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The Accumulation of Disadvantage: How Motherhood and Relationship Breakdown Influence Married and Single Mothers' Economic Outcomes

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Non-Technical summary

This study examines how earnings penalties to motherhood combine with the cost of partner absence to affect single mothers' economic well-being in the United States. Using 25-years of longitudinal data from the Panel Study of Income Dynamics (PSID) from 1990 to 2015 and fixed-effect models with individual-specific slopes I find that, after adjusting for needs, the transition to parenthood is as strongly linked to reduced income as partner absence. Comparing how these different routes to single motherhood affect economic outcomes, I show that previously married mothers face larger income penalties than those who were single when their first child was born, because married mothers see larger declines in their own earnings following childbirth. The results illustrate how marriage and parenthood, alongside partner absence, shape the economic prospects of single mother families, and highlight the importance of reducing gender inequalities in the labor market for improving single mothers' economic well-being.

The accumulation of economic disadvantage: the influence of childbirth and relationship breakdown on married and single mothers' income and poverty risk [1, 2]

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Abstract

This study examines how earnings penalties to motherhood combine with the cost of partner absence to affect single mothers' economic well-being. Using 25-years of longitudinal data from the Panel Study of Income Dynamics (PSID) from 1990 to 2015 and fixed-effect models with individual-specific slopes I find that, after adjusting for needs, the transition to parenthood is as strongly linked to reduced income as partner absence. Comparing how these different routes to single motherhood affect economic outcomes, I show that previously married mothers face larger income penalties than those who were single when their first child was born because they see larger declines in their own earnings following childbirth. The results illustrate how marriage and parenthood, alongside partner absence, shape the economic prospects of single mother families, and highlight the importance of reducing gender inequalities in the labor market for improving single mothers' economic well-being.

Keywords: child penalties; female earnings; income; poverty; single mothers; fixed effect with individual slopes models; life course analysis.

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For women, motherhood is associated with large employment and earnings penalties (Harkness & Waldfogel, 2004; Kleven et. al, 2019). While these penalties have an impact on the incomes of all families with children (Sigle-Rushton & Waldfogel, 2007), for single mothers they are likely to be particularly damaging as the reduced earnings associated with motherhood mean that, when a male breadwinning partner is absent, the risk of poverty will be high (Moullin & Harkness, 2021). Single fathers, on the other hand, are much less likely to be living in poverty because they do not face the same labor market penalties to parenthood (Nieuwenhuis & Maldando, 2018; Moullin & Harkness, 2021). For the one-in-four children growing up in single-mother families in the US, reduced income is associated with a series of negative outcomes, including reduced educational attainment and emotional problems (Thomson, Hanson & McLanahan, 1994; Reardon, 2011).

The weak labor market attachment of all mothers, and the associated reduction in their earnings potential (Kleven et al, 2019), is one reason single mothers' may be economically disadvantaged. Other explanations are the absence of a male partner's earnings and, as a result of caring responsibilities, their greater economic needs (Sorensen, 1994). Numerous studies have examined how partner absence affects the incomes and risk of poverty of all single mothers (e.g. Page & Stevens, 2004; Brady, Finigan & Hubgen, 2017) and of those becoming single mothers as a result of separation (e.g. Tach & Eads, 2015). Far less attention has been paid to earnings and employment penalties to motherhood as a source of single mothers' disadvantage. Yet research shows that maternal employment matters to single mothers' risk of poverty, with their children less likely to be poor in countries with high rates of maternal employment (Esping-Andersen, 2014).

In this article, I examine how parenthood affects families' economic well-being paying particular attention to those who become single mothers. To better understand single mothers' economic disadvantage, I examine how changes in female earnings following a first

birth interact with the absence of a partner's income to affect their incomes. I then make the important move from considering individual level outcomes (earnings) to household level outcomes (income), showing how reductions in maternal earnings following parenthood affect family income and assessing the implications for single mothers. I allow for the possibility that labor market penalties to motherhood vary by marital status at the time of first birth; for example, married mothers may be more likely to reduce their employment and hours of work than those who are unmarried (single or cohabiting) at the time of first birth (Loughran & Zissimopoulous, 2009). As I show, differences in these penalties in turn affect single mothers' economic well-being.

Family change may invoke private responses which may help mediate losses in income. For example, within couples, men may work more to compensate for reductions in their partners' earnings; child support payments may compensate for the absence of a male partner; or other family members, especially grandparents, may step in to provide help. Changes in the tax and welfare system also compensate families as their incomes, and needs, change. In this article, I show how these mechanisms moderate the losses in income associated with parenthood and partner absence and assess their contribution to the total income penalty to the single motherhood.

To address these issues, I leverage long-running panel data from the Panel Study of Income Dynamics (PSID) and fixed effect models with individual slopes (FEIS), allowing me to isolate the effects of parenthood and separation on income and poverty risks. This is important because, while single mothers have substantially lower incomes and face a higher risk of poverty than mothers with partners, the extent to which single motherhood contributes to low income and poverty is the subject of considerable debate. Before they have children those who go on to become single mothers are already disadvantaged; they are, on average, younger at the time of first birth, less educated, less likely to be employed, and have lower

incomes than those who marry (Kiernan et al, 2020). While cross-sectional estimates can account for some of these differences, important unobservable differences remain (Page & Stevens, 2004). By using longitudinal data and following women over a long period, I reduce potentially important sources of bias that may occur in cross-sectional estimates as a result of the correlation of the independent variables in the models with unmeasured individual-specific effects. Moreover, decisions about having a child, getting married or divorced are likely to be affected by individuals' earnings or income trajectories (see, for example, Ludwig & Bruderl, 2020). To take account of pre-existing differences in trends, models include individual-fixed effects and individual-specific slopes.

Overall, I show that earnings penalties to motherhood are a major factor contributing to the lower incomes and increased risk of poverty of single-mother families in the US. Assessing how motherhood affects women's earnings, I show - as other studies have (Kleven et al, 2019) – that it is associated with large earnings declines. Linking changes in individual earnings to changes in family income, I then show that, after adjusting for needs, first births are as strongly associated with reduced income as partner absence. A great deal of past research has looked at how partner absence – rather than earnings losses associated with motherhood – affect income. A major contribution of this paper, then, is to show the importance of maternal child earnings penalties – and not just family structure – for explaining single mothers' disadvantage, and to illustrate how these penalties vary with previous marital status.

