The earned income tax credit, mental health, and happiness ☆

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A B S T R A C T

We study the impact of the earned income tax credit (EITC) on various measures of subjective well-being (SWB) using the National Survey of Families and Households (NSFH) to estimate intent-to-treat effects of the EITC expansion embedded in the 1990 Omnibus Budget Reconciliation Act. We use a difference-in-differences framework that compares the pre-and post-expansion SWB-changes of women likely eligible for the EITC (low-skilled mothers of working age) to the SWB-changes of a comparison group that is likely ineligible (low-skilled, childless women of working age). Our results suggest that the EITC expansion generated sizeable SWB-improvements in the three major categories of SWB identified in the literature. The NSFH is one of few datasets containing all three major categories of SWB. Subgroup analyses by marital status suggest that improvements accrued more to married than unmarried mothers. Relative to their childless counterparts, married mothers experienced a 15.7% decrease in depression symptomatology (experiential SWB), a 4.4% increase in happiness (evaluative SWB), and a 10.1% increase in self-esteem (eudemonic SWB). We also present specification checks that increase confidence that the observed SWB-effects are explained by the OBRA90 EITC expansion. Lastly, we explore mechanisms that may explain the differential impact of the EITC expansion by marital status.

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1. Introduction

Over the past three decades, the federal earned income tax credit (EITC) has become arguably the most important U.S. anti-poverty program. Enacted in 1975, the EITC was designed as a refundable tax credit to offset the rise in payroll taxes; 6 million families received $5 billion in 1975 (2013 USD). Today, the program is viewed primarily as a wage supplement; 28 million families received $64 billion in 2012 (Tax Policy Center, 2012). By comparison, expenditures on Temporary Assistance to Needy Families, the U.S.'s flagship welfare program, are less than $30 billion (U.S. Department of Health and Human Services, 2013). The anti-poverty effects of the EITC are well-documented. For example, in 2011, the program lifted 9.4 million people, including 4.9 million children, above the poverty line (Center on Budget and Policy Priorities, 2013).

In response to the growing prominence of the EITC, empirical work has begun to shift away from traditional economic outcomes (e.g., employment) toward an emphasis on the EITC's potential health effects. In particular, recent studies examine whether EITC expansions have implications for infant health and birth weight (Baker, 2008; Strully et al., 2010; Hoynes et al., 2015), children's cognitive ability test scores (Dahl and Lochner, 2012), and adult biomarkers and mental health (Evans and Garthwaite, 2014). Using data from the National Survey of Families and Households (NSFH), this paper contributes new evidence on the health implications of the EITC. In particular, we examine the impact of the 1990 federal EITC expansion through the Omnibus Budget Reconciliation Act (OBRA90) on adults' mental health and subjective well-being (SWB).

The NSFH provides several advantages for studying the health effects of the EITC. First, the NSFH survey includes measures of three key categories of SWB, including a subset of the multi-item Center for Epidemiologic Studies-Depression (CES-D) scale (*experiential* SWB), a measure of global happiness (*evaluative* SWB), and a variety of indicators of self-esteem (*eudemonic* SWB). Importantly, all three SWB categories are seldom available in the same survey. Second, the NSFH's initial wave of data collection occurred in 1987 and 1988 — providing outcome data on pre-reform mental health and SWB — while the second wave occurred over the period 1992–1994 — providing post-reform outcome data. Therefore, our identification strategy relies on a difference-in-differences (DD) framework to estimate intent-to-treat (ITT) effects of the EITC. Third, the survey oversampled low-income families, including unmarried women with children, who are key beneficiaries of the EITC. Fourth, the NSFH was originally intended to be used by sociologists and demographers interested in studying household structures; thus, the survey provides detailed information on intra-household relationships. This allows us to closely simulate the federal EITC qualifying-child rules, whereas previous EITC studies generally rely on coarser measures of qualifying children. Finally, we are able to replicate with the NSFH the finding from the literature that EITC expansions have sizeable employment effects. Sub-group analyses by marital status suggest that unmarried and married mothers' employment increased; consistent with previous work, the effects were larger for unmarried than married mothers.

Given the range of outcomes that the EITC has been shown to affect — from income and labor supply to family structure — and the complicated ways in which these outcomes can interact to produce individual well-being, we anticipate that the EITC will affect mental health and SWB, but the net effect is unclear ex ante. For example, an SWB-increase from additional income may be partially or fully offset by an SWB-decrease from reduced leisure time. Of course, individuals are not forced to receive the EITC, so it would be unlikely that SWB would decrease.

Our DD estimates consistently point to a positive effect of the OBRA90 EITC expansion on mental health and SWB. Specifically, potentially eligible mothers show improved scores on the CES-D, report higher levels of happiness, and are more likely to report feelings of self-worth and -efficacy. Interestingly, our sub-group analyses reveal that married mothers capture most of the EITC's positive mental health and SWB effects. This pattern of results — smaller employment effects coupled with larger mental health effects for married relative to unmarried mothers — is consistent with that in Evans and Garthwaite (2014), who examine the health effects of a different EITC expansion (OBRA93).[1] Our baseline results are robust to a battery of specification checks, and the model passes a falsification test in which we estimate the DD model on two groups of women — high-income and -education — who are not likely to be eligible for the EITC.

The remainder of the paper proceeds as follows. Section 2 provides an overview of the EITC and estimates of the increase in potential EITC benefits for eligible households associated with the OBRA90 EITC expansion. Section 3 summarizes the relevant EITC and SWB literatures, and our contribution to both. Section 4 describes our empirical strategy, describes the analysis sample, and provides validation of the NSFH. Section 5 presents the results. We conclude with a discussion of mechanisms, magnitude, and policy implications in Section 6.

2. Overview of the EITC

The 1975 Tax Reduction Act created the EITC as a refundable tax credit for tax filers with children; if EITC benefits exceeded tax liabilities, families received a check for the difference from the Internal Revenue Service. The EITC was initially intended to achieve three goals: act as a "work bonus" for the working poor, offset growth in payroll taxes, and stimulate demand in response to the 1974 recession. Since its inception, eligibility for the EITC has been determined along two dimensions. First, taxpayers must have non-zero earned income from wages, salary, or self-employment. Second, unmarried and married tax filers must have adjusted gross income below some threshold. This threshold has varied over time and with the number of qualifying children. The EITC benefit structure has three regions (Browning, 1995). The first, the phase-in region, has a negative marginal EITC-tax rate and operates likes a wage subsidy. The second, the plateau region, has a marginal EITC-tax rate of zero and acts like a lump sum transfer. Finally, the phase-out region, has a positive marginal EITC-tax rate that phases out the credit as earnings rise. After gaining permanent tax code status in 1978, the EITC experienced its first expansion through the 1986 Tax Reform Act (TRA86). This law raised the subsidy rate to 14% and gradually increased the maximum credit and eligible income range, undoing the erosion EITC benefits had suffered due to inflation.

We are concerned with the EITC's second major expansion. The OBRA90 increased the maximum credit and eligible income range, and created separate benefit schedules for one- and multiple-child households, increasing the subsidy rate

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[1] Although presented, this finding is not discussed at length in Evans and Garthwaite (2014). Another contribution of this paper is to subject all results to subgroup analysis by marital status and to establish the robustness of Evans and Garthwaite's (2014) briefly-mentioned finding.

Table 1
The EITC benefit parameters, 1975–1996.

Year	Subsidy rate (percent)	Phase-in income range		Maximum credit	Plateau income range		Phase-out rate (percent)	Phase-out income range		Number of claimants (thousands)
1975–1978	10	0	4000	400	4000	4000	10	4000	8000	5877[a]
1979–1984	10	0	5000	500	5000	6000	12.5	6000	10,000	6824[a]
1985–1986	11	0	5000	550	5000	6500	12.22	6500	11,000	7294[a]
1987	14	0	6080	851	6080	6920	10	6920	15,432	8738
1988	14	0	6240	874	6240	9840	10	9840	18,576	11,148
1989	14	0	6500	910	6500	10,240	10	10,240	19,340	11,696
1990	14	0	6810	953	6810	10,730	10	10,730	20,264	12,542
1991										13,665
One child	16.7	0	7140	1192	7140	11,250	11.93	11,250	21,250	
≥Two children	17.3	0	7140	1235	7140	11,250	12.36	11,250	21,250	
1992										14,097
One child	17.6	0	7520	1324	7520	11,840	12.57	11,840	22,370	
≥Two children	18.4	0	7520	1384	7520	11,840	13.14	11,840	22,370	
1993										15,117
One child	18.5	0	7750	1434	7750	12,200	13.21	12,200	23,050	
≥Two children	19.5	0	7750	1511	7750	12,200	13.93	12,200	23,050	
1994										19,017
No children	7.65	0	4000	306	4000	5000	7.65	5000	9000	
One child	26.3	0	7750	2038	7750	11,000	15.98	11,000	23,755	
≥Two children	30	0	8425	2528	8425	11,000	17.68	11,000	25,296	
1995										19,334
No children	7.65	0	4100	314	4100	5130	7.65	5130	9230	
One child	34	0	6160	2094	6160	11,290	15.98	11,290	24,396	
≥Two children	36	0	8640	3110	8640	11,290	20.22	11,290	26,673	
1996										19,464
No children	7.65	0	4220	323	4220	5280	7.65	5280	9500	
One child	34	0	6330	2152	6330	11,610	15.98	11,610	25,078	
≥Two children	40	0	8890	3556	8890	11,610	21.06	11,610	28,495	

Source: adapted from Hotz and Scholz (2003).
Notes:

[a] Annual average.

from 14% to 23% and 25%, respectively.[2] Implementation was phased in from 1991 to 1994 (see Table 1). The expansion resulted in a substantial increase in the number of households receiving EITC benefits, from 8.7 million in 1987 to 15.1 and 19.0 million in 1993 and 1994, respectively. A third expansion occurred through the OBRA93, which was implemented from 1994 to 1996. It is worth noting that in 1994 implementation of OBRA90 and OBRA93 overlapped. Thus, 1994 EITC benefits are greater than prescribed in OBRA90.

