



*Citation for published version:*

Harkness, SE 2016, 'The effect of motherhood and lone motherhood on the employment and earnings of british women: a lifecycle approach', *European Sociological Review*, vol. 32, no. 6, pp. 850-863.  
<https://doi.org/10.1093/esr/jcw042>

*DOI:*

[10.1093/esr/jcw042](https://doi.org/10.1093/esr/jcw042)

*Publication date:*

2016

*Document Version*

Peer reviewed version

[Link to publication](#)

This is a pre-copyedited, author-produced version of an article accepted for publication in *European Sociological Review* following peer review. The version of record Harkness, S. E. (2016) *The Effect of Motherhood and Lone Motherhood on the Employment and Earnings of British Women: A Lifecycle Approach*. *European Sociological Review*, 32(6) is available online at: [10.1093/esr/jcw042](https://doi.org/10.1093/esr/jcw042)

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# **The Effect of Motherhood and Lone Motherhood on the Employment and Earnings of British Women: A Lifecycle Approach**

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## **Abstract**

This article examines the effect of becoming a first-time mother and subsequent, or concurrent, transitions to lone parenthood on women's employment and wages. Using longitudinal British Household Panel Survey data and fixed-effect models we find the arrival of a first child to have a substantial effect on employment and wages (n=1,133 individuals; 13,369 observations). Employment rates fall 20 percentage points (ppt), and full-time employment 44-ppt, following a first child's birth and do not recover with time. Mothers that remain in work also see a sharp drop in the rate of wage growth following childbirth. Yet, in spite of predictions that lone mothers may face greater difficulties combining work and childcare, and therefore suffer greater labour market penalties than mothers with partners, we find little evidence of additional penalties to lone motherhood. There is some evidence of heterogeneity in the relationship between motherhood and employment outcomes by education. Overall we conclude that addressing the problems of low employment and earnings among British lone mothers will require policymakers to deal with the high economic cost of motherhood.

Acknowledgements: This work was supported by ESRC Grant Number ES/K003984/1.

It is well known that motherhood has a substantial influence on women's employment and earnings (Harkness & Waldfogel, 2003; Budig & England, 2001), with wide variations by education and class (Korpi, Ferrarini & Englund, 2013). Far fewer studies have looked at whether there are differences between lone and partnered mothers. Whether the weak labour market position of British lone mothers is a consequence of lone motherhood *per se*, or whether they fare similarly to other comparable mothers, is therefore unknown. With 44% of British children expected to experience lone parenthood by age 16 (DWP, 2014) this is an important but neglected question.

The paper differs from previous studies on mothers' employment and earnings in the following ways. First, by following women over a long period of time we are able to see how employment and earnings trajectories are influenced by the transition to motherhood and subsequent (or concurrent) transitions to lone motherhood. Conventional fixed-effect models assume changes in parenthood or partnership status lead to discrete shifts in the probability of work or wages. We let demographic events influence both intercepts and growth rates, allowing us to see whether women's employment and earnings recover or deteriorate with time and to examine the joint effect of motherhood and lone motherhood on employment outcomes.

Second, we distinguish between those becoming lone mothers as a result of a first birth while single and those becoming lone mothers as a result of separation. Previous studies have looked at how partnership dissolution influences mothers' labour market outcomes (Uunk, 2004). However, 40% of children experiencing lone parenthood are born to lone mothers (Harkness, Gregg & Salgado, 2016) and this group has received little attention in the literature.

Third, we examine variations by education and age at first birth. Motherhood may affect labour market outcomes of high and low-educated mothers, or younger and older mothers, in different ways. This is important as, if there are systematic differences in the characteristics of lone and partnered mothers, the influence of partnership status on employment and earnings may be confounded with differences in education and age at first birth.

The following section briefly reviews the literature on motherhood and employment outcomes, setting out the reasons there may be differences by partnership status, and outlining the influence of institutional context. We then describe the UK context and review our data and methods before presenting the results. Earnings in the UK are found to deteriorate sharply in the years following a first birth. While we highlight some differences between lone and partnered mothers, to a large extent lone mothers are found to follow similar trajectories to otherwise similar women. We conclude by contrasting our results with those from other studies and discussing the implications for policy and future research.

## LITERATURE REVIEW

### *Motherhood, Employment and Earnings*

An extensive literature sets out reasons women disproportionately bear the labour market cost of raising children. Neo-classical economic theory suggests that, from the moment a child is born, women face disadvantages which accumulate with time. Following a first birth women often exit the labour market and, in a competitive market, even short absences from work are associated with depreciating human capital and falling relative wages. Mothers unable to return to the same job face large penalties as job specific human capital is lost (Waldfogel, 1997; Anderson, Binder & Krause, 2002). Being outside the labour market also affects job search, as those not in work do not have the same knowledge of, or access to, opportunities as those searching while employed (Blau & Robbins, 1990). At the same time, the burden of caring for children may reduce actual or perceived worker productivity and effort and even women returning full-time may see their relative earnings fall (Becker, 1985). Experimental studies further show employers discriminate against mothers when hiring (Correll, Benard & Paik, 2007). While in a perfectly competitive market discrimination should not persist in the long-run, if employers have a 'taste' for discrimination (Becker, 1957), or there is imperfect information (Arrow, 1973), discrimination may remain.

While competitive pressures reduce women's labour market opportunities, women's deteriorating labour market position may be reinforced by the choices and constraints they face following childbirth. Social norms dictate the division of household labour and, even when working full-time, women typically remain responsible for childcare (Harkness, 2008). To accommodate pressures of child-rearing women may choose to swap high-paying jobs for those with family-friendly working conditions, which are closer to home or have shorter hours or flexible working conditions (Budig & England, 2001). Even where mothers do not actively seek-out opportunities for more family-friendly working conditions, their careers may stall if the pool of jobs available to them shrinks because they are less geographically mobile or their working hours are constrained by childcare. Women often drop career-related ties following childbirth (Munch, Miller & Smith-Lovin, 1997), limiting opportunities for progression and reducing bargaining power with existing and prospective employers. Employers may further exploit mothers' constrained opportunities, acting as monopsony buyers and squeezing wages further (Manning, 2003).

Women exhibit considerable heterogeneity in their preferences for paid work and family care (Hakim, 2000), influencing the choices they make. More gender egalitarian attitudes, for example, are associated with a less gendered division of paid and unpaid work following a first birth (Schober, 2011). However, women's autonomy to actively take decisions about their participation in paid and unpaid work is limited by institutions. As Schober notes, UK family policy has allowed women 'to follow their attitudes or historically embedded gender norms, which maintain that mother care is best for young children' (p83). On the other hand, the options of career-orientated women may be more limited, as earnings may not be sufficient to meet high childcare costs.