PREVIOUS RESEARCH

Parenthood, marital status, earnings and family income

Being in work may help women buffer the worst economic consequences of single motherhood, including helping them and their families avoid poverty (Gornick & Jantii, 2010). Yet, the literature also shows that motherhood substantially affects women's

employment and earnings (Budig & England, 2003; Budig, Misra & Boeckmann, 2012). Research on child penalties in the labour market suggest that in the US women experience a 'large, immediate and persistent drop in earnings after the birth of their first child,' while men's earnings are largely unaffected (Kleven et al, 2019). This fall in earnings results from a combination of reduced labor force participation, hours of work, and wage rates (see also Kuziemko et al, 2020, who find similarly large declines in labor supply in the US). Kleven, Landais & Søgaard (2019), assess how a range of factors – including occupational choice and grandparent employment – contribute towards child earnings gaps but have not looked at variations by marital status. The influence of fatherhood on wages is less clear; while some studies have found that parenthood is associated with higher hourly wages (Glauber, 2008, 2018; Lundberg & Rose, 2000)(Glauber, 2008, 2018; Lundberg & Rose, 2002) others suggest that selection plays an important role (Ludwig & Brüderl, 2018). Other studies suggest that fatherhood premiums depend on family circumstances, with married men receiving positive wage premiums but that this premium vanishes when their wives work full-time (Killewald, 2013). Yet, while there is limited evidence for fatherhood wage premiums, fatherhood is associated with significant increases in working hours (Percheski & Wildeman, 2008) and higher annual earnings (Hodges & Budig, 2010).

In this paper, I make the important move from considering individual level outcomes (earnings) to family level outcomes (income). In the context of single mother families, this is important because past research on single mother families has focussed on how partner absence – rather than earnings losses attributed to motherhood – affect income. Given the now mature literature on how motherhood affects employment and earnings, it is surprising that only a handful of studies have looked at how parenthood affects household income. Looking across countries, Todd and Sullivan (2002) assess the relationship between children, family earnings, and income. They find that the relative incomes of families with children are

lowest in countries where children are associated with the largest declines in household earnings, and in particular mothers' earnings (see also Bronchetti & Sullivan, 2004). Taking a similar approach, Sigle-Rushton & Waldfogel (2007) show that differences in the earnings of women with and without children are important drivers of differences in income between families with and without children. One limitation of these studies, which in part motivates this research, is that, because they use cross-sectional data, they cannot look directly at the relationship between changes in maternal earning following childbirth and family income. Nor can they assess how changes in earnings associated with parenthood affect the incomes of single mothers, a group for whom issues of selection are particularly important. Using longitudinal data and following women over a substantial time period allows me to directly address these issues.

In this article I also address the question of whether the economic consequences of single motherhood differ for those who were unmarried at the time of first birth and those who were married but later separated. There are several reasons to expect women's partnership status at the time of birth to affect their subsequent employment and earnings. Among married couples, traditional models of the household predict that – to reap gains from marriage, couples will specialize, with husbands typically specializing in work and wives in care (Becker, 1981). Specialization may also be driven by cultural norms, with notions of the ideal mother emphasizing "intensive motherhood" which should be "childcentered, expert-guided, emotionally absorbing, labor-intensive, and financially expensive" (Hays, 1996, p.54). These ideals, while prevalent across the socio-economic spectrum (Edin & Kefalas, 2007; Macdonald, 2009; Nomaguchi, Milkie & Denny, 2015), are particularly prevalent among married mothers and the most educated (Altintas, 2016). On the other hand, those who are single when they become mothers are likely to have fewer income sources to draw on and

will therefore, *ceterus paribus*, be more likely to work and have greater employment continuity than married mothers.

The design of the tax and welfare system also plays a part in driving differences in the employment of single and married mothers. For low-income families, financial support in the US has become increasingly conditional on employment, encouraging single mothers to work (Moffitt & Garlow, 2018). The Earned Income Tax Credit (EITC) further incentivise difference, encouraging unmarried mothers to work but, for married mothers, because it is based on family rather than individual income, disincentivizing the employment of second earners, almost always women (Eissa & Hoynes, 2004; Neumark & Shirley, 2017). Overall, all else equal, mothers who were married at the time of first birth are therefore more likely to reduce their working hours or leave employment than those who were single.

While women may raise their labor market participation following divorce or separation (Ozcan & Breen, 2012; Tamborini, Couch & Reznik, 2015), lost work experience is likely to have a long-lasting impact on earnings. Human capital theory tells us that losses in work experience are associated with lower productivity and wages, and numerous studies have shown that motherhood earnings penalties are substantially reduced when differences in work experience are accounted for (Wilde et al, 2010; England et. al., 2016). Over and above losses in work experience, employment discontinuity is further associated with reduced earnings (Waldfogel, 1997; Lundberg & Rose, 2000).

Separation also affects labor supply decisions. For mothers, the loss of a partners' income is expected to increase both participation and hours of work. However, the extent to which increases in labor supply occur following divorce also depend on personal circumstances – including the opportunity cost of working, which will be influenced by the age of children and women's earnings potential, as well as labor market conditions and

institutional arrangements (Van Damme & Uunk, 2009). Moreover, women may raise their labor supply in the years before separation in anticipation of divorce (Özcan & Breen, 2012).

Partner absence

The absence of a male partner has long been viewed as a primary cause of single mother poverty. Partnership typically has economic benefits as, by pooling income and exploiting economies of scale, couples can improve their standard of living. Conversely, a single adult must command more than half of the income of those in couples to achieve the same standard of living (Sørensen, 1994). Taking care of children also affects income needs. For parents that separate, because mothers typically retain custody of children, differences in family size following relationship breakdown plays an important role in explaining asymmetries in its effect on mothers' and fathers' incomes (DiPrete and McManus, 2000). It is the absence of a *male* partner, rather than family size per se, that is particularly damaging; because women earn less than men, and because this difference widens substantially when they have children (Budig et al., 2012; Kleven et al., 2019), they are much less able to financially support their families. However, it may also be the case that fathers who are absent had lower earnings potential than those who were, and remained, married. Past research has shown marriage and divorce to be strongly graded by socio-economic status (Amato & James, 2010; Kalmijn, 2013), while the risk of separation is heightened by job loss and financial stress (Eliason, 2012; Poortman, 2005). Moreover, studies show that weak economic opportunities for low-skilled men are linked to a growing share of births out-of-wedlock and the postponement of marriage (Oppenheimer, 1994; Gibson-Davis, 2009) and this may mean that the earnings potential of the prospective partners of women unmarried at the time of birth may be poor.

While absent fathers may continue to support their children financially, these payments are rarely sufficient to offset the absence of a male partners' earnings (Grall, 2016). The contractual obligations of marriage mean that, when it ends, divorcees are more likely than

never-married mothers to receive child support, and levels of payments are likely to be higher, reflecting the fact that previously married fathers are more likely to be employed and have higher incomes than unmarried fathers (Lerman, 2010; Sariscsany, Garfinkel & Nepomnyaschy, 2019).