2.1. Estimating the magnitude of EITC expansion

The first wave of the NSFH was administered in 1987 and 1988, with the bulk of observations (89.5%) from 1987. The second wave of the NSFH was administered from 1992 to 1994, with the majority of observations (68.6%) from 1993 (17.3% and 14.1% are from 1992 and 1994, respectively). Thus, the EITC expansion between waves one and two is primarily due to the OBRA90. To estimate the magnitude of the EITC expansion between waves 1 and 2 of the NSFH, we examine how the expansion changes EITC benefits across income levels, both in absolute terms and as a percentage of annual income. Specifically, we compute the "potential treatment magnitude" in our D-in-D approach by comparing the EITC benefits in 1987–1993 (OBRA90 was not yet fully implemented) and 1994 (OBRA93 was beginning to be implemented). The magnitude depends upon number of children, income, and comparison years; and for comparability, we convert all values to 2014 dollars (see Figs. 1 and 2). For example, from 1987 to 1993 the maximum EITC benefits of a one-child household with real income of $19,987 increased by $1,131.80 (from $1217.20 to $2349), or 5.7% of household income. From 1987 to 1994, the maximum EITC benefits of a multiple-child household with real income of $14,421 increased by $2265 (from $1773 to $4038) or 15.7% of household income. Table 2 reports the treatment magnitudes as a percentage of household income by number of children and comparison years. The maximum treatment magnitudes for the 1987–1993, and 1987–1994, comparisons are 6.3%, and 16.8%, respectively.

We can compare the treatment magnitudes of the OBRA90 EITC expansion to other EITC expansions. For example, the treatment magnitudes for the TRA86 EITC expansion — which has been studied in the literature, including in Eissa and Leibman (1996) — never exceed 6.9% (see Table 3). This is comparable to the 1987–1993 OBRA90 treatment magnitudes

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[2] Since the differential between the benefit schedules for one- and multiple-child households is small after the OBRA90 EITC expansion (subsidy rates differ by at most 1 pp until 1994), we do not exploit this differential in our identification strategy.
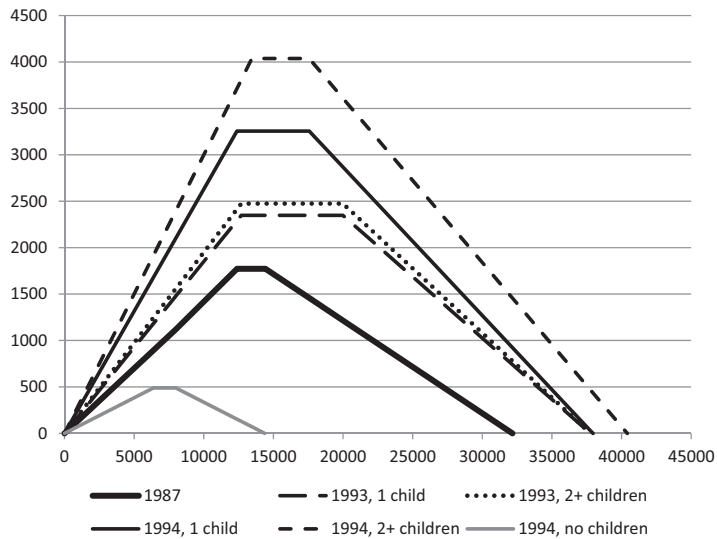
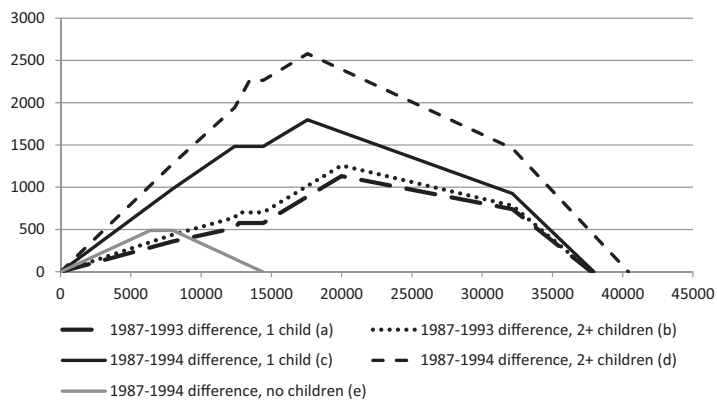**Fig. 1.** EITC payments in 1987, 1993, and 1994 by number of children.

Fig. 2. Difference in EITC benefits 1987–1993 and 1987–1994 by number of children.

Table 2
The OBRA90 treatment magnitudes as a percentage of income.

Income	1987–1993		1987–1994	
	1 Child	2+ Children	1 Child	2+ Children
$6390	4.5%	5.5%	4.6%	8.3%
$7987	4.5%	5.5%	6.2%	9.9%
$12,380	4.5%	5.5%	11.1%	14.8%
$12,670	4.8%	5.8%	11.0%	15.3%
$12,697	4.8%	5.8%	11.0%	15.3%
$13,458	4.6%	5.5%	10.8%	16.6%
$14,377	4.3%	5.2%	10.6%	16.0%
$14,421	4.0%	4.9%	10.3%	15.7%
$17,572	5.1%	5.8%	10.2%	14.7%
$19,987	5.7%	6.3%	8.3%	12.0%
$32,159	2.3%	2.4%	2.9%	4.5%
$37,763	0.0%	0.0%	0.1%	1.2%
$37,946			0.0%	1.1%
$40,408				0.0%

Source: Authors' analysis using Table 1 figures adjusted for inflation (Hotz and Scholz, 2003).

Table 3
The TRA86 treatment magnitudes as a percentage of income, with years defined as in Eissa and Leibman (1996).

Income	1984–1988	1984–1989	1984–1990	1985–1988	1985–1989	1985–1990	1986–1988	1986–1989	1986–1990
$10,800	4.0%	4.0%	4.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
$11,001	4.0%	4.0%	4.0%	3.0%	3.0%	3.0%	3.2%	3.2%	3.2%
$11,392	4.0%	4.0%	4.0%	3.4%	3.4%	3.4%	3.6%	3.6%	3.6%
$12,335	4.8%	4.8%	4.8%	4.2%	4.2%	4.2%	4.4%	4.4%	4.4%
$12,410	4.8%	4.8%	4.7%	4.2%	4.2%	4.2%	4.4%	4.4%	4.3%
$12,487	4.9%	4.8%	4.7%	4.3%	4.2%	4.1%	4.5%	4.4%	4.3%
$13,671	4.5%	4.4%	4.3%	3.9%	3.9%	3.8%	4.1%	4.0%	3.9%
$14,040	4.7%	4.6%	4.5%	3.8%	3.8%	3.7%	4.0%	3.9%	3.8%
$14,301	4.8%	4.7%	4.7%	3.8%	3.7%	3.6%	4.1%	4.1%	4.0%
$19,435	6.8%	6.8%	6.7%	6.0%	5.9%	5.9%	6.3%	6.2%	6.2%
$19,550	6.9%	6.8%	6.7%	6.0%	6.0%	5.9%	6.3%	6.3%	6.1%
$19,691	6.9%	6.8%	6.7%	6.1%	6.0%	5.8%	6.4%	6.2%	6.1%
$22,785	6.3%	6.2%	6.1%	5.6%	5.4%	5.4%	5.8%	5.7%	5.6%
$23,760	5.6%	5.5%	5.4%	5.4%	5.3%	5.2%	5.6%	5.5%	5.4%
$24,202	5.4%	5.3%	5.2%	5.4%	5.3%	5.2%	5.4%	5.3%	5.2%
$36,704	0.1%	0.1%	0.0%	0.1%	0.1%	0.0%	0.1%	0.1%	0.0%
$36,923	0.1%	0.0%		0.1%	0.0%		0.1%	0.0%	
$37,173	0.0%			0.0%			0.0%		

Source: Authors' analysis using Table 1 figures adjusted for inflation (Hotz and Scholz, 2003).

and less than the 1987–1994 OBRA90 treatment magnitudes. The OBRA90 treatment magnitudes are also comparable to the OBRA93 treatment magnitudes when comparing one- and multiple-child households, which is studied by Evans and Garthwaite (2014). Using a variety of pre- and post-expansion comparison years, the treatment magnitude is at most 14.9%.[3]

3. Literature review

3.1. The EITC

An extensive EITC literature examines the EITC's impact on such outcomes as marriage and divorce (Dickert-Conlin and Houser, 2002; Herbst, 2011a), fertility and abortion (Baughman and Dickert-Conlin, 2009; Duchovny, 2001; Herbst, 2011b), and material well-being (Barrow and McGranahan, 2000; Neumark and Wascher, 2001). As it is most relevant to the current paper, we will focus on the literature pertaining to the EITC's health-effects, complementing this with literature pertaining to the EITC's employment-effects, as we will estimate employment-effects as a check of our data.

A number of recent studies examine the EITC's health-effects, focusing on outcomes related to infants and children. For example, using a D-in-D design, Baker (2008) studies the OBRA93 EITC expansion and finds that it is associated with increased birth weight. Two potential mechanisms for the improved birth outcomes are more frequent prenatal doctor visits and a reduction in the likelihood of smoking during pregnancy. A more recent study by Hoynes et al. (2015) reexamines the EITC's birth-effects using a variety of estimation strategies; their results largely confirm those in Baker (2008). A final study, by Dahl and Lochner (2012), examines the impact of the OBRA93 EITC expansion on low-income children's math and reading test scores and finds positive effects.

To our knowledge, only one prior study examines the impact of the EITC on adult health (Evans and Garthwaite, 2014). The authors evaluate the OBRA93 EITC expansion, taking advantage of the growing differential in EITC benefits between one- and multiple-child households. Using the Behavioral Risk Factors Surveillance System (BRFSS), their DD estimates indicate that low-skilled mothers with multiple children experience fewer poor-mental-health days, and an increase in self-reported health. Furthermore, the health effects are experienced disproportionately by married mothers (relative to unmarried mothers).[4] Because Evans and Garthwaite (2014) utilize a novel dataset for studying the EITC's health-effects, they attempt to replicate prior EITC employment-effects from the literature. Using the same identification strategy used for health-outcomes, they find that low-skilled unmarried mothers with multiple children significantly increase their employment by 4.6 pp compared to their single-child counterparts. The corresponding effect for married mothers is 1.8 pp and is marginally significant.

As Evans and Garthwaite (2014) point out, the differential employment-effect by marital status is well-established in the literature, especially the large positive employment-effect for unmarried mothers. This differential — and indeed why the EITC literature often studies married and unmarried mothers separately — is believed to be due to the complexity

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[3] A table of treatment magnitudes using Evans and Garthwaite's (2014) pre- (1993–1995) and post-expansion (1998–2001) years is available upon request. The analyses of treatment magnitudes in Evans and Garthwaite (2014) use nominal dollars, while ours use real dollars; the treatment magnitudes obtained are similar.