Consequently, competitive labour market pressures, social norms which influence mothers' labour market choices, and institutional constraints mean that the arrival of children may lead to a persistent decline in wage growth, further reducing mothers' incentives to remain in the labour market. Where poor wage opportunities coincide with high childcare costs, or

rapid rates of withdrawal of means-tested benefits, employment rates fall further (Gornick & Jäntti, 2010).

### *Lone and Partnered Mothers*

The presence of a partner may have a substantial influence on mothers' employment and earnings trajectories. First, among couples, high costs of childcare alongside gender pay differences may encourage specialisation (Becker, 1981). This will be reinforced if men receive pay premiums for marriage or fatherhood (Killewald & Gough, 2013), as mothers are discouraged from working as household income rises (Verbakel & de Graaf, 2009). Second, if households aim to optimise household income, optimal household decisions may be sub-optimal for individuals' careers. Where women are younger or less well-paid than their partners, men's careers may be prioritised. Evidence shows that wage gains to employer changes are lower for married women (Fuller, 2008), while among couples who both voluntarily change jobs women's earnings typically fall while men's earnings grow (Dwyer, 2004). In spite of the constraints imposed by partnership on women's careers, partnership may also offer women greater choice, allowing those that are home-orientated to spend more time with their children.

Lone mothers are likely to face a greater economic imperative to work than partnered mothers, increasing labour supply and work effort. However high rates of welfare dependency reduce lone mothers' agency and, although the stigma associated with claiming out-of-work benefits discourages British lone mothers from staying at home, high childcare costs and means-tested in-work support encourages part-time work which limits opportunities for career development. The absence of a partner to share childcare with may further dis-incentivise work effort, putting working lone mothers at a disadvantage relative to partnered mothers (Budig & England, 2001). There may also be differences between lone mothers according to their route of entry into lone motherhood. Those becoming lone mothers as a result of a first birth, because they have no expectation of sharing a partner's income, may be more inclined to retain their

labour market position after childbirth. The effect on employment and earnings may therefore be smaller than that for mothers with partners at the time of birth, particularly if the tax and benefit system provides clear financial incentives to work. Previously partnered mothers may fare less well if they reduced their participation in the expectation of being supported by a partner. On the other hand, as they are more likely to retain contact with the child's father they may be better able to negotiate help with childcare.

### *Education and Age*

If lone mothers are less well-educated or younger at the time of birth than those with partners, and labour market penalties to motherhood vary by education and age at birth, these differences, rather than lone parenthood *per se*, may drive observed differences between lone and partnered mothers. For all mothers, because age-earnings profiles differ by education, there may be variations in the effect of age-at-first-birth on earnings by education (Heckman, Lochner & Todd, 2003). For the low-educated age-earnings profiles are relatively flat, peaking when women are in their 20s; for the higher-educated earnings rise with age, growing until women reach their late-30s. Children's arrival flattens earnings growth, meaning the cost to children is not only likely to be greater for more educated women but also higher the younger they are at the time of first birth (Wilde, Batchelder & Elwood, 2010).

### *Institutional Context*

A country's institutional context shapes the employment and earnings opportunities of mothers. Key policies supporting families are: (i) *reconciliation policies* which help parents reconcile work and family life, including maternity and family leave and state support for childcare; and (ii) direct *financial support* for families with children through the tax and benefit system. While direct financial support is associated with lower levels of maternal employment and income (Todd & Sullivan, 2002), reconciliation policies tend to support female employment (Gornick, Meyers & Ross, 1998). However, long maternity leave may reinforce gendered divisions of labour and provide normative signals about women's caring role (Hook, 2010).

Women returning to work often return part-time, allowing them to work while retaining primary responsibility for care. Among couples, this "one-and-a-half earner" family [...] characterizes labor market behavior in the majority of European countries' (Lewis, 2001: pp154). Yet part-time work remains substantively different to full-time work, associated with occupational downgrading and poor promotion prospects (Manning & Petrongolo, 2008) with few women using it as a stepping-stone back to full-time employment (Blank, 1994; Francesconi & Gosling, 2005). As a choice, it is therefore closer to non-employment than full-time work for most mothers. The state's provision of a safety net also has a profound influence on the employment decisions and earnings of low-income women, as generous out-of-work benefits and high rates of benefit withdrawal limit incentives.

#### THE UK CONTEXT

The UK's liberal welfare state provides highly targeted means-tested support for low-income families but few universal benefits and limited support for reconciliation policies. As a result, women face weak work incentives when their children are young, with long lasting implications for wages and employment. For all mothers, paid maternity leave gives women the right to return to the same employer. However, financial support for new mothers is much less generous than in many other developed countries (Ray, Gornick & Schmitt, 2008), reinforcing gendered divisions of labour at home (Boeckmann, Misra & Budig, 2013). Childcare costs are among the highest in Europe (Cooke, 2011), further limiting work incentives for mothers with young children. While subsidised part-time, part-year care for 3 and 4-year olds was rolled-out from 2000, potentially easing childcare constraints, this has done little to boost employment (Brewer et. al. 2014).

Recent decades saw partnered mothers' employment rates increase. However, mothers frequently work part-time with the 'full-time male breadwinner/part-time female carer' model widely accepted as best for children: the 2012 British Social Attitudes Survey, for example, reports that just 4% of the population believe it is desirable for both the mother and father of a pre-school child to work full-time. The expansion of part-time employment has been facilitated



by a range of policies aimed at aiding the reconciliation of work and family-life, and improving conditions for part-time workers (e.g. EU Directive on Part-time work, 1997; Right to Request Flexible Working, 2003). Low-income mothers have also been encouraged to work part-time, with entitlements to earnings supplements dependent on part-time work. Such part-time maternal employment presumes mother's economic dependence on a partner or the state, and places lone mothers at risk of poverty (Pfau-Effenger, 2007).

For lone mothers, dependence on means-tested support profoundly affects their employment decisions. In 1995 lone mothers' employment rates stood at just 42%, 24-ppt lower than for partnered mothers (Gregg & Harkness, 2003). Around 90% of lone-parent families received means-tested support (Brewer & Shaw, 2006). A series of welfare reforms, encouraging lone mothers to work, were introduced between 1999 and 2008, with tax credits rolled-out and financial support for childcare extended, substantially improving lone mothers' incentives to work. Since 1999, lone-mothers have had clear incentives to work a minimum 16-hour week and employment rates have risen (Gregg, Harkness & Smith, 2009). However, high marginal tax rates continued to limit incentives to increase hours or earnings (Brewer, 2003) and the design of the benefit system was believed to continue to contribute to the comparatively low employment rates of British lone mothers (OECD, 2014).