Welfare and tax

Changes in family structure and household earnings trigger responses in the tax and welfare system, which can help mitigate losses in income (DiPrete & McManus, 2000). For all families, the progressive nature of the tax system provides some compensation for changes in income and family needs. For those on low to middle incomes, means-tested financial assistance is delivered through the Earned Income Tax Credit (EITC) and Child Tax Credit (CTC), while for those on low incomes cash assistance is provided by Temporary Assistance for Needy Families (TANF). Spending on EITC and CTC (introduced in 1997) has expanded considerably since the late 1990s (see Nichols & Rothstein, 2016, for a detailed review). TANF's introduction in 1997, as a replacement to Aid to Families with Dependent Children, was associated with a fall in welfare caseloads and the redirection of payments away from the lowest income families towards those in work (Moffitt, 2008; Moffitt & Garlow, 2018). Since the 2000s, real spending on TANF further declined with the safety net for low-income families shifting away from providing direct cash support towards a system of refundable tax credits and in-kind support for food through the Supplemental Nutrition Assistance Program (SNAP) (Harding, Smeeding, Ziliak, 2018).

Overall, the tax and welfare system is expected to redistribute income towards families with children. The effect on the distribution of income is, however, less clear because while eligibility for support through the tax credit system extends to those on relatively high income, many of those on the lowest incomes – including single mothers, are ineligible for cash-based welfare receipt. While my focus is on income, other forms of welfare assistance

(including food stamps, housing assistance and Medicaid) go disproportionately to low-income single mother families (Moffitt & Garlow, 2018) and have important distributional effects (Wimer et al, 2016).

Empirical issues in estimating parenthood and partnership penalties and premiums

While there are dramatic gaps in the incomes, and risk of poverty, of single mother and couple families, the extent to which these differences are a result of the absence of a male breadwinner is the subject of a large body of research. Using cross-sectional data, researchers have examined how income and poverty rates would change if single mothers were to marry (Thomas & Sawhill, 2002; Sigle-Rushton & McLanahan, 2002/03). More recently, studies have estimated single mother 'poverty penalties' by comparing single and partnered mothers' poverty risk (Rothwell & McEwen, 2017; Brady, Finigan & Hubgen, 2017). Invariably these studies show that, after accounting for differences in observable characteristics such as education, single mothers' incomes are lower, and their risk of poverty, higher than mothers in couples. These findings do not, however, account for unobserved differences between partnered and single women, nor do they differentiate between mothers who are unmarried at birth and those who separate in the years following birth. This is an important limitation, as prior studies have shown that single mothers differ from those in couples in unobservable ways and, as a result, cross-sectional estimates of the 'cost' of partner absence are substantially larger than those controlling for pre-existing differences using fixed effects (Page & Stevens, 2004).

While fixed-effect estimates can help eliminate potentially large sources of bias present in cross-sectional estimates, further sources of bias may remain. In particular marriage and fertility decisions may be influenced by economic opportunities, with those who marry or have children more likely to be on an upward earnings or income trajectory (see, for example, Killewald & Lundberg, 2017, on men's earnings and marriage, and Ludwig & Bruderl, 2020,

on male earnings and parenthood). Moreover, whose earnings are growing may also matter, as women may be more likely to have children when their own earnings prospects are weak (as the opportunity cost of childbirth will be lower) but their partners' earnings are growing (DiPrete, 2002; Ludwig & Bruderl, 2020). Conversely divorce, separation or having a child while single may be a response to poor or deteriorating economic prospects (Cools, Markussen & Strøm, 2017; Killewald & Lundberg, 2017). While some studies take account of this by allowing for individual differences in the rate of income growth, in others the financial consequences of partner absence may be overestimated. In my empirical analysis, I account for differences in levels and rates of growth of income by using individual fixed-effect models with individual-specifics slopes.

Pre-existing trends in earnings growth may themselves reflect gender differences in *expectations* about work and care (Combet & Oesch, 2019). If, for example, income growth changes following marriage in the expectation of becoming a parent, including individual-specific slopes may understate the association between childbirth and income. This is potentially important because past studies have shown that marriage, which is often a precursor to childbirth, is associated with greater household specialization and reduced female earnings (Loughran & Zissimpoupoulos, 2009; Musick, Bea & Gonalons-Pons, 2020). If this is the case, the inclusion of individual slopes – if they are affected by the expectation of future earnings declines – will underestimate motherhood penalties. I therefore compare the results above with those where only individual specific fixed effects are included.

METHODS

Data

Data comes from the Panel Survey of Income Dynamics (PSID), which was collected annually from 1968 to 1996 before becoming biennial in 1997. I use data from 1990 to 2015. Demographic data and individuals' fertility histories are taken from the original PSID data

files. Income data comes from the Cross-National Equivalence Files (CNEF), which provides a range of income measures derived from the PSID, including pre- and post-government household income, estimates of annual taxes paid by respondents, and household composition variables needed (Burkhauser et al, 2000). This information is merged with data from the original PSID files. The PSID sample includes oversamples of low-income, Latino and immigrant families, with the provided sample weights adjusting the data to be nationally representative.

Individual women are the unit of analysis. My sample includes all women who are household heads, partners of the household head, or living in a sub-family. As I am interested in the influence motherhood and partnership has on economic outcomes, the sample includes all individuals first observed when they were of childbearing age (which I assume to be 40 or under) but who had not yet become parents. They are followed while they are of working age (over 18 and under 60). This gives a total of 49,465 observations. As I am interested in labor market outcomes, full-time students are excluded from the sample (3,241 observations). I also exclude those with missing income information (222 observations). As is common in the literature, I exclude person-year observations of individuals who live in households with income in the top or bottom percentile of the household income distribution (across all individuals in the PSID), to avoid problems of top coding and to exclude negative or zero incomes (1,590 observations). Because information collected in the PSID is for the previous financial year, income data for those who are new mothers may be overestimated (as information from before the first child was born is included). In the regression models I therefore exclude observations for the year when women are first observed as new mothers (2,045 observations). This leaves a total sample of 42,367 observations (7,418 individuals). Finally, as I am interested in income changes, I further restrict the sample to individuals observed three times or more across waves (this is also a minimum data requirement for the

models used, described below). This excludes a further 3,160 observations. The resulting sample is 39,207 observations and 5,165 individuals.

All women who meet the above criteria are included in the sample, regardless of their status within the household; I include those that are household heads, spouses, and other extended household members. I apply cross-sectional and longitudinal weights, as appropriate. As some observations are zero weighted, this reduces the sample further, to 35,037. The sensitivity of the results to weighting, and to alternative sampling inclusion restrictions, is discussed below where I conduct a range of robustness checks. Appendix Table A1 gives information on sample characteristics. Those who were single when their first child was born were younger at the time of birth, less educated, and more likely to live with their parents than those who were married.

Outcome variables

My interest is in how motherhood and the dissolution of partnerships affect household income. To understand what drives change, I first examine how earnings of women and her partner, if present, change and at changes in other sources of household income. I then consider how income and poverty are affected. The income sources I examine are labor income (of the woman, her partner – which is 0 if no partner is present, and all other household members); household non-labor income; and household taxes and transfers. Labor income includes gross earnings from employment and self-employment. Non-labor income comprises private transfers (which includes child support payments, alimony, and other private income transfers) and income from pensions and investment income. Taxes and transfers are the sum of all state benefits minus taxes and pension contributions. CNEF uses the National Bureau of Economic Research (NBER) TAXSIM model to estimate federal and state income taxes.

