Maternal movements to part time employment: what is the penalty?

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Abstract

Nearly 50% of employed women and 60% of employed mothers in Britain work part time, the movement to part time employment commonly occurs following the first childbirth. Part time jobs are often situated in lower occupational groups; therefore a switch to part time employment may reduce career progression opportunities and subsequent earnings. Using waves 1-16 of the British Household Panel Survey this study investigates whether the wage penalty associated with movement to part time employment acts independently of the motherhood pay penalty. Log wage equations indicate that a mother of one child receives a pay penalty of 7%, switching to part time employment increases this penalty to 13%, switching to part time employment and moving down the occupational scale further increases this penalty to 20%. The results provide implications for the structure of family and childcare policy in Britain, and for reducing gender inequality in the labour market.

Keywords: part time, motherhood pay penalty, childbirth

JEL codes: J13, J16, J21.

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1. Introduction

This paper analyses whether there is a negative wage effect associated with the movement to part time employment which acts independently of the motherhood pay penalty. Furthermore, variations in the motherhood wage penalty by employment behaviour over childbirth are examined.

Examination of the negative wage effect of the movement to part time (PT) employment and of the motherhood pay penalty is motivated by Figure 1. The raw data clearly indicates that mothers' hourly pay is lower than that of women's average hourly pay, with a suggestion of a slight reconciliation around ten years after prime childbearing age (around 40 years of age). Furthermore, the hourly pay of female PT workers lies below that of women's average hourly pay throughout the working age years. Recent analysis has confirmed the presence of a large wage penalty associated with female part time employment in the UK (Manning and Petrongolo, 2008; and Connolly and Gregory, 2009). Whilst the pay of full time women has been catching up to that of full time men the pay of part time women still lags behind that of part time men, the gender pay gap in the UK is increasingly becoming characterised as the part time pay penalty.

The part time pay penalty has increased over recent decades, in 1975 there was a 15% pay gap between full and part time women, by 2001 this was 25% (Jaumotte, 2003). Furthermore, the proportion of women participating in part time employment has increased over recent decades, currently just fewer than 50% of all women and 60% of mothers work in part time employment (Office of National Statistics (ONS), 2008). The proportion of the maternal labour force in PT work in Britain is one of the largest in Europe. The only EU country with a higher proportion of part time work amongst the female workforce is the Netherlands where 73% of employed females work part time (European Foundation for the Improvement of Living and Working Conditions, 2007).

A common feature of female part time employment in the UK is the tendency of women to have a spell of part time employment. This spell most commonly occurs around the first childbirth, Paull (2008) shows that 43% of mothers move from full to part time employment over the first childbirth. If it is the case that PT jobs are situated in to lower skill level occupation groups then movement to PT employment will involve a loss of career progression and human capital development opportunities, suggesting a reduction in the wage on movement to PT employment. Given only 11% of working men were in PT employment in 2008, compared to nearly a half of employed women (ONS, 2008), a negative wage effect due to the movement to PT work will stimulate gender inequality in the labour market. By increasing the price of motherhood the negative wage effect of moving to part time employment will have further implication for family inequality in the labour market.

Analysis of the wage penalty due to movement in to part time employment additionally has implications for economic inefficiency in the labour market. If the negative wage effect associated with moving to PT work is a result of occupational downgrading, then women in PT employment may be in occupations below their own skill level, suggesting an under-utilisation of qualifications.

The rest of the paper is structured as follows; section 2 reviews the literature, section 3 discusses the methodology, section 4 outlines the data and the sample used, and section 5 discusses the variables used in the analysis and the descriptive statistics. Section 6 displays the results, which are discussed in section 7 and section 8 concludes.

2. Previous Literature

The analysis in this paper builds on two strands of literature; that concerning the negative wage and occupational effects of switching to PT employment and that concerned with the motherhood pay penalty literature.