## METHODS AND DATA

### *Data Description*

Using eighteen waves of data from the British Household Panel Survey (BHPS) from 1991 to 2008 we trace individuals over time. As we are concerned with the effect of transitions to motherhood and lone motherhood on labour market outcomes we only include those observed to become first-time mothers. Over-55s are excluded as employment decisions may be affected by retirement. The final working sample includes 1,133 individuals who become first-time mothers and 290 becoming lone mothers. Around half become lone mothers as a result of a first birth while single and the rest as a result of separation. Mothers are observed for 4-to-5 years on average prior to a first birth and for 9-to-11 years after. Lone mothers are observed an

average of 9-years after becoming a lone mother. Appendix Table A1 reports descriptive statistics for all mothers in the BHPS sample and the sub-sample used in our analysis. It shows that, as expected, our working sample is, on average, slightly younger than the full sample but otherwise similar. The table confirms that lone mothers are typically less well-educated, younger at the time of first birth, less likely to be homeowners and more likely to live with their own parents than partnered mothers. Birth lone mothers have particularly low levels of human capital.

### *Empirical Specification*

We use fixed-effect (FE) models to identify the separate effects of becoming a first-time mother, and a lone mother, on women's labour market outcomes. Using an empirical specification similar to that of Loughran and Zissimopoulos (2009), we allow the effect of children and lone parenthood to vary with time since first birth. The models take the form:

$$LM_{it} = X_{it} \alpha + Child_{it} \beta + YChild_{it} \gamma + LP_{it} \delta + YLP_{it} \eta + Repartner_{it} \theta + Treat_{it} \kappa + \sigma_i + \varphi_t + \varepsilon_{it} \quad (1)$$

$LM_{it}$  is the labour market outcome of interest of individual 'i' at time 't'. For employment and full-time work results from a linear probability model (LPM) are reported. This is preferred to the fixed-effect logit model, which discards all observations where labour market status does not vary. A dummy variable,  $Child_{it}$ , is equal to 1 if the individual has dependent children at time t and 0 if not.  $YChild_{it}$  measures the number of years individual i has been observed to have dependent children at time t.  $LP_{it}$  is a lone parent dummy variable. It continues to be coded 1 if the women re-partners with a further dummy variable included for re-partnering (indicating the extent to which re-partnering offsets losses associated with lone parenthood). The variable  $YLP_{it}$  counts the number of years an individual has been observed since becoming a lone parent. As we do not expect losses to continue accumulating after re-partnering this variable stops counting once the episode of lone parenthood ceases.

As the policy environment for lone parents changed in 1999 we allow the association between lone parenthood and employment to vary before and after welfare reform (wages are

not expected to be affected). The variable  $Treat_{it}$  interacts the lone parent dummy ( $LP_{it}$ ) with a dummy variable equal to one after 1999. This term allows the intercept on lone parenthood to differ in the pre- and post-welfare reform period and is akin to the difference-in-difference methodology used in the welfare reform literature where reforms are assumed not to affect single childless women or partnered mothers (Gregg, Harkness & Smith, 2009). An interaction term allowing  $YLP_{it}$  to vary before and after welfare reform was not statistically significant and is not included in the final model.  $X_{it}$  is a vector including demographic and other controls described below. To deal with potential problems of unobserved heterogeneity, and to account for wage growth over time, individual ( $\sigma_i$ ) and year ( $\varphi_t$ ) specific fixed-effects are included.  $\varepsilon_{it}$  is an error term.

Initial models group all those experiencing lone motherhood together, and estimates FE and LPM models. This gives a sense of the importance of sorting on unobservable characteristics. We then estimate two variations of the model. First, we allow the effect of lone motherhood to vary for those becoming lone mothers by separation and those becoming lone parents by birth.

$$LM_{it} = X_{it} \alpha + Child_{it} \beta + YChild_{it} \gamma + BLP_{it} \delta + YBLP_{it} \eta + SLP_{it} \phi + YSLP_{it} \rho + Repartner_{it} \theta + Treat_{it} \kappa + \sigma_i + \varphi_t + \varepsilon_{it} \quad (2)$$

$BLP_{it}$  and  $SLP_{it}$  denote being a birth lone mother and separated lone mother respectively, and  $YBLP_{it}$  and  $YSLP_{it}$  the time since birth or separation.

Second, we allow the effect of motherhood and lone motherhood to vary by level of education and age at first birth. Separate regressions are run for high and low-educated women, with interaction terms included, allowing the effect of motherhood and lone-motherhood to vary for younger (under-25 at first birth) and older mothers.

$$LM_{it} = X_{it} \alpha + Child_{it} \beta + YChild_{it} \gamma + LP_{it} \delta + YLP_{it} \eta + U25 * Child_{it} \zeta + U25 * YChild_{it} \tau + U25 * LP_{it} \rho + U25 * YLP_{it} \nu + Repartner_{it} \theta + Treat_{it} \kappa + U25 * Treat_{it} \xi + \sigma_i + \varphi_t + \varepsilon_{it} \quad (3)$$

U25 is a dummy variable denoting being under-25 at the time of first birth.

Throughout robust standard errors are reported and longitudinal weights are used. Nonetheless non-random attrition remains a potential concern. A second concern is that FE models do not deal with time-variant unobserved heterogeneity. If preferences change following childbirth, and if these changes are not random, selectivity bias may remain. Dynamic selectivity corrected models are not estimated here as estimates are highly sensitive to the choice of estimator and instrument (Dustmann and Rochina-Barrachina, 2007; Machado, 2012).

#### *Dependent and Explanatory Variables*

Dependent variables are the probability of being in employment; working full-time (over 30-hours a week, *vis-a-vis* not-working or working part-time); and gross hourly wages. Full-time work is considered separately to part-time work because, as discussed above, it differs substantively. The BHPS collects information on usual hours of work and pay. Those on maternity leave are defined as employed. Wages are deflated to January 2010 prices. We define lone mothers as those not observed co-residing with a partner. The vector  $X_{it}$  includes demographic and other controls. Employment models control for number of additional children and having a pre-school child (under-5), both of which are associated with increased opportunity cost of working. The wage equations also include the number of additional children, as those with more children are likely to have had more career interruptions. Work experience is expected to directly influence wages and indirectly influence employment (though potential earnings). A quadratic in years of potential work experience (age minus age-left-school) is included as there are a large number of missing values for actual work experience in later waves of the BHPS.<sup>1</sup> Wage equations include a dummy variable for full-time work. Twelve regional dummies pick-up differences in labour demand and other local factors. OLS and LPM models include the same set of controls as the FE models, as well as controls for highest educational attainment (degree, A-level, GCSE or equivalent and below GCSE). The final models examine variations by education and age at first birth. Given small sample sizes we look at just two

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<sup>1</sup> Mare (2015) reports a fall in complete work history data from 90% of the sample in the first four waves to 80% in 2002 and 61% in 2008.

categories of educational attainment (high: A-level or above; low: below A-level) and age (under and over-25).