Two aggregate measures of household economic well-being are reported: income and the poverty rate. Income is defined as disposable income, adjusted for family size using the square root scale and normalized for a family of four ($\sqrt{4/s}$, where s is the number of individuals in the household). Households are defined as being poor if their disposable income falls below the official Census Bureau threshold of income needs, a needs adjusted measure of income reported for each household in the PSID (see Greiger, Schoeni & Danziger, 2008). All measures are annual, deflated to 2015 prices, and reported in US dollars.

As in other studies which have decomposed income changes into their component parts (Kleven et al., 2019; Page & Stevens, 2004; Todd & Sullivan, 2002), the dependent variables are specified in levels rather than logs. This allows me first to keep observations which take the value of zero and second, as income components are additive when reported in levels but not when logged, to examine how different sources of income contribute to overall change. I convert the levels into normalized effects by dividing income and its components by average annual equivalised disposable income. The resulting estimates should therefore be interpreted as shares of average income. Robustness tests using logged income are reported in the appendix.

Explanatory variables: childbirth and partnership status

To examine how the transition to parenthood affects income, I construct dummy variables for having a first birth while married or while single, using information on whether women had become first-time parents since they were previously interviewed (and had a youngest child 2 or under) and on marital status at time of interview. A small number of women were married at the time of birth but separated by the time of interview (33 individuals), while some mothers were cohabiting at the time of birth but married soon after (49 mothers). As is common in the literature, new mothers who were cohabiting with a partner were defined as single mothers. Around one-in-ten single mothers had a cohabiting partner in the working

sample. Separation is coded 1 if women divorced or separated in subsequent years. I sum the coefficients on childbirth and separation to give a total single mother income penalty. Models include a dummy variable if single mothers marry or re-marry. This shows the degree to which re-partnering offsets falls in income associated with single motherhood. I control for being single without children, the omitted category being married women without children.

Additional controls

Other controls are dummy variables for living with parents, living with other adults, number of additional children born, a quadratic in potential work experience (age-18), and a set of dummy variables for the year of observation. As I use panel data and fixed-effect models with individual slopes, which I describe below, it is not necessary to control for fixed characteristics, such as race or education as these are absorbed in the fixed effects.

Methods and empirical specification

The approach I take follows the literature estimating the joint effect of motherhood and partnership on wages and employment using FE models (Loughran & Zissimopoulos, 2009; Harkness, 2016). As discussed above, to avoid confusing the association of childbirth and separation with pre-existing income trends, I allow for individual-specific slopes as well as individual fixed effects (Rüttenauer & Ludwig, 2020). The equation estimated takes the form:

$$Y_{it} = D_{it}\,\alpha + X_{it}\,\beta + \mu_i + t\delta_i + \gamma_t + u_{it} \qquad [1]$$

The dependent variables are denoted as Y_{it}, where Y is the outcome of interest for individual 'i' at time 't.' The matrix D_{it} is a set of demographic controls, which includes dummy variables for having had a first birth while married or single, for separation, and for marrying or remarrying after childbirth, as well as for being single (unpartnered or cohabiting) without children. The coefficients on first birth and separation describe predicted changes in economic outcomes relative to being married without children. X_{it} is the set of additional controls described above. Individual specific fixed effects, μ_i account for time-invariant

unobserved heterogeneity; δ_i is an individual specific slope effect; year effects, γ_t, allow for variations over time; and u_{it} is an error term. Panel-robust standard errors are reported. Summing the regression coefficients across the different components of income gives the total association changes in the explanatory variables with pre- or post-tax income (before accounting for changes in family size). All models are estimated using the Stata package *xtfeis* (Ludwig, 2019). Note that the sign and significance of the coefficients is not affected by the base used to normalize income, although their magnitude is dependent on the scale (Bronchetti & Sullivan, 2004).

To understand why the earnings of mothers and fathers change, I estimate the impact of the transition to parenthood on women and their partners' employment and annual working hours. To do so I use the same models as above but, because changes in employment and hours of work are bounded, I use fixed-effect models without individual slopes. I also conduct several robustness checks on the model specification. First, I compare the main results with those that use using logged income for the three aggregate income measures. Second, income may recover, or decline further, in the years following birth, or following separation. To allow for this I compare the estimates with those from models which include a variable indicating the number of years since first birth and for the time since separation. Finally, to assess whether there are differences by race, I run separate models for black women and white women.

RESULTS

Descriptive Statistics

Before examining the models, I illustrate how in my sample income, and its composition, varies between women who are married or single, and with or without children (Table 1). On average, after adjusting for needs, single mothers' equivalised incomes are around half those of married women with children, and poverty rates are 26% and 3% respectively. Maternal

earnings are also lower for those that are single and comprise a far more important share of income. The earnings of 'other' household members are a further important source of single mothers' income because, as I describe later, they are particularly likely to co-reside with parents. Private transfers, which are mostly made up of child maintenance and alimony, on the other hand comprise only a small income share. Finally, taxes and transfers have little net impact on single mothers' incomes but reduce those of married mothers and those without children. Differences in the incomes of single and married mothers in part reflect differences in the characteristics of mothers. Appendix Table A1 reports the characteristics of the sample on which the models are run and shows that – as expected, single mothers at the time of first birth are on average less educated, younger at the time of first birth, less likely to be homeowners and more likely to live with their parents than married mothers.

Earnings penalties to parenthood and other income changes

The results from the model are reported in Table 2. As noted above, coefficients are expressed as a percentage of average income. The coefficients on the dummy variables for first births and separation describe predicted changes in economic outcomes relative to being married without children.

Mothers' earnings

The first column of Table 2 shows how childbirth and separation affected the earnings of those who were married and those who were single at the time of first birth. The coefficients on childbirth (top panel) show that married mothers' earnings were -.257 lower, equivalent to 26% reduction in average income. Those who were single saw smaller falls, of 11%. Differences in the size of the coefficients are statistically significant. These findings are similar to those of Bronchetti and Sullivan (2004) who, using cross-sectional data for 2000 and expressing changes as a share of median income, found married mothers with children under 6 to have lower earnings, with a 15% reduction if they had one child rising to a 28%

fall if they had three. For single mothers, they report slightly smaller penalties to one child although, as their estimates are based on cross-sectional data and single mothers are likely to be selected, they are likely to be overestimated. More recently, Kleven et. al. (2019) reported a long-run earnings penalty to children of 31% for women in the US, expressed as a share of predicted earnings, rather than income.