Differences in work experience due to childbearing can explain around 60% of the raw motherhood wage gap (Anderson et al, 2002). Similarly continuity in employment (a gap

of less than a year over childbirth) appears to be consistent with no significant wage penalty to motherhood (Lundberg and Rose, 2000 and Joshi et al, 1999). Davies and Pierre (2005) find that motherhood pay penalties in Britain are being driven by younger mothers (those who had their first childbirth before age 25), with older mothers earning no significant pay penalties. Thus an interruption in the career building process seems to be detrimental to pay.

Alternative explanations have suggested that mothers exchange wages for mother-friendly working conditions and better work life balance, or that motherhood pay penalties are a result of gendered work preferences (Gash, 2008). This theory can explain mothers' dominance in low paid sectors and in low paid PT flexible employment. For example, Booth and Van Ours (2009) have found that British women in PT employment are more satisfied with their job in terms of hours worked than are FT women.

For British women the remaining unexplained hourly pay penalties to motherhood (after controlling for human capital, job, household and personal characteristics, and unobserved effects) have been estimated at around 9% to one child and 20% to two or more children (Waldfogel, 1998; Waldfogel, 1995; and Harkness and Waldfogel, 1999). The pay penalties to children in Britain are larger than those found for a large number of other developed countries (Harkness and Waldfogel, 1999; and Davies and Pierre, 2005). The larger penalties observed in the UK have been argued to be a result of the liberal welfare state in the UK which emphasises individual freedom. The child is seen as the responsibility of the family and state provision of day care allowing FT maternal employment are limited (Davies and Pierre, 2005). Lack of adequate child care provision places mothers at a disadvantage relative to those without care responsibilities, this disadvantage is likely to result in lower pay.

The marginalisation of PT employment in the UK is additionally likely to hinder mothers' opportunities in the labour market, (Harkness and Waldfogel, 1999; and Ellingsæter, 1992). The increased propensity for mothers to work PT (Paull, 2008) means that current PT status and PT experience can explain a large portion of the motherhood

wage penalty and gender inequality in the labour market; Davies et al (2000) and Waldfogel (1997) find that current PT status is the largest source of lost earnings for mothers. Waldfogel (1997) shows that years previously spent in PT work additionally have a significant impact on the motherhood wage penalty. Significant pay penalties to PT status and motherhood remain independent, suggesting that working PT nearly doubles the negative wage effect of having one child (Waldfogel, 1995). The current analysis aims to extend this work by illustrating a pay penalty associated with the switch to PT employment which acts independently of motherhood status.

The probability of switching to PT employment appears to be largely predicted by the timing of the first childbirth, 43% of women who were in FT employment before the birth switch to PT employment, however at any employment observation 25% of mothers not having births and 15% of childless women will switch to PT employment, (Paull, 2008). The PT switch is likely to act negatively upon the wage over and above the impact of current PT status via loss of firm specific human capital and interruption of a good job match if this switch is accompanied by a job change (Jovanovic, 1979), and via loss of career building, promotional and human capital development opportunities due to the occupational segregation of part time jobs in the UK (Russo and Hassink, 2005). A reduction in career building and human capital development opportunities will promote a scarring impact on wages (Chalmers and Hill, 2007). Furthermore, the negative wage effect of the low incidence of promotions among PT workers will develop over time as the impact of missed promotion opportunities accumulate, Russo and Hassink (2005). Connolly and Gregory (2009) find that switching to PT employment involves a pay penalty of 7% which persists over time; any switch which is combined with a movement down the occupational scale generates even larger pay penalties. The current analysis extends this work by including controls for motherhood status alongside other job, human capital, personal and household characteristics in the wage equations and therefore investigating whether the negative wage effect of switching to PT employment acts additionally to the motherhood wage penalty.