## RESULTS

Table 1 reports mean values for employment (all and full-time), usual work hours and hourly pay. Employment rates and hours of work are lower once children arrive with those for lone mothers being particularly low. Table 2 reports regression results for: (i) employment, (ii) full-time work, (iii) log hourly wages (all workers) and (iv) log wages (full-time workers). FE models show a first birth is associated with a 20-ppt fall in employment and no recovery over time. Full-time employment falls further, by 44-ppt, and continues to decline in the years following birth. Wages also suffer, falling 4% immediately after childbirth and wage growth declining a further 2.8% a year. For those working full-time, the intercept shifts downwards 6% but relative wages deteriorate more slowly with time, falling 0.8% a year.

FE models indicate that five years after a first-birth employment rates are 19-ppt lower and full-time employment rates 49-ppt lower than had no birth not occurred. Relative wages fall 18% for all workers, and 10% for those working full time. Coefficients on a first birth are similar in the LPM/OLS and FE models suggesting, as expected, selection bias is not an issue in this sample.

For lone mothers, selectivity is much more important, the association between lone parenthood and labour market outcomes differing markedly in cross-sectional and FE estimates. While cross-sectional models show lone mothers are substantially less likely to be employed or work full-time, these results are largely driven by sorting on unobservable characteristics. When FEs are included employment shows no significant relationship with lone motherhood and is associated with statistically significant *increases* in full-time employment, of 1-ppt a year, relative to partnered mothers. We find no significant relationship between lone motherhood and wages for all workers. Full-time workers' relative wages deteriorate 1.7% a year.

Results from the OLS/LPM models indicate a positive association between re-partnering and employment and wages, although including FEs leads to much smaller, statistically insignificant effects. This suggests positive selection bias: the characteristics meaning individuals are more likely to work are also associated with re-partnering. Table 2 also reports coefficients on the number of additional children, the presence of a child under-5 and potential experience (quadratic). The FE models show falls in employment and full-time work of 10-ppt per additional child, while having a child under-5 is associated a further 5 to 6-ppt fall. Among those in work, wages deteriorate by 4-5% with each additional child.

#### *Birth and Separating Lone Mothers*

Descriptive statistics suggest large differences in the characteristics of those entering lone motherhood as a result of a first birth and those separating. Table 3 explores whether the route to lone motherhood influences these outcomes. Results from the FE models show becoming a lone mother by separation had little effect on employment both before and after welfare reform. Similarly, becoming a birth lone mother is not associated with a change in the overall employment rate, but is related to a higher probability of working full-time. For both birth and separating lone mothers, relative wages fall with duration of lone parenthood. OLS/LPM estimates differ to the FE estimates, again suggesting larger and more significant relationships than the FE models, and highlighting the importance of accounting for unobservable differences between lone and partnered mothers.

#### *Age at first birth and education*

The earlier discussion suggests there are good reasons to expect children to have a different influence on women's earnings and employment by education. However, there are also substantial educational differences in family status by education, with high-educated women less likely to have children at almost all ages (Figure 1). Differences are particularly stark when women are young, with 50% of low-educated and 20% of the high-educated women having children by 25. Similarly striking are differences in lone motherhood, one-third of low-educated women living as a step or lone-parent by 35 compared to 1-in-5 high-educated women.

Differences in family status are reflected in employment and earnings trajectories (Figure 2). Low-educated women's employment rates are around 60%, with full-time employment rates peaking at around 45% for women in their early-20s before falling to 30% by 35. High-educated women's employment rates are higher, rising until age-25 before plateauing at around 80% while full-time employment rates fall steadily after-25, levelling-off at around 50%. Earnings patterns differ too, with slower wage growth among the less educated and wages peaking earlier.

Table 4 reports FE estimates for high and low-educated women, with interaction terms allowing the coefficients on motherhood and lone motherhood to vary with age. As the number of individuals observed transitioning to lone parenthood by age and education are small, results should be interpreted with caution as estimates are not precise and significant relationships may not be detected. Nonetheless, the results suggest first births are associated with a fall in employment of 28-ppt and 20-ppt for the low- and high-educated respectively. Full-time employment rates fall around 50-ppt. For high-educated women, being under-25 at first birth is associated with further falls in employment, but has no influence on the likelihood of low-educated women working. Relative wages initially decline by 4% to 5% for both high and low educated women. However high-educated mothers see sharper falls in relative wages over time, of 4.4% a year, compared to 1% a year for less-educated mothers.

The influence of lone motherhood on labour market outcomes also shows striking variations by education, particularly prior to welfare reform. For the high-educated, becoming a lone mother was associated with a 25-ppt fall in employment before 1999, but showed no significant association after. For low-educated women, lone motherhood had no influence on the probability of working either before or after welfare reform. Reforms to the welfare system therefore appear to have disproportionately benefitted high-educated lone mothers, for whom the penalties to becoming a lone parent had previously been largest. Finally, lone motherhood is associated with lower wages for low-educated women, relative wage growth falling 1.8%, but has no influence on high-educated lone mothers' earnings.

## DISCUSSION AND CONCLUSION

Our first aim was to see how becoming a first-time mother influences employment and earnings, and whether the transition to lone motherhood alters these outcomes. A first-birth was associated with a 20-ppt fall in employment and 44-ppt fall in full-time work, with no evidence of recovery over time. Using cross-sectional data, Misra, Budig and Moller (2007) report similar results for the UK, showing far larger disparities in full-time employment rates among mothers and those without children than in the US. In this regard, they show that British mothers more closely resemble mothers in other European countries than North America.

Differences between British and American mothers' labour market attachment is important for understanding career development and wage growth (Pettit & Hook, 2009). Our results for wages show that the duration of motherhood matters, wages not only declining 5% following a first birth but penalties continuing to accumulate rapidly, relative wage growth falling a further 3% a year. Few other studies have examined how British mothers' earnings evolve in the years following birth with most studies instead assuming a fixed wage penalty to motherhood. There are a few exceptions: Misra, Budig and Moller (*ibid*), for example, using cross-sectional data report larger wage penalties for mothers with older children in the UK, Luxembourg and Netherlands, but greater penalties to those with young children in Austria, Germany, Canada and the US. Paull's (2006) panel data analysis also suggests slowing wage growth in the UK when children are born or start school. Our findings for the UK contrast sharply with those using US data, where no growth in the pay gap is found in the years following a first birth (Loughran & Zissimopoulos, 2009).