The second panel shows how women's earnings change following separation. Previously married mothers saw an average increase of 11.5% (as a share of average income) upon separation. This finding is in line with the results of Tamborini, Couch and Reznik (2015), who report that divorce was associated with a 10% increase in earnings in the early 1990s. Nonetheless, this increase was not sufficient to offset falls in earnings associated with childbirth. Moreover, overall, previously married single mothers faced larger earnings penalties than those unmarried at birth and this difference was statistically significant.

Fathers' earnings and other sources of private income

The second column of Table 2 shows changes in spouses' earnings following childbirth and separation. The coefficients show childbirth was associated with an 9.9% increase in spouses' earnings. Previous studies have similarly found childbirth to encourage specialization within marriage (Loughran & Zissimopoulos, 2009; Juhn & McCue, 2016, 2017), with the higher earnings of fathers helping offset earnings penalties to motherhood (Bronchetti and Sullivan, 2004). The coefficient on divorce/separation (second panel of Table 2) shows that the absence of a male partners' earnings is associated a 78% fall in income. As expected, the absence of a married partner has a smaller impact on the incomes of mothers who were unmarried at the time of first birth, a finding in line with prior research showing partner absence to have a greater influence on the incomes of mothers who separate from a partner than those not living with a partner at the time of birth (Page & Stevens, 2004).

The third column of Table 2 shows changes in other household members earnings, which account for a particularly important source of income for new unmarried mothers. The influence of childbirth and separation on income from private transfers (alimony, child support and other transfers between households) is shown in columns 4. Previously married mothers were more likely to retain financial support from their ex-partners following separation, accounting for a 6.8% change in the income. In comparison, those that had a child while unmarried received much less support, at just 1.5% of average income. Prior research similarly shows that child support is insufficient to offset the financial consequences of separation (Grall, 2016) and that those who were not previously married are less likely to be in receipt of child support, or to receive only small awards (Radey & Padilla, 2009; Nepomnyaschy, Magnuson & Berger, 2012). Finally, changes in pension and asset income (column 5) had little influence on income.

Tax and welfare

Changes in taxes and benefits moderated the association between childbirth and separation and income (Table 2, col. 6). For mothers who were married at the time of birth, changes in taxes and benefits were associated with a 5% increase in income following a first birth and an 20% increase following divorce. For unmarried mothers, the equivalent increase was 17% following a first birth.

Standards of living and poverty risks

Changes in disposable income (Table 2, col. 7) are found by summing the coefficients in columns 1 to 6. To see how families' standards of living change, we then need to adjust for household size. Moving from disposable income to equivalised income illustrates how changes in needs affect economic well-being. Results are reported in Table 3. Because children increase income needs, while married mothers' disposable income does not change following childbirth, once changes in needs are accounted for a strong negative association

between childbirth and income is observed. First births are associated with a 41% reduction in income for married women. While there are few directly comparable studies, Sigle-Rushton and Waldfogel (2007) find that for middle educated women having 2 children was associated with accumulated income over early adulthood being 28% lower. Divorce leads to large losses in disposable income which are moderated by reduced income needs. For women in our sample, divorce was associated with a 27% fall in equivalised income. This is of a similar magnitude to changes reported in other studies. For example, DiPrete and McManus (2000) reported a 26% fall in income following divorce for women in the US in the 1990s while, using more recent data, Hauser et. al. (2018) found a 25% decline and de Vaus et al. (2017) a 30% fall.

Comparing the impact of first births and divorce on married women's income, my results suggest that they have similar impact; while the coefficient on childbirth is larger than that on separation the difference in the size of the coefficients is not statistically significant. Overall, these penalties combine to give a total single mother income penalty of 68% for women for previously married mothers. For unmarried mothers, the single mother penalty is smaller, with childbirth associated with a 50% reduction in income. Differences between previously married and single mothers were statistically significant at the 95% level.

The last outcome I examined was poverty (Table 3, col. 2). A first birth raised married women's risk of poverty 2-percentage points (ppt) and separation increased it a further 4-ppt, giving an overall single mother poverty penalty of 6-ppt for previously married mothers. The poverty penalty associated with becoming an unmarried single mother is, as predicted, higher at 11-ppt. Using cross-sectional data Brady, Finigan and Hubgen (2017) report a single mother poverty penalty of 14% in the US. However, using longitudinal data allowed me to account for pre-existing differences in the risk of poverty so, given the importance of selection into single motherhood discussed previously, my estimates are, as expected, lower.

Private responses: co-residence and re-partnering

The lower panel of Tables 2 and 3 show how re-marriage and co-residing with parents or other adults affects economic outcomes. Mothers who remarry see a small fall in their own earnings, of 6%, a finding echoed by Tamborini, Couch and Reznik (2015) who find remarriage to attenuate the influence of divorce on earnings. However, the earnings of a new partner offset falls in women's own earnings, and overall, after adjusting for changes in income needs, income rises by 13%. Nonetheless, these gains are insufficient to offset the cost of divorce. This finding echoes that of Page and Stevens (2004), who show that although remarriage helped income recover to its prior levels, it never caught up with that of continuously married parents whose incomes had continued to grow. The earnings of other adult members of the household may also respond to the arrival of children. For example, grandparents may raise their labor supply when their daughters become single parents and move home. There is some indication that this also happens (col. 3, Table 2) in response to the birth of a child.

The coefficients on the variables for 'living with parents' and 'living with other adults' show how income is affected by living arrangements. Sharing with other adults, and in particular women's own parents, raises income because of the presence of other earners in the household. I find that living with parents had a greater influence on family income than remarriage; it was associated with income being 55% higher. Co-residing with adults other than parents, however, does little to raise income or reduce the risk of poverty. These finding support the conclusions from prior research which emphasize the importance of 'doubling up' to single mothers' incomes (Pilkauskas, Garfinkel & McLanahan, 2014).

Explaining changes in mothers' and fathers' earnings: employment and hours

To understand changes in earnings I examined the association of childbirth and separation with employment and working hours (Table 4). Unmarried mothers at the time of

birth had 9-ppt lower employment rates and saw a 352-hour reduction in annual hours. For married women, motherhood was associated with a larger 18-ppt reduction in employment and a 719 fall in annual work hours, while married men's annual hours did not significantly increase. Among married couples only, I then assessed how differences in labor market trajectories of new mothers and fathers contributed towards changes in the composition of income. As a share of disposable income (before adjusting for needs) married mothers' earnings fell 21-ppt. This fall in earnings shares is of a similar magnitude to that reported by Musick, Bea and Gonalons-Pons (2020). Lastly, divorce was shown above to be associated with higher maternal earnings. Table 4 shows that increased labor supply helped drive this change, with employment increasing 13-ppt and annuals hours by 396.

Robustness checks

Sample selection and sample weights

I conduct a set of robustness tests to evaluate the impact of alternative sample exclusion restrictions and of the inclusion of sample weights on the results. Changes to the sample inclusion restrictions I examine are: (i) the inclusion of students; (ii) restricting the sample to those over 22. The results for income and poverty are shown in Appendix Table A3 and are robust to these alternative sampling restrictions. The results presented took account of attrition by using the longitudinal weights provided in the PSID. However, the inclusion of weights reduces sample sizes and increases standard errors. Because of this studies using longitudinal data to examine the influence of family change on earnings (Kleven et al., 2019; Ludwig & Brüderl, 2018) or income (Jenkins, 2008) frequently present unweighted results. I also ran the models without weights and found the results, available in the Supplementary Material, to be similar.