Loss of career building, promotional and human capital development opportunities consistent with the movement to PT work will mainly be a result of the segregation of PT jobs in to low skill level occupational groups (Hakim, 1998; Polachek, 1987; and Stewart and Greenhalgh, 1984). Blackwell (2001) has found women switching from full to PT work over childbirth are more likely to be in feminised occupations and experience occupational downgrading. Furthermore, Connolly and Gregory (2008) find that at least 14% of women who switch to PT work will be downgraded; this occupational downgrading substantially increases if there is movement between employers (Connolly and Gregory, 2008; Manning and Petrongolo, 2008 and Blackwell, 2001). Manning and Petrongolo (2008) find that employers often are unwilling to allow women to switch to PT hours. Furthermore, Blundell et al (2005) have shown little evidence of hours flexibility within jobs, suggesting that any occupational downgrading effects associated with moving to PT employment will be enhanced due to the increased probability of a job change. These results highlight the marginalisation of PT employment in the UK and suggest that PT employment will be damaging to career progression. The second part of the analysis in this paper therefore investigates how the motherhood pay penalty changes by employment behaviour over childbirth; the post-childbirth wages of mothers who remained in FT employment over childbirth are compared to the wages of those who switched from FT to PT employment over childbirth.

3. Methodology

Equation (1) predicts the wage effect of moving to part time employment where the dependent variable is the log of gross real hourly pay (w_{it})

$$\ln w_{it} = r_{it} b_{1it} + d_{it} b_{2it} + J b_{3it} + p_{it} b_{4it} + x_{1it} b_{5it} + u_{it} \quad (1)$$

r_{it} is a vector of variables which indicates the presence of one or of two or more children. d_{it} is a dummy variable indicating current PT status. J_{it} shows whether the individual has

switched from FT to PT employment since the previous employment observation. p_{it} is an interaction term which indicates that the individual has switched to PT employment and moved down the occupational scale since the previous employment observation. x_{1it} is a vector of conditioning variables which include age and its square, ethnicity, region of residence, part time status, public sector status, education, experience in FT and PT employment and job tenure.

The first part of the analysis uses (1) in order to examine whether there is a negative wage effect associated with moving to PT employment, or with moving to PT employment and down the occupational scale and whether these effects act independently of the motherhood pay penalty. The second part of the analysis uses (2) to investigate whether the motherhood pay penalty differs by employment behaviour over the most recent childbirth period,

$$\ln w_{it} = (ra)_{it} b_{1it} + d_{it} b_{2it} + Jb_{3it} + p_{it} b_{4it} + x_{1it} b_{5it} + u_{it} \quad (2)$$

a_{it} is a vector of variables which indicates whether the mother remained in FT employment, remained in PT employment[1], or switched from FT to PT employment over the most recent childbirth. Interacting a_{it} with r_{it} therefore allows estimation of the motherhood pay penalty by whether the mother has one or two or more children and by their employment behaviour over the most recent childbirth.

Wage equations are estimated on a non-random selected sample; those reporting a positive wage. If selection in to employment positively affects the wage then the estimations of (1) and (2) need to be corrected for selection bias. The decision to participate in the labour market can be displayed as,

$$y_{it} = 1[x_{2it} b_{6it} + v_{it} \rangle 0] \quad (3)$$

[1] Remaining in PT employment over childbirth is additionally split in to those who are only ever observed in PT employment childbirth and those who are observed in (at least 3 months of) FT employment at some point in their careers. Those mothers only ever observed in PT employment act as a control group for those who move to PT employment over childbirth.

Where y_{it} is the binary labour force indicator, x_{2it} are a set of parameters which determine the labour force decision, b_{6it} are the coefficients on these parameters, and v_{it} is the error term in the participation equation. If w_{it} is only observed when $y_{it}=1$ and there is positive selection in to employment, then Heckman (1979) has shown that consistent estimates of $b_{1it}, b_{2it}, b_{3it}, b_{4it}, b_{5it}$ can be estimated by,

$$E(\ln w_{it} | x_{2it}, y_{it}=1) = r_{it} b_{1it} + d_{it} b_{2it} + J b_{3it} + p_{it} b_{4it} + x_{1it} b_{5it} + g_{1t} l(x_{2it} b_{6it}) \quad (4)$$

Where,

$$l(x_{2it} b_{6it}) = f(x_{2it} b_{6it}) \Big/ \Phi(x_{2it} b_{6it}) \quad (5)$$

$l(.)$ is the inverse Mills ratio, the normal density of the predicted values of $y_{it}=1$ over the normal distribution of the predicted values of $y_{it}=1$. Consistent estimates of b_{6it} are derived from a first stage probit regression which is estimated on all employed and non-employed observations[2]. In the current analysis selection in to employment is predicted by household income and the age of the youngest child in the household.

