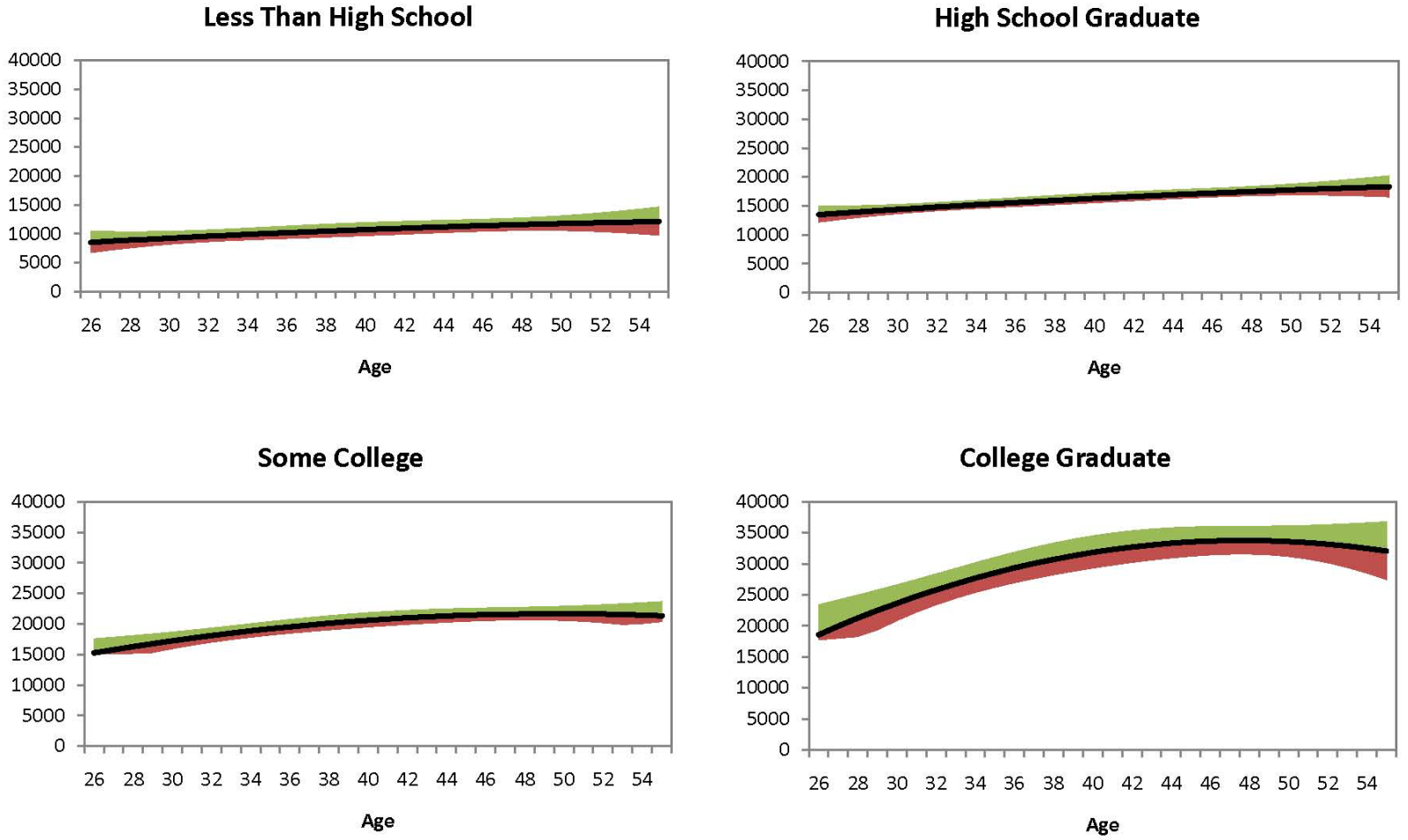
[7]Further note that at overlapping points—for example, ages 25 to 28 among the 'college graduate' group—we use the +5 standard error point from the 'some college' group.