Model specification

To check the validity of the results to alternative specifications I conduct several robustness tests. First, while the reported models account for pre-existing trends in income and earnings, as I discuss above these trends may themselves reflect gender differences in expectations about work and care. If income growth changes following marriage in the expectation of becoming a parent, including individual-specific slopes may understate the association between the transition to parenthood and income. I check whether this is the case by comparing my estimates from FEIS models with those from models with only fixed effects (FE). I also compare these estimates to those based on cross-sectional data, but which include additional controls for time-invariant characteristics. Results are reported for income and poverty in Appendix Table A2.

For married mothers, the coefficients on childbirth from the cross-sectional, FE, and FEIS models are similar. Differences between the models are not statistically significant, suggesting that neither differences in unobserved characteristics nor differences in the rate of income growth before childbirth explain changes in income. That the birth of a child, rather than prior trends, affects parents' earnings is perhaps unsurprising given the findings from previous studies. For example, studying male and female earnings Kleven et. al. (2019) find female earnings to show large and persistent falls *following* childbirth. One explanation for the absence of prior trends may be that women systematically underestimate the influence of childbirth on their post-birth labor supply (Kuziemko et al, 2020). The results for childbirth to unmarried mothers, however, show that the results are sensitive to the model specification; the inclusion of fixed effects to account for time invariant unobservable characteristics leads to a considerable reduction in the estimated association between childbirth and income and poverty (differences are statistically significant) while the inclusion of individual-specific slopes reduces the size of the estimates still further. For divorce, the inclusion of fixed effects also reduces the size of the estimates substantially, again illustrating the importance of

accounting for unobserved heterogeneity. Differences between the FE and FEIS estimates are harder to interpret; the inclusion of individual-specific slopes increases the size of the estimates (although differences are not statistically significant). This suggests that income was growing before divorce and may be a result of wives' increasing their labor supply, and therefore household income, in anticipation (similar findings are reported in the UK by (Gregg et al., 2009)). If this is the case, the FEIS may underestimate the cost of divorce.

It may be that income recovers, or further declines, in the years following childbirth or separation. Moreover, the number of children, rather than transition to parenthood per se, may affect income. To test this, I include controls for time since first birth, time since divorce, and for the number of further children born (Table A3). The results are similar although, for first births, there is some indication that income may decline further in the years after a first birth. There is no indication of a time trend following separation. Finally, I compare the results for income and poverty with models where income is logged. As the units of measurement differ the coefficients are not directly comparable. Nonetheless, the results in Table A4 show that the estimates and their significance are comparable.

Differences by Race

Finally, there may be differences in the impact of childbirth and separation by race. In Table A5, I report the results for black and white women. Black women typically suffer smaller penalties to motherhood and separation than white women, although birth and separation still have a negative association with income. This is consistent with findings showing that the independent influence of father absence on children's outcomes is smaller for those already facing socioeconomic disadvantage (Fomby & Cherlin, 2007; Cross, 2020).

DISCUSSION

This study presents new evidence on income and poverty penalties to motherhood, and to single motherhood, in the United States. Conceptualising single mother penalties as resulting

from penalties to motherhood and partner absence I move beyond prior studies, which have focussed on the cost of partner absence, to provide a fuller account of the reasons for single mothers' disadvantage. Using 25-years of panel data, I show how labor market penalties to motherhood combine with the cost of partner absence and the increased financial needs associated with raising children to affect economic well-being. My findings show that in the US, the transition to motherhood has as large an impact on single mothers' income as the absence of a married partner. For all families, parenthood is associated with reduced family income, because mothers' earnings fall just as income needs grow. Among those that are married, the composition of income also changes with specialization meaning families become more reliant on male earnings once children are born (Loughran & Zissimopoulos, 2009; Juhn & McCue, 2016, 2017), which heightens women's economic vulnerability should they separate. While divorce is associated with increased maternal earnings (Tamborini, Couch & Reznik, 2015), I find that earnings do not recover to pre-birth levels and only partially catch-up with those of unmarried mothers, whose earnings fell by less after childbirth. One consequence of this is that the income penalties associated with single motherhood are larger for previously married mothers than those who were not married when their first child was born.

Taken together, this study's findings illustrate the importance of prior life course events in determining single mothers' incomes. How mothers fare in the labor market on having children (which is related to their marital status) has an important bearing on their economic well-being should they become single parents. Previous studies have shown that men who become single parents do not face the same poverty penalties as women (Nieuwenhuis & Maldando, 2018) and this is because they do not suffer the same labor market penalties to parenthood (Moullin & Harkness, 2021). Consequently, the absence of a 'male breadwinner' remains a major cause of single mothers' low income (Sigle Rushton & McLanahan,

2002/03). This has important implications for welfare policy, supporting the conclusions of studies suggesting that policies enabling female employment, such as the provision of job-protected family leave or support for childcare, may be more effective for reducing poverty and inequality than social transfers (Förster & Verbist, 2014; Maldonado & Nieuwenhuis, 2015).

While the study exploits high-quality longitudinal data, it has some limitations. First, while using panel data with fixed effects and individual-specific slopes can help deal with many of the selection problems associated with unobservable, time-invariant characteristics, as I describe above, fertility and partnership decisions, and those that influence earnings and income, are highly interdependent. While our estimates account for individual differences in income levels and rates of change of income, issues of endogeneity may remain. For example, unobservable time-variant characteristics may influence the results. While the estimates are informative, as they allow us to observe the relative importance of different life course events in influencing single mothers' incomes, they should not be interpreted as causal. Second, in assessing economic well-being, I only analyzed measures of income and have not to include non-cash benefits, such as the Supplemental Nutrition Assistance Program (SNAP) or Medicaid, that are targeted at lower-income families. The value of these benefits to low-income families is substantial; for example, Hoynes & Rothstein (2016) report that the combined value of SNAP and Medicaid substantially outweigh those from EITC for families with incomes below $25,000. Their exclusion may lead to an overestimation of the cost of single motherhood, and an underestimation of the redistributive role of the state (see also Fox et al, 2015). Third, although I follow new mothers for up to 25 years before and after the first birth, I am not able to examine the consequences of motherhood or single motherhood over a longer period. Nor can I examine changes in income that occur in the very short term, although there is evidence that changes in income in the

months following a first birth may be large and lead to considerable economic insecurity (Stanczyk, 2016). Fourth, small sample sizes mean that I cannot examine differences in the experience of mothers by, for example, education or age at first birth or for cohabitees, or look at changes across cohorts to see how the experience of new mothers has changed. Finally, I am not able to measure the support that fathers provide with childcare, either within couples or single-mother families. Adjusting for fathers' in-kind support is likely to increase the estimated 'cost' of partner absence if fathers in couples are more involved in childrearing.