The OLS model produces consistent estimates of the regression coefficients as long as the explanatory variables are uncorrelated with u_{it}. This assumption will not hold if there are unobservable effects associated with each individual which are fixed over time and which are correlated with the explanatory variables. In this case the error term becomes $u_{1it} = a_{it} + u_{1i}$. u_{1i} is the individual specific variation which is fixed over time, if $E(u_{it} | r_{it}) \neq 0$ inconsistent estimates of the regression coefficients will be derived. Lundberg and Rose (2000) have found that characteristics such as career drive and attitudes towards family life which are likely to be fixed over time are correlated with the

[2] Since there is no Heckman two-step command available for the fixed effects estimator or for the instrumental variables estimator a separate probit regression is ran before estimation of these regressions in order to generate the inverse Mill's ratio. See table B1 in appendix 2 for details of this regression. This inverse Mill's ratio is then included in to the fixed effects and instrumental variables wage equations, bootstrapping is used in order to generate consistent standard errors.

wage and with the probability of entry into motherhood. This introduces an endogeneity issue in to the model causing inconsistent estimation of the regression coefficients.

A specification of (1) if ran using the fixed effects linear estimator in order to generate consistent estimates in case $E(u_{it} | r_{it}) \neq 0$. In order to test for the presence of this unobserved heterogeneity a random effects model is estimated and a Hausman test is performed[3].

The switch in to part time employment will occur if the opportunity cost of full time employment is larger than the wage rate. If the wage rate and movement to PT employment are jointly determined then the regression coefficients in (1) will suffer from endogeneity bias. Instrumental variable estimation can be used to correct for this bias. If it is the case that $E(u_{it} | J_{it}) \neq 0$ then a variable z_{it} can be used to predict J_{it} such that, $Corr(z_{it}, J_{it}) \neq 0$ and $E(u_{it} | z_{it}) = 0$. Marital status is used as an instrument for the switch in to part time employment; Waldfogel (1998) has previously used martial status to predict current PT status. Furthermore 67% of the sample of women used in the analysis are married or cohabiting, compared to 79% of those who report movements to PT employment.

4. Data and Sample

The analysis of movements to PT work and their impact on the wage requires analysis on women observed over a long period of time. This study uses the British Household Panel Survey (BHPS) waves 1-16 (1991-2006) alongside the separate BHPS Consolidated Marital, Cohabitation and Fertility Histories (1991-2006) and the BHPS Combined Work-Life History Data (1990-2005). The BHPS Combined Work-Life History Data is retrospective labour market history information and monthly inter-wave data for each individual. Work-Life History Data is available up to the end of wave 14, the monthly

[3] The random effects regression results and results from the Hausman test are displayed in tables 1C and 2C respectively in appendix 3.

employment information for the remaining two waves was constructed using information about the length of time spent in each subsequent labour market spell. The BHPS Consolidated Marital, Cohabitation and Fertility Histories Data set contains lifetime histories of the respondents' partnerships and childbearing. The information in this study was used to accurately infer the dates each respondent had a child. The BHPS panel contains further yearly information on personal and household circumstances. The BHPS Combined Work-Life History Data and the BHPS panel were merged together by month, producing a large dataset based on monthly observations; the only information changing between months rather than wave is the employment and occupational information.