[4] In addition, the authors use the National Health Examination Nutrition Survey to assess the impact of the EITC expansion on a series of biomarkers. They find that mothers with multiple children experience reductions in various adverse health conditions, including risky levels of diastolic blood pressure, albumin, and C-reactive protein; differential impacts by marital status are not explored for these outcomes.

of joint labor supply decisions of married couples. Other studies that examine the employment-effects of EITC expansions for unmarried mothers find employment increases of between 2.3 and 14 pp (Eissa and Leibman, 1996; Meyer and Rosenbaum, 2001; Dickert et al., 1995; Hotz et al., 2011; Keane and Moffitt, 1998; Ellwood, 2000; Herbst, 2010). For married mothers, the estimates range from −1 to 2 pp (Eissa and Hoynes, 2004; Ellwood, 2000). In sum, the evidence shows positive employment effects for unmarried mothers, and smaller positive or even negative effects for married mothers.

3.2. Subjective well-being

Survey-based SWB measures are gaining considerable traction in economic and policy analyses. Such measures have already been used in studies examining economic growth and labor market conditions, in addition to government policies. Implicit in this research is that reliance on *choices* (i.e., revealed preferences) alone may not fully capture the well-being effects of policy interventions. As explicated by Stiglitz et al. (2010), in their critique of current national account systems, SWB data are important complements to choice-based welfare analysis, as it is a direct, valid, and relatively inexpensive measure of well-being. Indeed, several national governments (e.g., Britain, France, and Bhutan) are collecting and using happiness data alongside traditional measures of economic well-being.

In light of the growing interest in using SWB measures, researchers have classified three broad categories that capture different and important facets of SWB: *evaluative*, *experiential*, and *eudemonic* (Dolan et al., 2011). Experiential-SWB measures assess feelings, experiences, or emotions over short time-frames, like the last day or week. Evaluative-SWB measures assess overall or domain-specific satisfaction or happiness with life. Lastly, eudemonic-SWB measures assess the fulfillment of underlying psychological needs, like meaning, autonomy, and self-acceptance.[5]

The policies and economic phenomena studied in the growing SWB literature include:[6] gross domestic product (Di Tella et al., 2003), inflation and unemployment (Wolfers, 2003; Di Tella et al., 2001), business cycle volatility (Wolfers, 2003), gasoline prices (Boyd-Swan and Herbst, 2012; Graham et al., 2010), income taxes (Akay et al., 2012), progressive taxation (Oishi et al., 2012), tax morale (Lubian and Zarri, 2011), unemployment benefits (Di Tella et al., 2003), social safety nets (Easterlin, 2013; Easterlin et al., 2012), income inequality (Alesina et al., 2004; Oishi et al., 2011), and cigarette taxes (Gruber and Mullainathan, 2005). Of particular relevance are a few recent studies that estimate the impact of other social policy reforms on SWB. For example, Ifcher (2011) and Herbst (2012, 2013) find that U.S. welfare reform (in 1996) increased unmarried mothers' SWB; Herbst and Tekin (2014) find that parallel reforms to the child care subsidy system reduced SWB; and Milligan and Stabile (2011) find that increased child tax credits in Canada improve mothers' self-reported depression. Evidence from large-scale randomized controlled trials is also mixed: Ludwig et al. (2012) find that U.S. housing vouchers improve SWB in the long-term, while Dorsett and Oswald (2014) find that in-work benefits in the U.K. reduced unmarried mothers' SWB in the long-term.

Because the EITC affects income and labor-market decisions, their effects on SWB are relevant. The positive cross-sectional relationship between income and all three dimensions of SWB is well-established in the literature (e.g., Stevenson and Wolfers, 2008; Kahneman and Deaton, 2010; Clark and Senik, 2011). Further, in the cross-section, Kahneman and Deaton (2010) find evidence of a satiation point for experiential but not evaluative SWB (at annual income of roughly $75,000). Windfall income also impacts evaluative and experiential SWB differently. Compared to lottery winners of small sums, winners of larger sums exhibit improvements in stress and other experiential SWB measures; the same holds when comparing winners to non-winners. However, there is no difference in the evaluative SWB of winners and non-winners (Kuhn et al., 2011; Gardner and Oswald, 2007; Lindahl, 2005; Brickman et al., 1978).[7] Lastly, some studies use different identification strategies to demonstrate the causal impact of income on SWB. For example, Pischke (2011) and Powdthavee (2010) use instrumental variables for income; Di Tella et al. (2010) and Powdthavee (2010) use longitudinal data with individual fixed effects; and Li et al. (2011) use twins data from China. All of these studies find that income increases SWB.

Similarly, employment has generally been shown to be positively related to all three dimensions of SWB (Lucas et al., 2003; Clark and Senik, 2011; Clark and Oswald, 1994), but with a weaker link to experiential SWB (Kahneman et al., 2004; Dolan et al., 2011). Winkelmann and Winkelmann (1998) and Kassenboehmer and Haisken-DeNew (2009) use longitudinal data with individual fixed effects, and the latter exploits exogenous variation due to company closures, to identify the causal impact of employment on SWB. Both find that unemployment is associated with dramatic SWB losses — losses that significantly surpass the effect of lost income alone.

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[5] See Dolan et al. (2011) for a full discussion of the similarities and differences of the three dimensions and the importance to policymakers of capturing all three dimensions separately.

[6] Because it is most commonly found on national and international surveys, evaluative SWB as measured by happiness or life satisfaction is often the outcome variable utilized in research exploring how SWB is influenced by the economy and economic policies.

[7] The reduction in stress of large- compared to small-lottery winners is only experienced a year after winnings. In the shorter run, the stress of the large winners actually increases relative to small winners (Gardner and Oswald, 2007). In Kuhn et al. (2011), evaluative happiness is measured six months after the win and no difference is found between winners and non-winners.

4. Data and methodology

The NSFH is a nationally representative sample of individuals aged 16 and older who are living in households whose primary language is English or Spanish.[8] The first wave of the NSFH was administered in 1987 and 1988, generating a sample of 13,007 adults who were interviewed face-to-face and completed a supplemental questionnaire. In the second wave, administered between 1992 and 1994, 10,005 individuals from the first wave were interviewed.[9] The NSFH oversampled minority and one-parent households, as well as stepfamilies, recently married couples, and cohabitating couples.[10] To our knowledge, the NSFH has been utilized in one other economic analysis of SWB (Luttmer, 2005).

To examine the impact of the OBRA90 EITC expansion on mental health and SWB, we use a D-in-D approach, comparing the change in mental health and SWB for a treatment group before and after the expansion to the change experienced by a comparison group. To create the analysis-sample, we pool observations for the first two waves and retain individuals likely to be eligible for the EITC or comparable to those who are eligible. We restrict the analysis sample to women ages 16–55 who have no more than a high school degree. We then separate the analysis sample into the treatment group (women living with qualifying children) and control group (women not living with qualifying children).[11] The NSFH allows us to carefully simulate the EITC's qualifying-child definition as it reports the nature of the relationship between respondents and children residing in the same household.[12]

The D-in-D estimator is an intent-to-treat estimator, not a treatment-on-the-treated estimator, as the treatment group includes mothers eligible for the EITC, not those actually receiving it.[13] The D-in-D estimator is an estimate of the average effect of the OBRA90 EITC expansion across the population of low-skilled, working-aged mothers, some of whom are influenced by the EITC and others who are not.

Expressed formally, the D-in-D estimator can be generated by the following model:

$$Y_{ist} = \beta_1 Treated_{it} + \beta_2 (Post-OBRA90_t) + \beta_3 (Treated_{it} \times Post-OBRA90_t) + \mathbf{X}'_{ist}\gamma + \eta_s + \varepsilon_{ist}, \tag{1}$$

where i indexes individuals, s indexes state of residence, and t indexes year; Y represents the outcomes examined (SWB, mental health, or employment); *Treated* is an indicator variable that equals unity if the respondent is a mother (resides with qualifying children); *Post-OBRA90* is an indicator variable that equals unity if an observation is from wave 2; and $\mathbf{X}'$ represents observable demographic covariates, including age, age-squared, race (three dummy variables), marital status (four dummy variables), educational attainment (one dummy variable)[14], the presence of children aged 13–18 in the household, and the number of children aged 0–18 in the household. All demographic controls are wave-specific.[15] Also included are dummy variables for missing demographic information. The D-in-D approach requires that pre-expansion trends for outcome variables be common for the treatment and control groups. Because the NSFH has only one pre-expansion wave, it does not allow for a test of common trends; instead, in the results section we establish common trends using SWB-items from the General Social Survey (GSS) from 1972 to 1990. Eq. (1) is estimated using OLS with standard errors clustered by individual.[16]

4.1. Outcome measures and descriptive statistics

Depression symptomatology is measured using an 11-item version of the Center for Epidemiological Studies Depression (CES-D) scale (Radloff, 1977). Respondents report the number of days in the previous week they felt or experienced 11

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[8] Detailed information on the NSFH can be found in Sweet et al. (1988) and Sweet and Bumpass (1996).

[9] A third wave of the NSFH was initiated in 2001. This wave was excluded from the analysis because it was fielded long after the OBRA90 EITC expansion, and because NSFH administrators substantially changed the criteria for inclusion in the sample.

[10] The oversampling procedure is described in Sweet et al. (1988). After following standard procedures to obtain a randomly-selected, nationally representative set of addresses, in a given listing area, roughly half of the addresses were assigned to the "main sample" and half to the "oversample." The screeners assigned to the oversample had extra screening questions to determine if the household fell into one of the desired oversample populations: black, Mexican American, Puerto Rican, one-parent family, family with step-children (or with children with neither parent in the household), cohabiters, and recently married persons. Households in the oversample that did not satisfy a desired oversampling criterion were excluded from the NSFH.

[11] It has been shown that low-skilled, working-aged mothers and childless women participate in similar labor markets, have comparable wages, and respond similarly to changes in labor market conditions (Meyer and Rosenbaum, 2000, 2001).

[12] A qualifying child must be aged 18 or less, aged 24 or less if a full-time student, or permanently disabled; live with the taxpayer for at least 6 months of the year; and satisfy the relationship requirement (the child must be an adoptive or biological child, step-child, foster child, sibling, half-sibling, or step-sibling of the tax-filer or his/her spouse, or the descendent of one of these relations). Of the 9503 qualifying children in our sample, 91.9% are the women's biological, adopted, step, or foster children; for ease of exposition, we will refer to these women as "mothers" throughout the text.

[13] In 1992, the March CPS started estimating EITC benefits for respondent households based on the Census Bureau's tax model. A sample of mothers from the 1993 March CPS (with the same age and education restrictions we use) indicates that 61.2% were eligible to receive the EITC. Therefore, an approximation of treatment-on-the-treated effect can be calculated by "scaling up" our intent-to-treat effects by a factor of 1.6 (=1/0.612).

[14] Because we restrict our analysis-sample to those who at most completed high school, the possible categories are "completed high school" and "did not complete high school."