Overall, this study has highlighted the importance of taking a life course approach to understanding single mother penalties. Looking beyond partnership dissolution to understand how earlier life course events influence women's income and earnings potential provides important insights for policy and research. The results suggest that, if the economic position of single mothers is to improve, policies that focus on maintaining female employment and earnings following childbirth will be critical. Welfare-to-work policies that focus on moving single mothers into work after they have become single parents are likely to be interventions that come too late. The results also show that single motherhood is a leveller - those who were previously married, who were financially better off before single motherhood, see the largest falls in income on becoming single parents. This is in part because married women become more economically dependent following childbirth than unmarried mothers and suggests that marriage provides little income protection against the risk of future divorce.

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Table 1: Household Income Components for Single and Married Women, with and without children (Estimation Sample)

	Single (no or cohabiting partner)				Married			
	Children	% DPI	No Children	% DPI	Children	% DPI	No Children	% DPI
Female earnings	23,691	64%	31,179	65%	30,294	38%	39,453	54%
Male earnings	4,953	13%	2,905	6%	65,856	83%	52,727	72%
Other earnings	5,978	16%	20,868	44%	843	1%	362	0%
Private transfers (alimony, child support, intra-household transfers)	2,388	6%	1,297	3%	1,511	2%	1,145	2%
Pensions and assets	668	2%	2,139	4%	2,094	3%	3,061	4%
Total Market income	37,678	101%	58,388	122%	100,598	126%	96,748	132%
Net tax (welfare-tax)	-512	-1%	-10,717	-22%	-20,887	-26%	-23,575	-32%
Disposable personal income	37,198	100%	47,672	100%	79,711	100%	73,173	100%
Equivalised disposable income	43,336		69,852		81,446		100,936	
Poverty rate (CPS)	26%		8%		3%		1%	
Sample Size	7,315		10,451		12,118		6,743	

Notes: Amounts reported in 2015 US dollars. Cohabiting male partners' earnings are reported for single women. Cross-sectional weights applied.

Table 2: The association of motherhood and separation with family income components (fixed-effect models with individual-specific slopes)

	(1) Earnings		(2)		(3)	(4) Other private income	(5)		(6) Taxes & benefits		(7) (sum of cols. 1-6) Disposable income	
	Women's own		Male Partner		Other HH members	Transfers (alimony, child support)	Pension/assets					
First birth												
First birth, married	-0.257**		0.099**		0.084**	0.008+	0.006		0.045**		-0.014	
	(0.026)		(0.031)		(0.016)	(0.005)	(0.008)		(0.015)		(0.027)	
First birth, single	-0.109*	++	-0.535**	++	0.160**	0.015+	0.014	++	0.170**	++	-0.286**	++
	(0.043)		(0.049)		(0.036)	(0.009)	(0.012)		(0.023)		(0.048)	
Separation												
Divorce/separation	0.115**		-0.780**		0.02	0.068**	-0.008		0.202**		-0.383**	
	(0.041)		(0.080)		(0.025)	(0.012)	(0.010)		(0.029)		(0.049)	
Remarriage												
Marry or re-marry	-0.059*		0.312**		-0.003	0.007	0.012+		-0.075**		0.194**	
	(0.026)		(0.048)		(0.018)	(0.009)	(0.007)		(0.022)		(0.035)	
Other												
Coreside, with parents	-0.212**		-0.103**		1.312**	0.004	0.073**		-0.199**		0.876**	
	(0.018)		(0.023)		(0.048)	(0.005)	(0.012)		(0.019)		(0.038)	
Coreside, other	-0.288**		-0.072**		0.639**	-0.012+	0.055*		-0.026		0.295**	
	(0.028)		(0.024)		(0.080)	(0.007)	(0.028)		(0.028)		(0.064)	
Total effect of single motherhood												
Married at birth	-0.142**		-0.681**		0.104**	0.076**	-0.002		0.247**		-.397**	
	(0.049)		(0.086)		(0.030)	(0.013)	(0.013)		(0.033)		(0.056)	
Single at birth	-0.109*	++	-0.535**	++	0.160**	0.015+	0.014	++	0.170**	++	-0.286**	++
	(0.043)		(0.049)		(0.036)	(0.009)	(0.012)		(0.023)		(0.048)	
Sample Size	35,037											

Note: Dependent variables are normalized income with respect to mean equivalised income for a family of 4; coefficients are interpreted as the percentage change in the dependent variable as a proportion of mean equivalised income. Single women are defined as women who are unpartnered of cohabiting. Male partners' earnings are the earnings of married or cohabiting male partners and may therefore take on positive values for single women. For women without a partner in the household, partner earnings are zero. The total effect of single motherhood is found by summing together the coefficients on the 'birth' and 'divorce/separation' for those that are married or separate. Controls are also included for age and age squared; single no kids and cohabiting no kids (base is married couple no kids). Observations for the year of birth are excluded. Standard errors in parentheses, + p<0.10, * p<0.05, ** p<0.01. ++ denotes significant differences between the coefficients for single and married mothers. Longitudinal weights applied.

Table 3: The association of motherhood and separation with equivalised income and poverty (fixed-effect models with individual-specific slopes)

	Eq DPI		Poverty	
First birth				
First birth, married	-0.410**		0.018*	
	(0.032)		(0.008)	
First birth, single	-0.504**	++	0.107**	++
	(0.057)		(0.027)	
Separation				
Divorce/separation	-0.272**		0.043*	
	(0.048)		(0.019)	
Remarriage				
Marry or re-marry	0.128**		-0.057**	
	(0.040)		(0.021)	
Other				
Coreside, with parents	0.545**		-0.051**	
	(0.036)		(0.012)	
Coreside, other	0.056		-0.022	
	(0.062)		(0.037)	
Total effect of single motherhood				
Married at birth	-0.682**		0.061**	
	(0.058)		(0.021)	
Single at birth	-0.504**	++	0.107**	++
	(0.057)		(0.027)	
Sample Size	35,037			

Notes: As Table 2. Standard errors in parentheses, + p<0.10, * p<0.05, ** p<0.01. ++ denotes significant differences between the coefficients for single and married mothers.