For British lone mothers, while studies show that employment and wage rates fall far below those of otherwise similar partnered mothers (Gregg, Harkness & Smith, 2009; Misra, Budig & Moller, 2007), the results presented here suggest that selection on unobservable characteristics plays a crucial part in explaining these differences. After accounting for FE, we find little evidence that becoming a lone mother is associated with reduced employment or earnings. Our results also differ to standard FE estimates, which suggest smaller wage penalties



to lone motherhood; for example, Gangl and Ziefle's (2009) UK results suggest smaller wage penalties for single mothers than those with partners. Our results show this apparent advantage disappears once duration of parenthood is accounted for. Finally, Loughran and Zissimopoulos find that American women's relative wages decline following separation. Our results for the UK suggest parallels with the US when lone mothers work full-time, relative wages deteriorating an additional 1.7% a year upon becoming a lone mother.

The second aim of the paper was to consider whether the route of entry into lone motherhood was associated with differences in employment outcomes. We found that while route of entry into lone motherhood did not influence the likelihood of working, becoming a lone mother through separation, rather than birth, was associated with larger wage penalties among those working full-time. This chimes with Budig and England's (2001) finding that wage penalties are greater for women with children who divorce or separate than those who never married. They conclude that the effect of marriage on wages is long lasting, and a similar conclusion appears to hold here.

Finally, for both low and high-educated women employment rates fall sharply upon becoming a first-time mother. The transition to lone motherhood has little additional influence on low-educated mothers' employment, but for high-educated women becoming a lone mother was associated with substantial further falls in the probability of working prior to 1999. This deficit disappeared after 1999 and for these women changes in the policy environment have been critical to improving their labour market position.

In sum, the results presented here show that the duration of motherhood matters to the wages and employment of British women, with mothers' labour market position deteriorating in the years following a first birth. In contrast, studies looking at American mothers do not find mothers' labour market position to worsen in the years following birth. While there are few comparable European studies, as in many countries mothers' employment patterns more closely resemble those observed in the UK than in the US, we might expect to see similar results elsewhere.

Cultural and structural constraints in the UK appear to play a particularly important role in curtailing the labour market opportunities of mothers (Schober, 2013). Other authors similarly highlight differences in the labour market experience of American and European mothers, with policy variations pointed to as a reason for these differences. Mandel and Semyonov (2006), for example, argue that policies intended to promote mothers' employment while facilitating work-life balance, which are common in Europe, may have the unintended consequences of compromising women's careers by promoting occupational segregation and employer discrimination. In the US, where fewer provisions for mothers are made, mothers may be less discriminated against, better integrated into the labour market and more able to compete for high-status jobs.

British lone mothers' employment trajectories follow very similar to those of partnered mothers; they are also likely to work part-time although, rather than relying on a partner, they are frequently dependent on the state for means-tested support. Rates of non-employment are also high. While the OECD (2014) attributes this to the generosity of the UK welfare system, our results indicate that, while benefits may help sustain non-employment, they do not drive behaviour. Few lone mothers work full-time and those that do see their relative wages decline. This suggests that lone mothers face greater difficulties in combining families and careers. However, lone mothers are also discouraged from working full-time as a result of economic constraints (including high costs of childcare and steep marginal tax rates) and cultural constraints, while the welfare system allows home-orientated women to follow their preferences and stay at home.

This study has a number of important limitations. First, we observe individuals for an average of 10-years following a first-birth, and 9-years as a lone parent. Mothers' longer-term trajectories are therefore uncertain. However, cross-sectional data suggests that women's relative earnings continue to decline as they grow older and it seems unlikely that their position would show a substantial recovery. A second concern is that women, anticipating the arrival of children or separation, adapt their labour market behaviour. Our results are robust to

conditioning on labour market circumstances one year prior to the events of motherhood and lone motherhood. Third, mothers remaining in continuous full-time employment may face smaller wage penalties (Lundberg & Rose, 2000). Just 30% of mothers in our sample are continuously employed after a first birth (allowing for a one-year maternity break) and fewer than 10% continuously work full-time. As so few women manage to sustain full-time work following childbirth we cannot look at the effect of employment continuity on wages. Fourth, the effect of unmeasured confounders (fixed effects) on labour market outcomes is assumed to remain stable over time. In particular, we do not control for time-variant unobserved heterogeneity. Gangl and Ziefle's (2009) results from dynamic sample-selection do not find the selectivity term to be significant for the UK. Finally, while longitudinal weights are used, non-random attrition may remain a problem. Related studies, looking at partnership dissolution and economic outcomes, offer some reassurance, finding that non-random attrition does not bias results (Jenkins, 2008; Fisher & Low, 2015).

Not-with-standing these limitations, our results shed important light on how women's labour market opportunities evolve following a first birth, and at the influence this has on lone mothers' employment and earnings. While pay differences have been central to the equality agenda for decades, less attention has been paid to employment rates, in spite of a yawning gap in full-time employment rates between men and women. Many women in the UK, including the highly educated, do not maintain full-time employment following the birth of a first child. Partly as a result of this, relative earnings deteriorate rapidly following a first birth, reducing women's economic autonomy and leading to a high risk of poverty among those becoming lone mothers (OECD, 2014).

The UK's welfare system is being reformed, with the introduction of Universal Credit described as the most ambitious and far-reaching reform for over 70-years. Yet the incentives the new system provides are unlikely to improve mothers' financial autonomy: Universal Credit will incentivize lone mothers to work very short hours and weaken incentives for full-time work, while for second-earners partnered to low-earning men work incentives will diminish

(Finch, 2016). The promotion of incentives for longer working hours, through a system of earnings disregards, and the introduction of an additional allowance for second-earners, would provide greater labour market protection for women, while helping those transitioning to lone motherhood maintain economic independence. The continued policy promotion of part-time work has implications for gender equality and women's financial autonomy. As a result, those experiencing lone motherhood look set to remain reliant on means-tested support and at risk of poverty.