[15] Given the panel nature of the data, differential follow-up rates for mothers and childless women are a concern. However, the proportion of mothers in waves 1 and 2 are statistically indistinguishable (0.725 versus 0.705, $p = 0.11$). Similarly, the proportion of attritors and non-attritors who are mothers are statistically indistinguishable (0.729 versus 0.724, p-value of difference = 0.79). However, the proportion of attritors with a high school degree (0.617) is significantly lower than the proportion of non-attritors with a high school degree (0.722) (p-value of difference <0.001). Our results are robust to restricting the analysis to non-attritors.

[16] Our results are robust to using an ordered probit regression (results available upon request).

depressive symptoms.[17] Responses are coded to conform to the scale's original construction: zero (zero days), one (one to two days), two (three to four days), and three (five to seven days). The 11 response-codes are summed to produce the CES-D scale, ranging from zero to 33. We also examine the 11 depressive symptoms separately using an indicator variable (zero (zero days) and one (one to seven days)). As self-reports of emotional experiences over the past week, these are experiential SWB measures.

Evaluative SWB is measured using a happiness question. The question is similar to those used in other large-scale surveys: "Next are some questions about how you see yourself and your life. . .First, taking all things together, how would you say things are these days?" The response scale ranged from one ("very unhappy") to seven ("very happy"). We also use indicator variables for "low happy" and "high happy" that equal unity if a respondent is in the bottom or top two happiness categories, respectively.

The remaining SWB measures capture various dimensions of self-esteem, a component of eudemonic SWB. Specifically, the following statements were presented to respondents: "I feel that I'm a person of worth, at least on an equal plane with others," "On the whole, I am satisfied with myself," and "I am able to do things as well as other people." We call these "self-worth," "self-satisfaction," and "self-efficacy," respectively. The response scale for each statement ranged from one ("strongly agree") to five ("strongly disagree"). For the analysis, the responses are recoded to one ("strongly agree" or "agree") and zero ("neither agree nor disagree," "disagree," or "strongly disagree"). We use reported hours-of-work during the previous week as the employment measure. This is transformed into an indicator variable that equals unity if the hours-of-work are non-zero.

We conduct our analysis on the pooled sample as well as separately for married and unmarried (never married, separated, divorced, or widowed) women. Our pooled sample consists of 5557 women, of whom 2954 (53%) are married and 2603 (47%) are not. Table 4 provides summary statistics for all outcome measures by marital and parental status.[18] Married women have higher experiential and evaluative SWB than do unmarried women; eudemonic SWB is roughly equivalent. Further, as shown in Panel B, unmarried mothers have lower experiential and evaluative SWB than their childless counterparts, but roughly equivalent eudemonic SWB; this pattern is consistent with recent analyses of the DDB Worldwide Communications Life Style Survey (Herbst, 2012) and the GSS (Ifcher and Zarghamee, 2014). As shown in Panel C, the differences in SWB between married mothers and their childless counterparts are less pronounced. Finally, consistent with Eissa and Leibman (1996), unmarried mothers are less likely to be employed than their childless counterparts.

Table 5 provides demographic characteristics by marital and parental status. Mothers are more likely to be disadvantaged than their childless counterparts, regardless of marital status. For example, mothers tend to have lower household income than childless women, tend to be younger, and are more likely to be black or Hispanic. Further, unmarried (but not married) mothers are more likely than their childless counterparts to have less than a high school degree. Given these differences, we include observable characteristics when estimating Eq. (1).

4.2. Data validation exercise

As a check of the NSFH's validity, we estimate Eq. (1) with employment as the outcome variable. The coefficient on *Treated* indicates that mothers are less likely to be employed than childless women (see Table 6). The D-in-D estimate implies that mothers witnessed a significant increase in employment (9.2 pp) following the OBRA90 EITC expansion compared to childless women [column (2) of Panel A]. The positive employment-effect is concentrated among unmarried mothers: the likelihood they work increases significantly (10.3 pp) compared to their childless counterparts [column (2) of Panel B]. The employment-effect for married mothers is smaller (6.5 pp) and marginally significant [column (2) of Panel C]. It warrants mention that the employment question in the NSFH differs from those typically used in EITC literature. For example, in Eissa and Leibman (1996) and Hotz et al. (2011), employment is defined as having worked a positive number of hours in the last year according to the March CPS and the California Work Pays Demonstration Project, respectively. The BRFSS, used in Evans and Garthwaite (2014), asks respondents their current employment status. Our measure reflects having worked in the past week. Such a measure may be more volatile than others used in the literature; and this may explain the magnitude of the estimated employment-effects. Further, none of the studies in the EITC literature use the same comparison years as our study. As noted in the EITC literature review, the employment-effects estimated for unmarried mothers range between 2.3 and 14 pp. Our estimates for unmarried mothers fall in this range. Our estimate of the employment-effect for married mothers is consistent with Ellwood (2000) insofar as it is positive, and with Evans and Garthwaite (2014) insofar as it is positive, marginally significant, and of roughly half the magnitude of unmarried mothers'. We consider this evidence regarding both unmarried and married mothers' employment-effects sufficiently consistent with the existing literature to proceed with our analysis using the NSFH.

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[17] (a) Bothered by things that usually do not bother them, (b) diminished appetite, (c) that they could not shake off the blues even with help from family members or friends, (d) depressed, (e) that everything they did was an effort, (f) fearful, (g) restless sleep, (h) talking less than usual, (i) lonely, (j) sad, and (k) unable to get going.

[18] As noted in Table 4, response rates are imperfect for the outcome variables, especially the eudemonic SWB measures. The response rates were statistically indistinguishable for mothers and non-mothers for all outcome variables except for self-satisfaction, self-efficacy, self-worth, blue, and talk less; for all these variables, mothers were more likely to respond than non-mothers. As noted above, in additional analyses, we restrict to non-attritors; under this restriction, only blue and talk less have significantly different response rates by parental status.

Table 4
Summary statistics for outcome variables by parental and marital status.

	Experiential												Evaluative			Eudemonic			
	CES-D (0–33)	Depressed	Lonely	Sad	Bothered	Appetite	Blue	Effort	Fearful	Sleep	Talk less	Get going	Happiness (1–7)	High happiness	Low happiness	Self-worth	Self-satisfaction	Self-efficacy	Employed
All Women	10.04	0.61	0.48	0.59	0.67	0.50	0.48	0.59	0.36	0.61	0.43	0.62	5.22	0.46	0.29	0.86	0.75	0.81	0.59
N = 5557	(0.12)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
With Children	10.24	0.62	0.48	0.60	0.68	0.51	0.49	0.60	0.37	0.62	0.44	0.62	5.19	0.45	0.29	0.86	0.74	0.82	0.55
N = 3983	(0.14)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Without Children	9.53	0.59	0.46	0.56	0.65	0.45	0.45	0.58	0.36	0.61	0.41	0.61	5.27	0.50	0.29	0.86	0.77	0.77	0.67
N = 1574	(0.21)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.04)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Difference	0.71***	0.03*	0.02	0.04**	0.03**	0.06***	0.04**	0.02	0.00	0.00	0.03**	0.01	−0.08	−0.05***	0.00	0.00	−0.03***	0.05***	−0.11***
	(0.26)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.05)	(0.02)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)
Unmarried Women	11.52	0.67	0.58	0.64	0.69	0.55	0.53	0.64	0.42	0.64	0.48	0.63	4.90	0.36	0.39	0.83	0.69	0.81	0.58
N = 2603	(0.18)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
With Children	12.10	0.69	0.59	0.66	0.71	0.58	0.56	0.66	0.43	0.65	0.50	0.64	4.86	0.34	0.39	0.83	0.66	0.82	0.53
N = 1800	(0.22)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.04)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)
Without Children	10.25	0.62	0.54	0.61	0.64	0.48	0.48	0.59	0.39	0.60	0.43	0.60	4.98	0.41	0.37	0.83	0.73	0.79	0.70
N = 803	(0.31)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.06)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Difference	1.85***	0.06***	0.05**	0.05**	0.07***	0.10***	0.07***	0.07***	0.04**	0.05**	0.07***	0.04**	−0.11	−0.07***	0.03	−0.01	−0.06***	0.03	−0.16***
	(0.39)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.07)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.02)
Married Women	8.75	0.56	0.39	0.54	0.66	0.45	0.43	0.56	0.32	0.60	0.39	0.61	5.49	0.55	0.21	0.88	0.77	0.81	0.59
N = 2954	(0.15)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
With Children	8.73	0.56	0.39	0.55	0.66	0.46	0.44	0.55	0.31	0.59	0.39	0.61	5.46	0.53	0.21	0.87	0.77	0.83	0.57
N = 2183	(0.17)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Without Children	8.79	0.56	0.38	0.52	0.65	0.42	0.43	0.57	0.33	0.62	0.38	0.62	5.56	0.59	0.21	0.88	0.79	0.76	0.64
N = 771	(0.29)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.05)	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)
Difference	−0.06	0.01	0.01	0.03	0.00	0.04*	0.01	−0.01	−0.02	−0.03	0.00	−0.01	−0.10	−0.05***	0.00	0.00	−0.02	0.06***	−0.07***
	(0.33)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.06)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)

Notes:

* Statistically significant differences between women with and without children at the 0.10 level.
** Statistically significant differences between women with and without children at the 0.05 level.
*** Statistically significant differences between women with and without children at the 0.01 level.

Standard errors are reported in parentheses. Response rates for the various SWB measures were imperfect. 93.9% of the analysis sample responded to the CES-D items, 85.7% responded to the happiness question, and 62.9% responded to the eudomonic measures.

Table 5

Demographic characteristics by marital and parental status.