Table 4: Fixed-effect model of changes in employment and working hours of mothers and fathers and changes in earnings shares

	All women				**Married Couples**	
	Women		Male partners		All married couples	
Birth	Employed	Annual hours	Employed	Annual hours	Male earnings share	Female earnings share
First birth, married	-0.180**	-719**	-.021**	18	0.170**	-0.207**
	(0.011)	(25)	(0.008)	(24)	(0.012)	(0.011)
First birth, single	-0.091**	-352**	-0.549**	-1231**	-	-
	(0.020)	43	(0.019)	(48)		
Separation						
Divorce / separation	0.134**	396**	-0.658**	-1501**	-	-
	(0.018)	(41)	(0.017)	(43)		
Sample size	28,399				10,633	

Note: For all women, male partners include husbands and cohabiting partners and, for those who are unpartnered, partners' employment status and hours are coded as zero. Female and male earnings shares are expressed as a proportion of disposable income (before adjusting for needs) and models run on married couples only. Standard errors in parentheses, + p<0.10, * p<0.05, ** p<0.01. Controls as Table 2. Observations in the year of first birth are excluded. All other notes as Table 2.

Table 5: Cross-sectional, individual fixed effect and individual fixed effect with slopes

	Income			CPS Poverty		
	Cross-section	FE	FEIS	Cross-section	FE	FEIS
Birth						
Birth, married	-0.421**	-.430**	-0.410**	0.023**	0.027**	0.018**
	(0.035)	(0.019)	(0.032)	(0.006)	(0.006)	(0.008)
Birth, single	-0.755**	-0.609**	-0.504**	0.168**	0.109**	0.107**
	(0.036)	(0.031)	(0.057)	(0.014)	(0.016)	(0.027)
Separation						
Divorce / separation	-0.375**	-0.237**	-0.272**	0.082**	0.051**	0.043**
	(0.038)	(0.027)	(0.048)	(0.014)	(0.013)	(0.019)
Sample Size	26,755					

Notes: as Table 2. Cross-sectional models include the same controls as the FE models plus controls for education (high, middle, low) and race (black, white, other). Models are run on the same samples as the FEIS models in Table 2. Cross-sectional and longitudinal weights applied as appropriate.

Table A1: Characteristics of the estimation sample

	Mothers, first birth while		No Children	
	Single	Married	Single	Married
Age	31	37	30	33
Age at first birth	22	28	-	-
Share under 25 at first birth	79%	25%	-	-
Share over 35 at first birth	2%	11%	-	-
Education				
More than high school	42%	71%	64%	68%
High school	42%	24%	29%	28%
Less than high school	16%	5%	7%	4%
Demographics				
Number of children	1.9	1.7	-	-
Age oldest child	9.2	9.2	-	-
Live with parents	10%	0%	27%	0%
Live with other adults (excl partner)	1%	0%	2%	0%
Divorce/separate (parents only)	0%	20%	-	-
Share who marry / remarry (parents only)	7%	8%	-	-
Employment				
Female employed	78%	79%	85%	92%
Female work hours (annual)	1,332	1,277	1,626	1,777
Male partner employed	37%	83%	7%	92%
Male work hours (annual)	821	1,891	148	2,084
Of those partnered or re-partnered:				
Male partner employed *	93%	96%	100%	92%
Male work hours (annual)*	2,099	2,186	2335%	2,084
Number of observations	7,754	6,618	10,492	3,535

Notes: data is pooled for all waves. Single includes all those who are unmarried, including cohabitees. Cross-sectional weights applied.* denotes those with a partner, married or cohabiting, including those who re-partnered.

Table A2: Results from fixed-effect models with individual slopes under different sample inclusion rules and with longitudinal weights

	1. Original sample (over 18, excluding students)	2. All age 22 or over	3. Original sample plus students	4. All those observed eight times or more
Income				
First birth, married mother	-0.410**	-0.461**	-0.411**	-0.442**
	(0.032)	-0.036	-0.031	-0.037
First birth, single mother	-0.504**	-0.606**	-0.524**	-0.532**
	(0.057)	-0.082	-0.031	-0.076
Separate or Divorce	-0.272**	-0.345**	-.286**	-0.278**
	(0.048)	(0.054)	(0.049)	(0.053)
Poverty				
First birth, married mother	0.018*	0.017*	0.019**	0.022**
	(0.008)	-0.008	-0.006	-0.008
First birth, single mother	0.107**	0.103**	0.102**	0.116**
	(0.027)	-0.036	-0.021	-0.032
Separate or Divorce	0.043*	0.03	0.067**	0.042*
	(0.019)	(0.019)	(0.018)	(0.021)
Sample Size	28,396	25,759	30776	17,976

Notes: as Table 2.

Table A3: Fixed-effect models with individual slopes and controls for time since first birth, number of additional births, and time since separation

	Equivalised DPI		CPS Poverty	
Birth				
Birth, married	-0.410**	-0.400**	0.018*	0.019**
	(0.032)	(0.033)	(0.008)	(0.008)
Birth, single	-0.504**	-0.474**	0.107**	0.102**
	(0.057)	(0.056)	(0.027)	(0.027)
Years since first birth		-0.027**		0.006*
		(0.008)		(0.003)
Number of additional children born		-0.098**		0.021**
		(0.011)		(0.005)
Separation				
Divorce / separation	-0.272**	-0.252**	0.043*	0.051**
	(0.048)	(0.053)	(0.019)	(0.020)
Time since divorce/separation		-0.005		-0.001
		(0.007)		(0.002)

Notes: As Table 2.

Table A4: The association between the birth of a first child and partner absence on family income and the risk of poverty, *logged income models* (fixed-effect with individual-specific slopes)

	Log equivalised DPI	
Total single mother penalty		
Divorced / Separ	-0.593	**
	(0.049)	
%	-44.7%	
Single at birth	-0.469	**
	(0.037)	
%	-37.4%	
Birth		
Birth, married	-0.266	**
	(0.021)	
%	*-23.4%*	
Birth, single	-0.494	**
	(0.060)	
%	*-39.0%*	
Separation		
Separate, marriag	-0.327	**
	(0.044)	
%	*-27.9%*	
Marriage		
Marry/re-marry	0.193	**
	(0.045)	
%	*21.3%*	
Sample size	28,399	

Notes: Robust standard errors in parentheses, percentage effect in italics. Significance levels: +<.10, *p<.05, ** p<.01. Poverty risks are estimated using linear probability models. All models also control for age (quadratic), interview year, being single without children, and cohabiting without children. Longitudinal weights are applied. 'Single' includes those without a partner and those who are cohabiting. For single women, partners earnings include those of cohabiting partners.

Table A5: The association between children, separation and income and poverty in the US, black and white women (FEIS models)

	Equivalised DPI			CPS Poverty		
	White	Black	diff	White	Black	diff
Birth						
Birth, married	-0.459**	-.176+	0.283**	0.019**	-0.028	-0.047
	(0.035)	(0.096)	(0.102)	(0.009)	(0.042)	(0.043)
Birth, single	-0.591**	-0.593**	-0.002	0.06	0.066	0.006
	(0.106)	(0.152)	(0.185)	(0.048)	(0.071)	(0.086)
Separation						
Divorce/ separate	-0.341**	-0.07	0.271**	0.051**	0.05	-0.001
	(0.055)	(0.107)	(0.120)	(0.020)	(0.097)	(0.099)
	13,514			7,557		

Notes as Table 2.