[8]We have also tried a variety of estimation methods, including using the median or mode value across the educational attainment values. We have also modified whether we round or integerize this mean or median total. For this sample, rounding the mean value seems to best approximate the distribution found in the CPS.

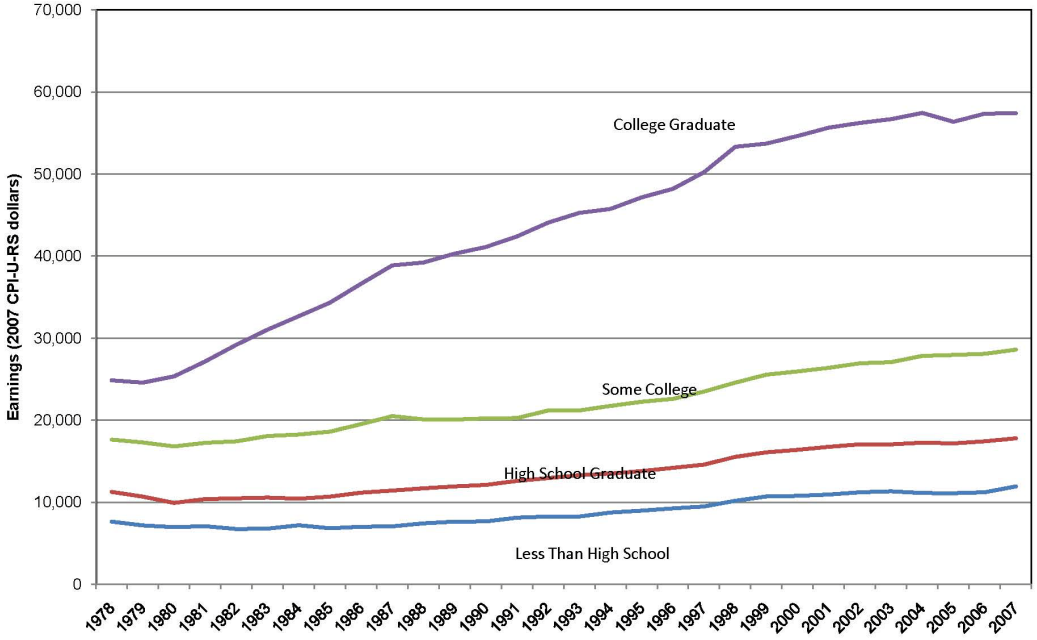
education groups and the two higher education groups, the distribution of educational attainment is within about two percentage points from the CPS distribution. (See Appendix Table 1.)

Appendix Figure 1. Estimated Average Earnings-Age Profiles from Pooled March CPS data for Women in the 1953 Birth Cohort



Notes: Estimated profiles from pooled 1979-2009 March CPS data. Estimates derived from separate earnings regressions for each level of educational attainment. All regressions are weighted using the CPS person weights. Earnings are deflated to 2007 CPI-U-RS dollars. Earnings "bands" around each profile represent +/- 5 standard errors around each estimated coefficient.

Appendix Figure 2. Average Earnings-Age Profiles, CWHS, Post Education-Imputations



Source: March CPS, 1978-2009; CWHS; and author's calculations. Earnings shown in 2007 CPI-U-RS dollars.

Appendix Table 1
Distribution of Educational Attainment, CPS and CWHS Imputations, Women Born in 1953

Education Level	March CPS, 1978–2008	CWHS Imputation Results	Difference
Less Than High School	7.4	10.3	2.9
High School Graduate	35.9	30.9	-5.0
Some College	27.6	22.6	-5.0
College Graduate	29.0	36.3	7.3
Low Educated			
Less Than High School or High School Graduate	43.3	41.2	-2.1
High Educated			
Some College or College Graduate	56.6	58.8	2.2

Source: March CPS, 1979–2009; CWHS; and authors' calculations.