	Age	White	Black	Hispanic	Other	Married	Never married	Separated	Divorced	Widowed	< High school	High school	Qualif. children, age 13–18	# Qualif. Children, age 0–18	Household income
All Women	36.27	0.66	0.22	0.11	0.01	0.53	0.17	0.08	0.19	0.04	0.28	0.72	0.33	1.50	28,881.93
N = 5557	(0.13)	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.02)	(424.88)
With Children	34.50	0.63	0.23	0.13	0.01	0.55	0.15	0.08	0.18	0.03	0.29	0.71	0.46	2.10	27,628.29
N = 3983	(0.13)	(0.04)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.02)	(482.72)
Without Children	40.75	0.74	0.18	0.07	0.01	0.49	0.20	0.06	0.20	0.06	0.26	0.74			32,303.91
N = 1574	(0.29)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)			(873.26)
Difference	−6.24***	−0.11***	0.06***	0.06***	0.00	0.06***	−0.04***	0.03***	−0.02	−0.03***	0.03*	−0.03*			−4675.62***
	(0.27)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)			(956.77)
Unmarried Women	35.62	0.54	0.34	0.11	0.01		0.35	0.16	0.40	0.08	0.34	0.66	0.32	1.44	16,817.53
N = 2603	(0.19)	(0.01)	(0.01)	(0.01)	(0.00)		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)	(453.30)
With Children	34.13	0.50	0.37	0.13	0.01		0.34	0.19	0.41	0.07	0.36	0.64	0.47	2.09	15,036.59
N = 1800	(0.20)	(0.01)	(0.01)	(0.01)	(0.00)		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)	(445.06)
Without Children	38.95	0.65	0.26	0.08	0.00		0.39	0.11	0.39	0.11	0.29	0.71			21,319.86
N = 803	(0.41)	(0.02)	(0.02)	(0.01)	(0.00)		(0.02)	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)			(1115.32)
Difference	−4.82***	−0.15***	0.11***	0.05***	0.00		−0.05**	0.08***	0.02	−0.05***	0.07***	−0.07***			−6283.28***
	(0.41)	(0.02)	(0.02)	(0.01)	(0.00)		(0.02)	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)			(996.28)
Married Women	36.85	0.76	0.11	0.11	0.01						0.23	0.77	0.33	1.56	38,177.53
N = 2954	(0.17)	(0.01)	(0.01)	(0.01)	(0.00)						(0.01)	(0.01)	(0.01)	(0.03)	(606.55)
With Children	34.81	0.74	0.12	0.13	0.01						0.23	0.77	0.45	2.11	36,976.38
N = 2183	(0.17)	(0.01)	(0.01)	(0.01)	(0.00)						(0.01)	(0.01)	(0.01)	(0.02)	(701.95)
Without Children	42.62	0.84	0.09	0.06	0.01						0.23	0.77			41,662.51
N = 771	(0.39)	(0.01)	(0.01)	(0.01)	(0.00)						(0.02)	(0.02)			(1195.69)
Difference	−7.81***	−0.10***	0.03**	0.07***	0.00						0.00	0.00			−4686.14***
	(0.37)	(0.02)	(0.01)	(0.01)	(0.00)						(0.02)	(0.02)			(1386.48)

Notes:

* Statistically significant differences between women with and without children at the 0.10 level.

** Statistically significant differences between women with and without children at the 0.05 level.

*** Statistically significant differences between women with and without children at the 0.01 level.

Standard errors are reported in parentheses.

Table 6
Impact of the OBRA90 EITC expansion on employment.

	(1) Employment	(2) Employment
Panel A: All Women		
Treated (=with kids)	−0.1486***	−0.0773***
	(0.0185)	(0.0229)
Post-Reform	−0.0076	−0.0446**
	(0.0219)	(0.0221)
Treated × Post-Reform	0.0905***	0.0920***
	(0.0268)	(0.0264)
Observations	5529	5524
Pre-Reform Mean for Treated Group	0.5221	
Panel B: Unmarried Women		
Treated (=with kids)	−0.1908***	−0.1046***
	(0.0257)	(0.0329)
Post-Reform	−0.0126	−0.0631**
	(0.0316)	(0.0318)
Treated × Post-Reform	0.0795**	0.1033***
	(0.0394)	(0.0385)
Observations	2590	2587
Pre-Reform Mean for Treated Group	0.5098	
Panel C: Married Women		
Treated (=with kids)	−0.1056***	−0.0484
	(0.0267)	(0.0325)
Post-Reform	−0.0017	−0.0152
	(0.0315)	(0.0319)
Treated × Post-Reform	0.0920**	0.0649*
	(0.0378)	(0.0374)
Observations	2939	2937
Pre-reform mean for treated group	0.5336	
Demographic controls	No	Yes
Region fixed effects	No	Yes

Notes: Analyses are based on the NSFH. Standard errors, reported in parentheses, are adjusted for individual-level clustering. Demographic controls include age, age-squared, race, marital status, educational attainment, presence of children aged 13–18 in the household, and number of children aged 0–18 in the household. Missing dummy variables were created in cases where demographic information was missing.

* Statistical significance at the 0.10 level.
** Statistical significance at the 0.05 level.
*** Statistical significance at the 0.01 level.

5. Results

5.1. Depression symptomatology (experiential SWB)

Table 7 presents D-in-D estimates for the eleven CES-D items; to conserve space, we present only full-model estimates. Across Panel A, the results suggest that the OBRA90 EITC expansion reduces depression symptomatology: mothers are significantly less likely to report being depressed, lonely, bothered, effortful, and fearful — and marginally less likely to report sadness or loss of appetite — compared to childless women. Panels B and C illustrate that the reduced depression symptomatology is concentrated among married mothers. For married mothers, all coefficients are negative, suggesting qualitatively that depression symptomatology is reduced relative to their childless counterparts. Further, the coefficients on being depressed, lonely, sad, bothered, and talking less are significant; and the coefficient on effort is marginally significant. In contrast, unmarried mothers experience significant improvement in only one CES-D item — fearful. For all other items, the coefficients are insignificant, and in some cases, the sign suggests exacerbation, not improvement, of the symptom. This bifurcated result is consistent with the mental-health effects identified in Evans and Garthwaite (2014).

In Table 8, the outcome variable is the CES-D score; recall that the score can range from 0 to 33 with higher scores indicative of greater depression symptomatology. Again, the results are bifurcated by marital status. Married mothers experience a significant decrease in CES-D score (1.4 points) after the OBRA90 EITC expansion compared to their childless counterparts, a 15.7% (=1.4/8.8) decrease [column (2) of Panel B]. Unmarried mothers, on the other hand, experience an insignificant change in the CES-D score (as does the pooled sample) [column (2) of Panels A and B].

5.2. Global happiness (evaluative SWB)

Again, the results are bifurcated. Married mothers experience a significant increase (0.24 points) in happiness compared to their childless counterparts after the OBRA90 EITC expansion, a 4.4% (=0.24/5.5) increase (see Table 9). This

Table 7
Impact of OBRA90 EITC expansion on CES-D items.

	(1) Depressed	(2) Lonely	(3) Sad	(4) Bothered	(5) Appetite	(6) Blue	(7) Effort	(8) Fearful	(9) Sleep	(10) Talk Less	(11) Get Going
Panel A: All Women											
Treated (=with kids)	0.0215	0.0001	0.0090	0.0375	0.0195	0.0071	0.0077	0.0068	0.0143	−0.0132	−0.0185
	(0.0242)	(0.0246)	(0.0246)	(0.0236)	(0.0247)	(0.0246)	(0.0244)	(0.0240)	(0.0245)	(0.0244)	(0.0239)
Post-Reform	0.0899***	0.0873***	0.0916***	0.1209***	0.0586**	0.1014***	0.0558**	0.1137***	0.1117***	0.0827***	0.0234
	(0.0241)	(0.0246)	(0.0249)	(0.0238)	(0.0249)	(0.0250)	(0.0252)	(0.0242)	(0.0245)	(0.0248)	(0.0245)
Treated × Post-Reform	−0.0828***	−0.0892***	−0.0546*	−0.0738***	−0.0490*	−0.0403	−0.0730**	−0.0820***	−0.0452	−0.0359	−0.0002
	(0.0285)	(0.0290)	(0.0293)	(0.0281)	(0.0294)	(0.0295)	(0.0295)	(0.0285)	(0.0287)	(0.0294)	(0.0292)
Observations	5420	5443	5433	5440	5454	5441	5420	5402	5430	5415	5438
Pre-Reform Mean for Treated Group	0.6237	0.4948	0.5927	0.6689	0.5237	0.4771	0.6153	0.3620	0.5984	0.4268	0.6215
Panel B: Unmarried Women											
Treated (=with kids)	0.0262	0.0362	0.0035	0.0805**	0.0647*	0.0353	0.0490	0.0580*	0.0237	0.0092	0.0136
	(0.0335)	(0.0354)	(0.0343)	(0.0326)	(0.0356)	(0.0353)	(0.0343)	(0.0344)	(0.0341)	(0.0353)	(0.0341)
Post-Reform	0.0661*	0.031	0.0772**	0.0973***	0.0293	0.0916**	0.0414	0.1422***	0.0955***	0.0211	0.0106
	(0.0342)	(0.0361)	(0.0351)	(0.0344)	(0.0358)	(0.0366)	(0.0371)	(0.0356)	(0.0353)	(0.0350)	(0.0351)
Treated × Post-Reform	−0.0494	−0.0131	0.0011	−0.0556	−0.0318	−0.0205	−0.0568	−0.1044**	−0.0319	0.0442	0.0187
	(0.0408)	(0.0427)	(0.0420)	(0.0414)	(0.0423)	(0.0437)	(0.0440)	(0.0431)	(0.0422)	(0.0431)	(0.0428)
Observations	2530	2540	2540	2542	2546	2539	2528	2522	2533	2529	2540
Pre-Reform Mean for Treated Group	0.6881	0.5962	0.6398	0.7038	0.5910	0.5385	0.6690	0.4258	0.6339	0.4834	0.6411
Panel C: Married Women											
Treated (=with kids)	0.0349	−0.0057	0.0417	−0.0102	−0.0078	−0.0093	−0.0261	−0.0408	0.0072	−0.0180	−0.0471
	(0.0358)	(0.0348)	(0.0359)	(0.0350)	(0.0351)	(0.0354)	(0.0350)	(0.0342)	(0.0358)	(0.0349)	(0.0345)
Post-Reform	0.1126***	0.1452***	0.1083***	0.1398***	0.0856**	0.1074***	0.0654*	0.0860**	0.1291***	0.1447***	0.0342
	(0.0352)	(0.0348)	(0.0356)	(0.0337)	(0.0358)	(0.0349)	(0.0351)	(0.0337)	(0.0347)	(0.0354)	(0.0354)
Treated × Post-Reform	−0.1089***	−0.1548***	−0.1018***	−0.0822**	−0.0604	−0.0464	−0.0789*	−0.0510	−0.0582	−0.1069***	−0.0110
	(0.0408)	(0.0403)	(0.0413)	(0.0389)	(0.0417)	(0.0407)	(0.0406)	(0.0406)	(0.0392)	(0.0400)	(0.0410)
Observations	2890	2903	2893	2898	2908	2902	2892	2880	2897	2886	2898
Pre-Reform Mean for Treated Group	0.5641	0.4006	0.5488	0.6364	0.4611	0.4200	0.5654	0.3029	0.5656	0.3743	0.6032
Demographic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Analyses are based on the NSFH. Standard errors, reported in parentheses, are adjusted for individual-level clustering. Demographic controls include age, age-squared, race, marital status, educational attainment (a dummy for high school graduation), presence of children aged 13–18 in the household with a qualifying relationship to the respondent, and number of children between the ages of 0–18 in the household with qualifying relationship to the respondent. Missing dummy variables were created in cases where demographic information was missing.