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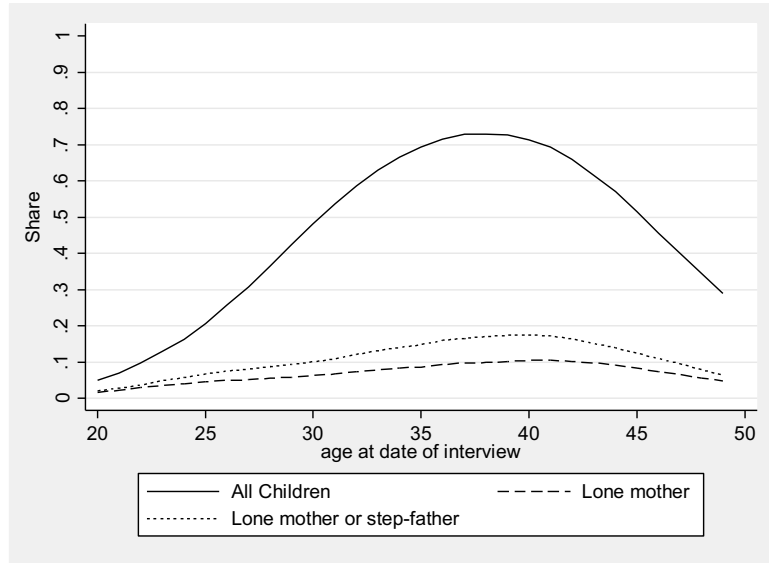
Appendix Table A1: Characteristics of Mothers with Partners and Lone Mothers, Whole Sample and Working Sample (observed prior to having a first child)

	Partnered mothers	Partnered mothers in working sample	Lone mothers	Lone mothers in working sample	Birth lone mothers in working sample	Separating lone mothers, in working sample
Age	36.35	33.65	34.93	30.85	28.31	33.58
Education:						
Degree	0.14	0.22	0.07	0.07	0.09	0.05
A levels	0.25	0.31	0.20	0.22	0.15	0.30
GCSE (A-C)	0.35	0.34	0.36	0.40	0.37	0.44
< GCSE	0.21	0.13	0.37	0,31	0,39	0.21
Age first birth	-	28.91	-	24.76	23.36	26.07
First kid before 25	-	0.20	-	0.57	0.67	0.47
First child over 35	-	0.10	-	0.07	0.06	0.06
No. of children	1.83	1.62	1.66	1.58	1.59	1.56
Age of youngest child	6.02	2.88	7.13	3.88	2.70	5.22
Home owner	0.78	0.84	0.40	0.42	0.32	0.53
Live with parents	0.01	0.01	0.08	0.13	0.20	0.05
Years since first birth	-	9.64	-	10.43	9.84	11.15
Years as a lone mother	-	-	-	8.60	9.81	7.32
Average number years observed	12.49	14.54	11.43	14.19	13.60	14.82
Number of Observations	28,750	7,175	6,995	1,809	931	865
Number of Individuals	4,598	1,036	1,601	290	137	151

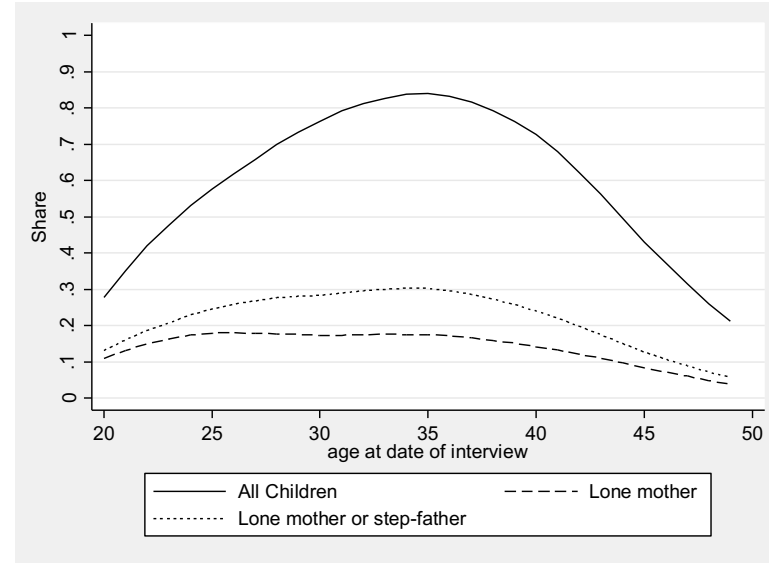
Note: The “working sample” group refers to those who were also observed prior to becoming a first-time parent. Here we report results for number of individuals and observations over periods when women are observed to have had children, as lone or partnered mothers. Note partnered mothers in the working sample may go on to become lone mothers. Lone mother remain classified as lone mothers even if they re-partner. The table reports the average number of years before and after the birth. This does not equate to the number of observations divided by the number of individuals as some individuals do not respond in every wave of the survey.

**Figure 1: Differences in Family Status by Education and Age**

Higher Education (A-levels and Degree)



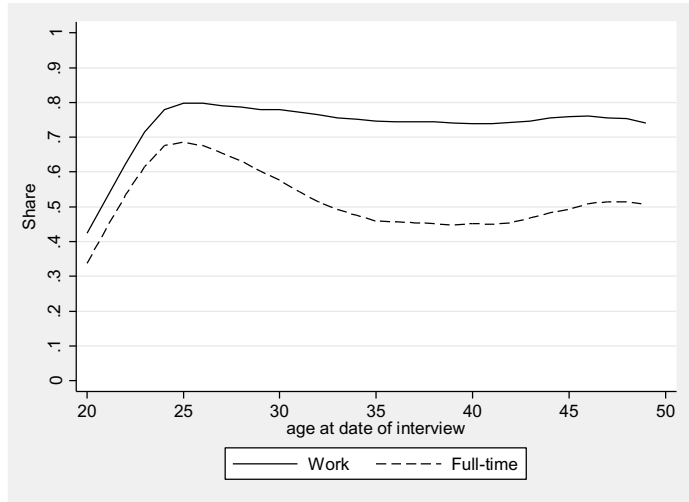
Lower Education (GCSE and below)



Note: Data is for the full BHPS sample.