* Statistical significance at the 0.10 level.

** Statistical significance at the 0.05 level.

*** Statistical significance at the 0.01 level.

Table 8
Impact of OBRA90 EITC expansion on CES-D score.

	(1) CES-D	(2) CES-D
Panel A: All Women		
Treated (=with kids)	1.0291***	0.0032
	(0.3320)	(0.4243)
Post-Reform	0.6669*	1.1917***
	(0.4047)	(0.4119)
Treated × Post-Reform	−0.7892	−0.6686
	(0.4959)	(0.4955)
Observations	5217	5212
Pre-Treatment Mean for Treated Group	10.2845	
Panel B: Unmarried Women		
Treated (=with kids)	1.7329***	0.8061
	(0.4943)	(0.6475)
Post-Reform	0.1244	0.6993
	(0.5973)	(0.6247)
Treated × Post-Reform	0.3618	0.2880
	(0.7581)	(0.7673)
Observations	2421	2418
Pre-Treatment Mean for Treated Group	11.9298	
Panel C: Married Women		
Treated (=with kids)	0.4922	−0.2860
	(0.4354)	(0.5643)
Post-Reform	1.2310**	1.6589***
	(0.5652)	(0.5571)
Treated × Post-Reform	−1.3388**	−1.3810**
	(0.6610)	(0.6500)
Observations	2796	2794
Pre-Treatment Mean for Treated Group	8.7780	
Demographic Controls	No	Yes
Region Fixed Effects	No	Yes

Notes: Analyses are based on the NSFH. Standard errors, reported in parentheses, are adjusted for individual-level clustering. Demographic controls include age, age-squared, race, marital status, educational attainment, presence of children aged 13–18 in the household with a qualifying relationship to the respondent, and number of children aged 0–18 in the household with a qualifying relationship to the respondent. Missing dummy variables were created in cases where demographic information was missing.

* Statistical significance at the 0.10 level.
** Statistical significance at the 0.05 level.
*** Statistical significance at the 0.01 level.

happiness-improvement appears to be driven by married mothers becoming marginally more likely (8.5 pp) to report high levels of happiness, a 15.65% (=8.5/54.3) increase; the effect on reporting low levels of happiness is insignificant [columns (3)–(4) of Panel C]. In contrast, unmarried mothers' happiness-effect was insignificant (as it was for the pooled sample) [column (2) of Panels A and B].

5.3. Self-esteem (eudemonic SWB)

The eudemonic SWB results are consistent with the above findings: married mothers experience improved SWB and unmarried mothers do not. Married mothers are significantly more likely to feel self-worth (7.4 pp, or 8.5%) and self-efficacy (8.4 pp, or 10.1%) than their childless counterparts after the OBRA90 EITC expansion (see Table 10); the self-satisfied coefficient is positive but insignificant. In contrast, there is no evidence that unmarried mothers' self-esteem improved after the OBRA90 EITC expansion; all the coefficients are insignificant.

In sum, married mothers experience improvements in all three categories of SWB while unmarried mothers do not. Importantly, for married mothers, the OBRA90 EITC expansion not only improves short-term SWB measures (experiential SWB) but also long-term SWB measures (evaluative and eudemonic SWB).

5.4. Identifying the EITC's effect

In this section, we present specifications that (i) help rule out alternative explanations (Table 11) and (ii) build our confidence that the OBRA90 EITC expansion explains the findings (Table 12). To conserve space, we do not report the *treated* and *post-OBRA90* coefficients, and only report the results for following outcome variables: employment, the CES-D score (experiential SWB), happiness (evaluative SWB), and self-efficacy (eudemonic SWB).

Table 9
Impact of OBRA90 EITC expansion on self-reported happiness.

	(1) Happy	(2) Happy	(3) High Happy	(4) Low Happy
Panel A: All Women				
Treated (=with kids)	−0.1501**	−0.0520	−0.0632**	0.0004
	(0.0626)	(0.0761)	(0.0267)	(0.0242)
Post-Reform	−0.1535**	−0.0961	−0.0562**	0.0030
	(0.0777)	(0.0795)	(0.0265)	(0.0241)
Treated × Post-Reform	0.1815**	0.0976	0.0382	−0.0310
	(0.0924)	(0.0919)	(0.0313)	(0.0284)
Observations	4760	4755	4755	4755
Pre-Treatment Mean for Treated Group	5.1836		0.4467	0.3069
Panel B: Unmarried Women				
Treated (=with kids)	−0.1174	−0.0269	−0.0760**	0.0128
	(0.0932)	(0.1157)	(0.0375)	(0.0375)
Post-Reform	−0.0387	0.0653	−0.0019	−0.0066
	(0.1128)	(0.1183)	(0.0370)	(0.0369)
Treated × Post-Reform	0.0076	−0.0541	−0.0073	−0.0181
	(0.1381)	(0.1387)	(0.0445)	(0.0444)
Observations	2204	2201	2201	2201
Pre-Treatment Mean for Treated Group	0.3423	0.3988		
Panel C: Married Women				
Treated (=with kids)	−0.2028**	−0.1862*	−0.0920**	0.0169
	(0.0795)	(0.1005)	(0.0381)	(0.0309)
Post-Reform	−0.2673**	−0.2453**	−0.1109***	0.0089
	(0.1040)	(0.1071)	(0.0385)	(0.0317)
Treated × Post-Reform	0.2568**	0.2413**	0.0850*	−0.0382
	(0.1199)	(0.1210)	(0.0443)	(0.0367)
Observations	2556	2554	2554	2554
Pre-Treatment Mean for Treated Group	5.4680		0.5430	0.2221
Demographic Controls	No	Yes	Yes	Yes
Region Fixed Effects	No	Yes	Yes	Yes

Notes: Analyses are based on the NSFH. Standard errors, reported in parentheses, are adjusted for individual-level clustering. Demographic controls include age, age-squared, race, marital status, educational attainment, presence of children aged 13–18 in the household with a qualifying relationship to the respondent, and number of children aged 0–18 in the household with a qualifying relationship to the respondent. Missing dummy variables were created in cases where demographic information was missing.

* Statistical significance at the 0.10 level.
** Statistical significance at the 0.05 level.
*** Statistical significance at the 0.01 level.

Interviews for the NSFH were conducted on a rolling basis during the year, raising the concern that seasonal patterns are potentially influencing the results; for example, treated households could have been more likely to be interviewed during certain seasons than untreated households. Our results are robust to including month-of-interview fixed effects [column (1) of Table 11]. In particular, the SWB-improvements for married mothers and the employment-effects for unmarried mothers are unchanged.

Recall that about seven percent of wave 2 interviews were administered in 1994, the year that OBRA90 and OBRA93 EITC expansions overlapped. To test whether our results are driven by this overlap, we estimate Eq. (1) dropping 1994 observations [column (2)]. The results are robust to this restriction. The only changes are that the married mothers' happiness-effect, and the unmarried mothers' employment-effect, decrease in significance, from fully to marginally significant. These differences may reflect the loss of statistical power as the number of observations is reduced.

One of the key identifying assumptions in a D-in-D approach is that no other shocks coincided with the OBRA90 EITC expansion. If such a shock occurred, we risk attributing the other shock's effect to the OBRA90 EITC expansion; for example, some states may be more likely than others to have EITC-eligible households. Although the full model includes state fixed effects, we take the additional step of including separate year indicator variables, and interacting them with the state fixed effects, to control for state-year shocks. The results are robust to this modification [column (3)].

In columns (4)–(6), we attempt to address concerns stemming from the panel nature of the data. Column (4) restricts the sample to non-attritors, in case treated and untreated households had differential rates of attrition between waves 1 and 2. The results are robust to this restriction. The only changes are that the married mothers' CES-D- and happiness-effect decrease in significance, from fully to marginally significant; again, this may be due to loss of statistical power. Column (5) restricts the sample to respondents whose marital status is unchanged between waves, in case treated and untreated households had differential rates of marriage between waves 1 and 2. This helps rule out the concern that changes in marital status drive the results, as the formation (dissolution) of a marriage is known to increase (decrease) SWB (Stevenson and Wolfers, 2007). The married mothers' CES-D- and the happiness-effect are robust to this restriction.

Table 10
Impact of OBRA90 EITC expansion on self-esteem measures.

	(1) Self-worth	(2) Self-worth	(3) Self-satisfaction	(4) Self-satisfaction	(5) Self-efficacy	(6) Self-efficacy
Panel A: All Women						
Treated (=with kids)	−0.0278	0.0027	−0.0530**	−0.0371	0.0280	0.0073
	(0.0189)	(0.0247)	(0.0296)	(0.0296)	(0.0231)	(0.0277)
Post-Reform	−0.0566***	0.0532**	−0.0882***	−0.0812***	−0.0533**	−0.0378
	(0.0205)	(0.0222)	(0.0254)	(0.0279)	(0.0256)	(0.0274)
Treated × Post-Reform	0.0475*	0.0541**	0.0385	0.0360	0.0375	0.0287
	(0.0249)	(0.0254)	(0.0309)	(0.0316)	(0.0300)	(0.0305)
Observations	3490	3485	3498	3493	3484	3479
Pre-Reform Mean for Treated Group	0.8667		0.7686		0.8345	
Panel B: Unmarried Women						
Treated (=with kids)	−0.0105	0.0679	−0.1115	−0.1090	0.0888	0.0950
	(0.0627)	(0.0689)	(0.0748)	(0.0843)	(0.0644)	(0.0684)
Post-Reform	−0.0053	−0.0046	−0.0470	−0.1142	0.0103	0.0374
	(0.0518)	(0.0600)	(0.0606)	(0.0767)	(0.0583)	(0.0689)
Treated × Post-Reform	0.0050	−0.0188	0.058	0.0444	−0.0654	−0.1124
	(0.0677)	(0.0685)	(0.0816)	(0.0872)	(0.0699)	(0.0706)
Observations	1061	1058	1070	1067	1062	1059
Pre-Reform Mean for Treated Group	0.8256		0.6552		0.8721	
Panel C: Married Women						
Treated (=with kids)	−0.0344**	−0.0071	−0.0516**	−0.0271	0.0202	0.0010
	(0.0196)	(0.0268)	(0.0247)	(0.0327)	(0.0248)	(0.0313)
Post-Reform	−0.0599**	−0.0636**	−0.0838***	−0.0841**	−0.0987***	−0.0808**
	(0.0253)	(0.0265)	(0.0313)	(0.0326)	(0.0327)	(0.0339)
Treated × Post-Reform	0.0683**	0.0738**	0.0584	0.0535	0.0877**	0.0841**
	(0.0299)	(0.0304)	(0.0369)	(0.0375)	(0.0374)	(0.0379)
Observations	2429	2427	2428	2426	2422	2420
Pre-Reform Mean for Treated Group	0.8706		0.7798		0.8309	
Demographic Controls	No	Yes	No	Yes	No	Yes
Region Fixed Effects	No	Yes	No	Yes	No	Yes

Notes: Analyses are based on the NSFH. Standard errors, reported in parentheses, are adjusted for individual-level clustering. Demographic controls include age, age-squared, race, marital status, educational attainment, presence of children aged 13–18 in the household with a qualifying relationship to the respondent, and number of children aged 0–18 in the household with a qualifying relationship to the respondent. Missing dummy variables were created in cases where demographic information was missing.

* Statistical significance at the 0.10 level.
** Statistical significance at the 0.05 level.
*** Statistical significance at the 0.01 level.

However, the married mothers' self-efficacy result is compromised; while the magnitude of self-efficacy-effect is diminished by only about 20%, the coefficient is no longer significant. Column (6) restricts the sample to respondents who were employed in both waves, in case treated and untreated households experienced different changes in employment status between waves 1 and 2. This reduces the sample size substantially; and as a result, the significance of the coefficients are diminished. The married mothers' CES-D- and happiness-effect change from fully to marginally significant, and the self-efficacy-effect is insignificant. However, the magnitudes of the married mothers' coefficients are unchanged. In sum, these specification increase our confidence that the main results are not explained by interview-timing, the OBRA93 EITC expansion, policies unique to specific states in specific years, nor changes in marital or employment status between the waves.

We turn now to specifications that build our confidence that the OBRA90 EITC expansion caused the main results by demonstrating that our findings hold most strongly for respondents who are most likely to be eligible for the EITC, and do not hold for those respondents who are unlikely to be eligible. We begin with two falsification tests. Recall that the analysis-sample includes women who are likely to be eligible for the EITC, and their childless counterparts: women aged 16–55 with no more than a high school degree. If the findings are due to the OBRA90 EITC expansion, then there should be no identifiable effect when the sample is restricted to respondents who are unlikely to be eligible for the EITC. Columns (1) and (2) of Table 12 explore this assertion by estimating Eq. (1) restricting the sample to women aged 16–55 with (i) more than a high school education and (ii) household income greater than $40,000, respectively. All D-in-D estimates are insignificant: SWB- and employment-effects when comparing high-skilled mothers to their childless counterparts — and when comparing high-income mothers to their childless counterparts — are statistically indistinguishable from zero. While statistical insignificance alone could be the result of statistical imprecision, the point estimates of the effects are smaller in magnitude than the corresponding estimates using the analysis sample. These falsification tests provide further evidence that the findings are likely driven by the OBRA90 EITC expansion.

Table 11
Specification checks to rule out alternative explanations.

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: All Women						
Employment	0.0922***	0.0817***	0.0866***	0.1029***	0.1299***	–
	(0.0264)	(0.0278)	(0.0273)	(0.0273)	(0.0312)	–
	5524	5152	5524	4856	3598	–
CES-D	−0.0671	−0.8500	−0.5913	−0.5467	−0.6691	−0.8297
	(0.4956)	(0.5319)	(0.5154)	(0.5135)	(0.5846)	(0.6754)
	5212	4868	5212	4579	3402	2042
Happiness	0.0987	0.1196	0.0813	0.1005	0.1096	0.2416*
	(0.0919)	(0.0972)	(0.0947)	(0.0950)	(0.1068)	(0.1344)
	4755	4424	4755	4180	3107	1851
Self-Efficacy	0.0302	0.0450	0.0280	0.0265	0.0162	0.0247
	(0.0305)	(0.0320)	(0.0311)	(0.0325)	(0.0370)	(0.0470)
	3479	3117	3479	3273	2491	1450
Panel B: Unmarried Women						
Employment	0.1034***	0.0771*	0.0930**	0.1170***	0.1469***	–
	(0.0385)	(0.0410)	(0.0403)	(0.0400)	(0.0488)	–
	2587	2401	2587	2225	1445	–
CES-D	0.2914	0.4446	0.5736	0.4843	0.3648	−0.3981
	(0.7670)	(0.8366)	(0.8165)	(0.8069)	(0.9710)	(1.0873)
	2418	2245	2418	2075	1349	913
Happiness	−0.0556	−0.0242	−0.1647	−0.0468	−0.0750	0.2341
	(0.1338)	(0.1502)	(0.1469)	(0.1435)	(0.1697)	(0.2041)
	2201	2039	2201	1892	1232	824
Self-Efficacy	−0.1137	−0.0922	−0.1144	0.1334	0.2280	0.0227
	(0.0702)	(0.0715)	(0.0747)	(0.0820)	(0.1450)	(0.0983)
	1059	882	1059	1024	651	434
Panel C: Married Women						
Employment	0.0661*	0.0675*	0.0559	0.0746*	0.1079**	–
	(0.0375)	(0.0390)	(0.0394)	(0.0388)	(0.0418)	–
	2937	2751	2937	2631	2153	–
CES-D	−1.3853**	−1.7397**	−1.4656**	−1.2912*	−1.4896**	−1.4897*
	(0.6507)	(0.6846)	(0.6887)	(0.6685)	(0.7209)	(0.8851)
	2794	2623	2794	2504	2053	1129
Happiness	0.2449**	0.2414*	0.3044**	0.2391*	0.2837**	0.3380*
	(0.1210)	(0.1260)	(0.1281)	(0.1255)	(0.1383)	(0.1865)
	2554	2385	2554	2288	1875	1027
Self-Efficacy	0.0858**	.0942**	0.0832**	0.0801**	0.0663	0.0861
	(0.0381)	(0.0398)	(0.0386)	(0.0397)	(0.0435)	(0.0585)
	2420	2235	2420	2249	1840	1016
Demographic Controls	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	No	Yes	Yes	Yes
Month of Interview Controls	Yes	No	No	No	No	No
Omit Observations from 1994	No	Yes	No	No	No	No
State Fixed Effects (Year Interactions)	No	No	Yes	No	No	No
Restrict to Non-Attritors	No	No	No	Yes	No	No
Restrict to Unchanged Marital Status	No	No	No	No	Yes	No
Restrict to Employed in Both Waves	No	No	No	No	No	Yes

Notes: Analyses are based on the NSFH. Standard errors, reported in parentheses, are adjusted for individual-level clustering. Demographic controls include age, age-squared, race, marital status, educational attainment, presence of children aged 13–18 in the household with a qualifying relationship to the respondent, and number of children aged 0–18 in the household with a qualifying relationship to the respondent. Missing dummy variables were created in cases where demographic information was missing.

* Statistical significance at the 0.10 level.
** Statistical significance at the 0.05 level.
*** Statistical significance at the 0.01 level.

Finally, the analysis-sample is restricted to women with household income of $40,000 or less. This should increase the likelihood that mothers (in this sample) are eligible for the EITC. After the OBRA90 EITC expansion, the upper bound of the phased-out income range was $21,250; our income-restriction is considerably higher than this. The magnitude of each married mothers' SWB-effect is now greater. Note, the married mothers' happiness-effect is now less significant, changing from fully to marginally significant. However the sample size is roughly 40% smaller, so this may be due to a loss of statistical power. In sum, these specifications increase our confidence that the main results are likely explained by the OBRA90 EITC expansion.

Table 12
Specification checks that increase confidence that SWB-effects caused by the OBRA90 EITC expansion.

	(1)	(2)	(3)
Panel A: All Women			
Employment	0.0059	0.0324	0.0912**
	(0.0312)	(0.0313)	(0.0375)
	2434	3075	3331
CES-D	−0.0971	0.0387	−0.7506
	(0.5281)	(0.4810)	(0.7112)
	2373	2983	3122
Happiness	−0.1661	−0.1426	0.1178
	(0.1033)	(0.1001)	(0.1330)
	2126	2672	2859
Self-Efficacy	0.0238	0.0059	0.0496
	(0.0342)	(0.0288)	(0.0426)
	1800	2759	2005
Panel B: Unmarried Women			
Employment	−0.0284	−0.0706	0.1073**
	(0.0484)	(0.0771)	(0.0482)
	924	485	1787
CES-D	0.2739	−0.3430	0.2972
	(0.9990)	(1.3935)	(0.9605)
	900	468	1668
Happiness	−0.1040	−0.3515	−0.0677
	(0.1754)	(0.3220)	(1769.0000)
	805	407	1533
Self-Efficacy	0.5182**	0.0471	−0.1230
	(0.2091)	(0.0935)	(0.1034)
	450	388	745
Panel C: Married Women			
Employment	0.0242	0.0343	0.0643
	(0.0458)	(0.0355)	(0.0619)
	1510	2590	1544
CES-D	−0.5161	0.1008	−2.3582**
	(0.6668)	(0.5377)	(1.0940)
	1473	2515	1454
Happiness	−0.1060	−0.1219	0.3632*
	(0.1344)	(0.1092)	(0.2096)
	1321	2265	1326
Self-Efficacy	0.0537	0.0011	0.1263**
	(0.0401)	(0.0317)	(0.0597)
	1350	2371	1260
Demographic Controls	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes
Falsification Test: High Education	Yes	No	No
Falsification Test: High Income	No	Yes	No
Restrict by Income ≤$40,000	No	No	Yes

Notes: Analyses are based on the NSFH. Standard errors, reported in parentheses, are adjusted for individual-level clustering. Demographic controls include age, age-squared, race, marital status, educational attainment, presence of children aged 13–18 in the household with a qualifying relationship to the respondent, and number of children aged 0–18 in the household with a qualifying relationship to the respondent. Missing dummy variables were created in cases where demographic information was missing.

* Statistical significance at the 0.10 level.
** Statistical significance at the 0.05 level.
*** Statistical significance at the 0.01 level.