**Figure 2: Employment, Full-time Employment and Hourly Wages by Education and Age**

**Degree and A-level**



**GCSE and Below**

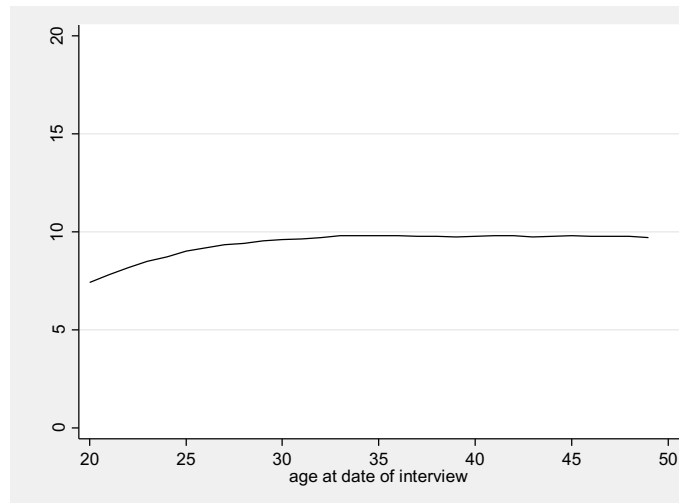
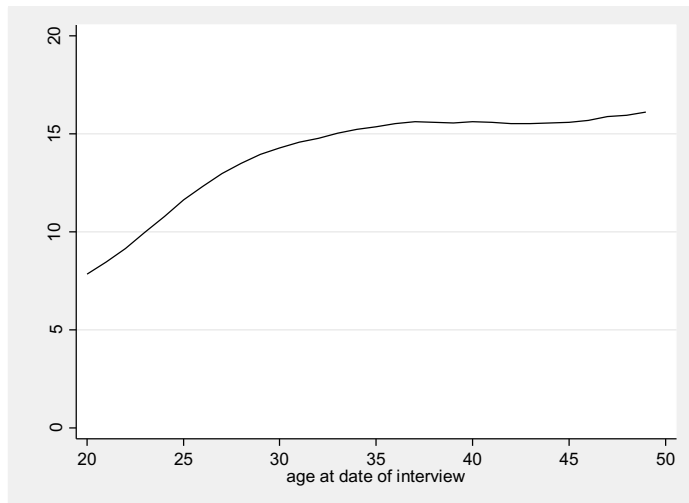
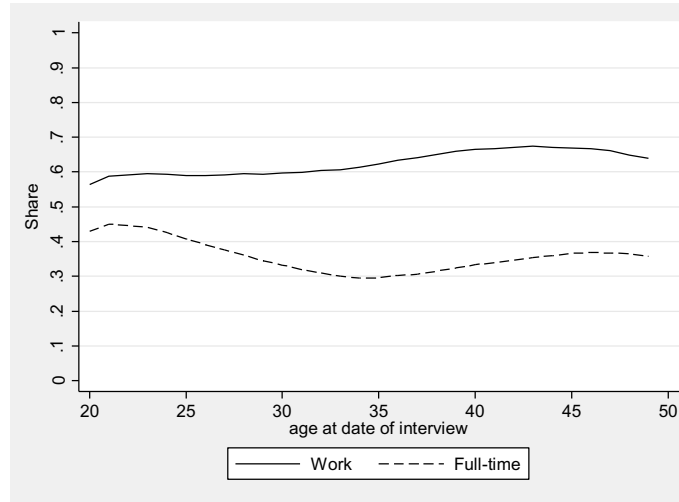


Table 1: Mean Values: Employment, Working Hours, Wages and Earnings for Women before and after a First Birth by Family Status (Sample of all those observed to become parents)

	All	All women, before kids	All women in couples with kids	All lone Mothers	Birth lone mothers	Separated lone mothers
Employed	0.70	0.82	0.66	0.50	0.39	0.62
Full-time (>30 hours)	0.44	0.75	0.26	0.22	0.17	0.25
No. hours normally worked per week (in work)	29.67	35.35	25.06	25.86	25.29	25.93
Gross weekly pay	269.02	268.79	269.02	255.26	198.80	292.39
Hourly wage	12.57	11.58	13.57	10.99	10.09	11.64
Number of Observations	13,369	4,930	7,175	1,809	931	865
Number of individuals	1,133	1,133	1036	290	137	151

Note: Lone mothers include all those observed to become lone parents, including those who repartner. Full-time employment is defined as working more than 30 hours a week with part-time work and non-employment as the base category.

Table 2: OLS and Fixed Effect Models of the Effect of Motherhood and Lone Parenthood on Employment Outcomes and Wages

	Employed		Full-time		Log wage		Log Wage (FT only)	
	LPM	FE	LPM	FE	OLS	FE	OLS	FE
First birth	-0.190** (0.020)	-0.196** (0.018)	-0.419** (0.019)	-0.435** (0.018)	0.064** (0.012)	-0.038** (0.011)	0.021 (0.014)	-0.060** (0.011)
Time since 1 <sup>st</sup> birth	0.012** (0.002)	0.001 (0.003)	-0.005* (0.002)	-0.010** (0.003)	-0.022** (0.002)	-0.028** (0.003)	-0.010** (0.003)	-0.008* (0.003)
Lone parent	-0.196** (0.030)	-0.041 (0.032)	-0.073** (0.024)	0.017 (0.028)	-0.020 (0.023)	0.012 (0.023)	-0.052 (0.033)	-0.033 (0.031)
Lone parent * post 1999	0.125** (0.033)	0.058+ (0.034)	0.078** (0.027)	0.047 (0.029)				
Time since lone parent	-0.014** (0.003)	-0.002 (0.003)	0.004 (0.003)	0.009** (0.003)	-0.014** (0.004)	-0.003 (0.004)	-0.022** (0.005)	-0.017** (0.005)
Re-partner	0.201** (0.037)	0.049 (0.036)	0.090** (0.030)	0.024 (0.031)	0.061* (0.030)	0.024 (0.032)	0.097* (0.038)	0.035 (0.035)
Number of additional children Child <5	-0.138** (0.009)	-0.099** (0.010)	-0.120** (0.008)	-0.107** (0.009)	0.012 (0.011)	-0.036** (0.010)	0.025 (0.017)	-0.049** (0.016)
	-0.067** (0.016)	-0.060** (0.014)	-0.068** (0.015)	-0.048** (0.012)	-	-	-	-
Full-time	-	-	-	-	0.127** (0.010)	0.024* (0.010)	-	-
Potential experience	0.045** (0.002)	0.017 (0.013)	0.037** (0.002)	0.016 (0.014)	0.062** (0.002)	0.049** (0.011)	0.071** (0.003)	0.028* (0.012)
Potential experience squared	-0.001** (0.000)	-0.001** (0.000)	-0.001** (0.000)	-0.001** (0.000)	-0.001** (0.000)	-0.001** (0.000)	-0.001** (0.000)	-0.001** (0.000)
Constant	0.459** (0.029)	0.588** (0.100)	0.499** (0.031)	0.625** (0.104)	1.516** (0.032)	1.773** (0.091)	1.544** (0.033)	1.955** (0.096)
R-Squared	0.168	0.496	0.300	0.578	0.414	0.763	0.469	0.859
No. observations /individuals	13,369 / 1,133		13,201 / 1,133		8,928 / 1,042		5,393 / 925	

Note: All models also control for wave of interview and government region. OLS models also control for education (4 categories). Standard errors in parentheses and clustered at family level; + p<0.10, \* p<0.05, \*\* p<0.01. For full-time employment the base category is part-time work or non-employed.