5.5. Common trends

The validity of the D-in-D estimates rests on the assumption of common trends in the outcome measures for the treatment and control groups in the absence of the OBRA90 ETIC expansion. If mothers and childless women's SWB follow different time-trends, the D-in-D estimates could reflect such differences (rather than the impact of the EITC expansion). Given that only one wave of the NSFH was administered prior to OBRA90, we rely on pooled cross-sections of the GSS (from 1972 to 1990). The GSS asks respondents a happiness question similar to that in the NSFH: "Taken all together, how would you say things are these days — would you say that you are very happy, pretty happy, or not too happy?" We code the possible responses as 3, 2, and 1, respectively. The GSS also asks respondents about financial satisfaction: "We are interested in how people are getting along financially these days. So far as you and your family are concerned, would you say that you are pretty
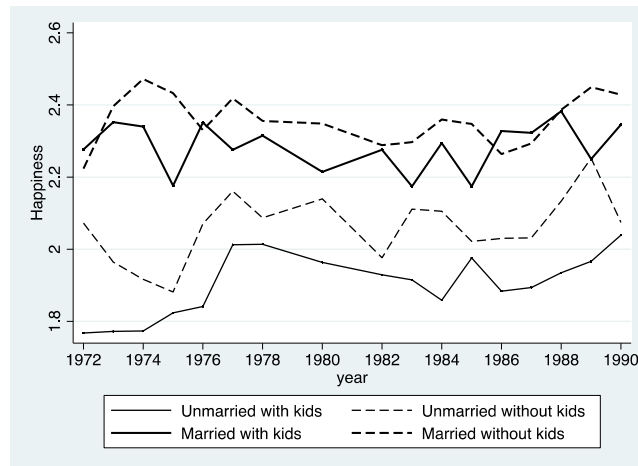
Fig. 3. Happiness trends from GSS by marital and parental status, 1972–1990.
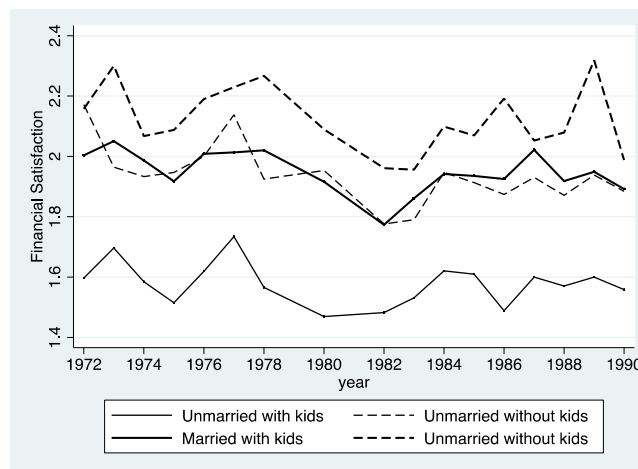

Fig. 4. Financial-satisfaction trends from GSS by marital and parental status, 1972–1990.

well satisfied with your present financial situation, more or less satisfied, or not satisfied at all?"[19] We code the possible responses as 3, 2, and 1, respectively.

Figs. 3 and 4 illustrate the happiness and financial-satisfaction trends by marital and parental status. Table 13 presents the happiness and financial-satisfaction linear time-trends by marital and parental status from an ordered probit regression that includes a similar set of demographic covariates as Eq. (1). Again, we restrict the sample to women aged 16–55 with no more than a high school degree. We find consistent evidence that the pre-OBRA90 happiness and financial satisfactions time-trends are not significantly different for mothers and childless women.[20]

6. Discussion

This paper contributes new evidence on the EITC-well-being link. Using the NSFH to study the impact of the OBRA90 EITC expansion on low-skilled mothers' mental health and SWB, we find evidence that the EITC has positive effects. Subgroup analysis reveals that the effect is driven by married mothers. The magnitudes of the effects vary by outcome measure. For example, married mothers' CES-D scores decline by 1.4 points (15.7%); self-reported happiness increases by 0.24 points

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[19] The NSFH has a comparable financial satisfaction question in wave 2, but it was not asked in wave 1.
[20] We estimate D-in-D estimates using the happiness and financial satisfaction questions from the GSS. The results are qualitatively similar to the NSFH for both, and significant for financial satisfaction. That said, the NSFH is preferred to the GSS for the current research because it (i) yields roughly twice as many observations (likely due to the oversample of low-income households); (ii) has a greater number (eighteen versus two) and variety of SWB measures (evaluative, experiential, and eudemonic); (iii) has SWB measures with more refined response scales (seven versus three categories of happiness); and (iv) allows us to more carefully identify qualifying children.

Table 13
Pre-OBRA90 happiness and financial-satisfaction trends, GSS, 1972–1990.

	(1) Observations	(2) With Kids	(3) Without Kids	(4) Difference
Happiness				
Unmarried Women	2556	−0.4272	−0.4474	0.0201
		(0.6974)	(0.7718)	(0.7674)
Married Women	4611	−0.0823	0.4433	−0.5256
		(0.7158)	(0.6891)	(0.9955)
Financial satisfaction				
Unmarried Women	2550	−0.2603	−1.5826	1.3223
		(1.0651)	(1.0450)	(0.9161)
Married Women	4602	−1.2786[*]	−1.4944	0.2158
		(0.7357)	(0.9296)	(0.4710)

Notes: Columns (2) and (3) report the linear time-trend coefficient (standard errors in parentheses) from an ordered probit regression. Column (4) reports the difference in the linear time-trend between mothers and childless women, testing the null hypothesis of no difference in the time-trend. The model includes controls for race, age, educational attainment, employment status, household income, presence and number of children in the household, and region of residence.

[*] Statistical significance at the 0.10 level.
[**] Statistical significance at the 0.05 level.
[***] Statistical significance at the 0.01 level.

(4.4%);[21] and the probability of agreement with feeling self-efficacious increases by 8.4 pp (10.1%). Married mothers' SWB-improvements are greatest (smallest) in magnitude for experiential (evaluative) SWB measures. Importantly, we identify the effect of the OBRA90 EITC expansion on all three categories of SWB. This has not been done before, and may be of particular interest in the context of policy evaluation, as it is presumably more impactful to show that SWB-improvements do not simply reflect hedonic gains but also reflect gains in feelings of self-worth and evaluative SWB.

In contrast, unmarried mothers experience few significant changes in their mental health and SWB after the OBRA90 EITC expansion compared to their childless counterparts. The employment-effects of the OBRA90 EITC expansion follow the opposite pattern; they are stronger for unmarried than married mothers. All of our results are consistent across a range of specifications.

The magnitudes of the married mothers' SWB-improvements are in line with past studies identifying the SWB-effects of social policy interventions. For example, Evans and Garthwaite (2014) find that, after the OBRA93 EITC expansion, married mothers with multiple children, compared to married mothers with one child, report a significant decrease (2.3%) in the number of bad-mental-health days in the last month and a significant increase (3.6%) in very good or excellent health. Consistent with our findings, neither of these outcomes improves for unmarried mothers with multiple children, compared to unmarried mothers with one child, despite more marked employment gains. Ifcher (2011) and Herbst (2013) find that welfare reform increases, respectively, unmarried mothers' happiness (8.7%), and unmarried mothers' agreement with the statement that they are satisfied with their life (16.2%), compared to unmarried childless women.

It is important to note that the effects we identify are short-term only. In the analysis of a large-scale randomized temporary in-work support-program intervention in the U.K., Dorsett and Oswald (2014) find that those who received the intervention had greater income than those who did not both two and five years later. However, their SWB was not significantly different after two years and was significantly lower after five years. The authors speculate that the long-term SWB-reduction may have been due to higher consumption norms being set during the temporary (up to two-year) intervention than could be met subsequently. While such long-term effects may apply to individuals when they eventually lose their EITC benefits, the results from Evans and Garthwaite (2014) — a context more similar to ours — suggest that SWB-improvements last at least five years: they identify SWB-improvements of the OBRA93 EITC expansion through 2001.[22]

To understand why the identifiable SWB-improvements primarily accrue to married mothers, it is useful to consider marital-status-variant mechanisms through which the EITC may affect mental health and SWB. Unmarried mothers' increased employment did not translate into measurably higher SWB; this could be because the salutary effects of employment may be offset by contravening factors particular to unmarried mothers, rendering any SWB improvements for unmarried mothers too small to differentiate from zero. For example, an employed unmarried mother has to arrange, manage, and perhaps pay for childcare. In contrast, since the EITC-employment effect is smaller for married than unmarried mothers, any associated negative SWB from increased childcare-management would be milder for married mothers. Further, married mothers, unlike unmarried mothers, can share the responsibilities of managing childcare with their husbands.

It is also possible that married and unmarried mothers spend EITC-generated income differently, thus causing variant SWB-effects by marital status. For example, married mothers may be more likely to spend additional income on utility-enhancing goods like clothes and dishwashers. In contrast, unmarried mothers may be more likely to spend additional

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[21] For a comparison of magnitudes, Luttmer (2005), using the same dataset, found that unemployment (natural log of household income) was associated with a significant reduction (increase) in happiness of 0.36 points (0.36 points).

[22] We thank an anonymous referee for raising the concern of intertemporal dynamics.

income on childcare or other work-related expenses. Smeeding et al. (2000) divide the uses of EITC-generated income into "making ends meet" (e.g., paying utility bills and rent) and "social-economic mobility" (e.g., savings, debt repayment, and human-capital investment). Their findings suggest that households in the EITC's phase-out range are more likely to spend EITC-generated income on mobility than on making ends meet. Further, two-parent households are more likely to be in the phase-out range than one-parent households (Eissa and Hoynes, 2004). Thus, insofar as social-economic mobility expenditures are more SWB-improving than making-ends-meet expenditures, differential spending patterns by marital status may help explain our results.

Another mechanism, suggested in Eissa and Hoynes (2004), is the labor-leisure choices of married mothers' husbands. For example, husbands may increase their home production and childcare responsibilities in response to the EITC expansion. This would presumably increase married mothers' SWB, as they may have more leisure time to spend in activities conducive to improving mental health and SWB, like social engagements with their husbands, family, and friends.

Further, it may be that employment, as compared to homemaking, impacts social networks and leisure differently. The greater employment-effect for unmarried mothers suggests that their workplace (out-of-work) social networks may become proportionately more (less) prominent. If participation in these varying social contexts is associated with different types of stressors or emotional supports, then changes in social networks could be one of the mechanisms through which the EITC is influencing mental health and happiness. Given both the stronger employment-effect on unmarried mothers, and the reduced probability of joint labor-market decision, unmarried mothers are less likely to experience both increased employment *and* time for out-of-work social networks. Analyses of time-use data could identify such a mechanism.

Lastly, a potential mechanism is the feeling of security and support associated with an augmented social safety net. While this would, on its surface, affect married and unmarried mothers similarly, given the timing of OBRA90, we cannot rule out that low-skilled married and unmarried mothers bore different psychological costs associated with the political and social discussions of welfare reform taking place concurrently with the administration of the second wave of the NSFH. Indeed, one of President Clinton's 1992-campaign promises was to "end welfare as we have come to know it" (Clinton, 1991). Though welfare reform was found to improve unmarried mothers' SWB once implemented (Ifcher, 2011; Herbst, 2013), it is plausible that, in advance of implementation, low-skilled unmarried mothers may have feared the paring down of a social safety net that they, and not married mothers, were eligible for.

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