Table 3: LPM/OLS and Fixed Effect Estimates of the Effect of a First Birth and Becoming a Lone Mother by Birth or Separation on Employment and Wages

	Employed		Full-time		Log wage		FT log wage	
	LPM	FE	LPM	FE	OLS	FE	OLE	FE
<i>Separating Lone Mothers</i>								
Lone Parent	-0.181** (0.059)	-0.032 (0.053)	-0.132** (0.038)	-0.065+ (0.040)	-0.011 (0.027)	0.021 (0.027)	-0.030 (0.042)	-0.033 (0.041)
Lone parent * post 1999	0.186** (0.062)	0.074 (0.057)	0.149** (0.042)	0.097* (0.043)	-	-	-	-
Years as lone parent	-0.014** (0.004)	-0.002 (0.005)	0.005 (0.004)	0.007 (0.004)	-0.005 (0.005)	-0.010 (0.006)	-0.010 (0.006)	-0.024** (0.008)
<i>Birth Lone Mothers</i>								
Lone Parent	-0.231** (0.034)	-0.062 (0.042)	-0.059* (0.028)	0.090* (0.037)	-0.068* (0.034)	0.021 (0.036)	-0.116** (0.042)	-0.005 (0.033)
Lone parent * post 1999	0.042 (0.040)	0.027 (0.046)	0.033 (0.032)	0.033 (0.038)	-	-	-	-
Years as lone parent	-0.009* (0.004)	-0.000 (0.004)	0.003 (0.003)	0.009** (0.004)	-0.015** (0.005)	0.001 (0.004)	-0.024** (0.006)	-0.011* (0.005)
<i>All Mothers</i>								
First child	-0.183** (0.020)	-0.193** (0.018)	-0.417** (0.019)	-0.440** (0.018)	0.067** (0.012)	-0.039** (0.011)	0.026+ (0.014)	-0.062** (0.011)
Years since parent	0.011** (0.002)	0.000 (0.003)	-0.005* (0.002)	-0.009** (0.003)	-0.023** (0.002)	-0.029** (0.003)	-0.011** (0.003)	-0.008* (0.003)
R-Squared	0.155	0.496	0.301	0.578	0.415	0.763	0.469	0.859
Sample Size								
No. observations	13,363	13,363	13,195	13,195	8,923	8,923	5,390	5,390
No. individuals	1,133	1,133	1,133	1,133	1,042	1,042	925	925

Note: Controls are also included for re-partnering, potential experience (quadratic), additional children, presence of a child under 5 (included in employment; full-time employment and hours of work models only), wave of interview and government region. LPM/OLS models control also for education (4 categories). Log wage models for the full sample control for being in full-time work.

Table 4: Fixed-effect Estimates of the Effect of a First Birth and Lone Motherhood on Employment Outcomes and Wages: Differences by Education and Age of First Birth

<i>Education</i>	Work		Full-time		Log wage		FT Log Wage	
	High	Low	High	Low	High	Low	High	Low
First child	-0.200**	-0.277**	-0.476**	-0.541**	-0.039**	-0.048**	-0.063**	-0.035+
(x under 25)	(0.014)	(0.019)	(0.017)	(0.021)	(0.014)	(0.018)	(0.014)	(0.020)
Years since 1 <sup>st</sup> birth	-0.145**	-0.015	-0.016	0.238**	0.082+	0.023	0.006	-0.105*
(x under 25)	(0.048)	(0.032)	(0.051)	(0.030)	(0.043)	(0.035)	(0.042)	(0.044)
Years since 1 <sup>st</sup> birth	0.005	0.021**	-0.011*	-0.012*	-0.044**	-0.010*	-0.011*	0.009
(x under 25)	(0.004)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.005)	(0.006)
	0.014+	-0.008	0.007	0.001	-0.002	-0.008	-0.012	-0.031**
	(0.008)	(0.006)	(0.007)	(0.005)	(0.008)	(0.006)	(0.011)	(0.009)
Lone mother	-0.247**	0.087+	-0.104	0.043	-0.051	0.034	-0.090	-0.024
(x under 25)	(0.068)	(0.045)	(0.072)	(0.043)	(0.048)	(0.036)	(0.069)	(0.048)
Lone mother*	0.078	-0.116*	0.050	-0.089+	0.225*	-0.028	0.275**	0.104
post 1999	(0.104)	(0.055)	(0.100)	(0.052)	(0.090)	(0.056)	(0.095)	(0.069)
(x under 25)	0.228**	0.012	0.133+	0.030				
Years lone Mother	(0.073)	(0.046)	(0.079)	(0.044)				
(x under 25)	-0.005	0.007	0.044	0.006				
	(0.092)	(0.049)	(0.092)	(0.047)				
Years lone Mother	0.008	-0.003	0.002	0.001	0.009	-0.018*	-0.010	-0.027**
(x under 25)	(0.008)	(0.006)	(0.008)	(0.005)	(0.009)	(0.007)	(0.008)	(0.010)
	-0.022	-0.007	-0.005	0.014*	0.017	0.022*	-0.007	0.039**
	(0.014)	(0.008)	(0.013)	(0.007)	(0.015)	(0.010)	(0.019)	(0.013)
Re-partner	0.210**	0.007	0.149*	0.027	0.034	0.030	0.012	0.055
	(0.070)	(0.043)	(0.075)	(0.033)	(0.047)	(0.042)	(0.054)	(0.046)
Number Additional children	-0.143**	-0.090**	-0.142**	-0.088**	0.011	-0.091**	-0.050**	-0.088**
Potential experience	(0.013)	(0.013)	(0.014)	(0.011)	(0.014)	(0.016)	(0.019)	(0.031)
Potential Experience squared	0.009	0.019	0.025	-0.018	0.032*	0.064**	0.026+	0.033
Full-time	(0.017)	(0.022)	(0.019)	(0.021)	(0.014)	(0.020)	(0.015)	(0.021)
	-0.001**	-0.001**	-0.000+	-0.000	-0.001**	-0.001**	-0.001**	-0.002**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
					0.030*	0.001		
					(0.014)	(0.015)		
R-Squared	0.470	0.531	0.573	0.603	0.776	0.657	0.857	0.815
Sample Size								
No. observation	6,873	6,490	6,769	6,426	4,985	3,938	3,206	2,184
No. individuals	604	620	604	620	577	523	533	428

Note: Controls are also included for re-partnering, potential experience (quadratic), additional children, presence of a child under 5 (included in employment; full-time employment and hours of work models only), wave of interview and government region. Standard errors in parentheses and clustered at family level. +<0.10, \*p<0.05, \*\* p<0.01. Sample sizes range from 533-604 high-educated and 428-620 low-educated individuals (3,206-6,873 and 2,184-6,490 observations). Of these 86 high-educated women become lone mothers (1,031 observation) and 32 are under-25 at the time of first birth (314 observations). Among the less-educated, 232 individuals transition to lone parenthood of whom 156 were under-25 (2,406 and 1,377 observations respectively).