The sample used in this analysis is made up of women and mothers of children under the age of 12. Mothers of children under age 12 are of interest because it is at these ages when children require the most care and thus impact upon the mothers' labour force participation decision. The women are between the ages of 21 and 50, thus are likely to have started their childbearing and labour market careers. Using a sample of women aged over 21 additionally excludes any PT work done by students.

In order to model the selection into employment the sample is made up of employed and non-employed observations from this group of women. Because the second part of the analysis investigates differences in the motherhood pay penalty by employment transitions over childbirth, the mothers included in the sample who were employed at some point in time were all employed before childbirth[4]. Self-employed women have been dropped[5] since due to the variables available in the BHPS Combined Work-Life History Data it is impossible to tell whether these women work full or PT. Only observations where information from the panel was available (observations after 1991 with non-missing panel information) were kept. The sample consists of 4323 individuals, 292707 total monthly observations and 157541 monthly employment observations.

[4] This involves dropping 7% of the employment observations.

[5] Self-employed women make up 15% of the employment observations.

5. Variables and Descriptive Statistics

The dependent variable in the analysis is the log of real hourly gross pay[6]. r_{it}[7] indicates the presence of one child and of two or more children. The results in table 1 show that on average motherhood status has a fairly large negative effect on the hourly wage. The penalty to one child is slightly smaller than the raw wage penalty to two or more children. This suggests that the increased time pressures associated with a greater number of children translates in to lower pay.

Table 1 shows that current PT status (d_{it}) has a very large negative effect on the average hourly wage which is greater than that generated by the presence of children. This suggests it is likely that d_{it} is synonymous with poor human capital development and career progression opportunities due to the occupational segregation of PT employment. The results in table 1 suggest that the negative wage impact of J_{it} is likely to be smaller than that to d_{it}. However, the mean penalties to d_{it} and J_{it} are much greater than the mean pay penalties to motherhood; the raw data suggests that any mothers who move to PT employment appear to be particularly disadvantaged in the labour market.

Examining the mean motherhood pay penalty by the components of a_{it} suggests that the motherhood pay penalty is likely to differ by behaviour over the childbirth period. Firstly, (column 1 of table 4) a_{it} is divided in to whether the mother stayed FT over childbirth, stayed PT over childbirth or switched FT to PT over childbirth[8] and this is interacted with the presence of one or two or more children. In column 2 of table 4 a_{it} is divided in exactly the

[6] Any hourly wages smaller than 50 pence and greater than 90 pounds have been excluded (0.11% of employed observations). Hourly wages are given at January 2006 prices.

[7] The fertility history file only records childbirths until wave 14, the impact of any births which occurred in waves 15 or 16 therefore has not been assessed.

[8] Only 0.4% of monthly employment observations recorded moving from PT to FT employment over childbirth. These observations have been dropped from the sample.

same way but is interacted with a dummy variable indicating motherhood status, not with the presence of one or two or more children in order to make the results comparable to the following part of the analysis. The results in table 1 indicate that mothers who remained in FT employment over their most recent childbirth do not suffer any penalty to the average hourly wage. However, those who remain in PT employment over childbirth earn smaller average wages than the average motherhood wage, and those switch from FT to PT employment over childbirth on average receive an even smaller average hourly wage. Movement to PT employment over childbirth appears to be particularly damaging to post-childbirth career prospects.

In column 3 of table 4 a_{it} is divided in to whether the mother stayed in FT employment over childbirth, switched from FT to PT employment over childbirth, stayed in PT employment over childbirth but works FT at some point in their career[9], or stayed in PT employment over childbirth and is only ever observed in PT employment. This is then interacted with the dummy variable for motherhood status, not with the presence of one or two or more children due to small sample numbers. Separating those who remained in PT employment over childbirth in this way is beneficial as those who only ever work PT are likely to be a useful control group for those who begin their PT careers immediately after childbirth. Furthermore, like the women who move to PT work over childbirth, those who worked PT immediately before and immediately after over childbirth but who do work FT at some point in their careers are likely to have entered PT employment in order to better balance work and family responsibilities. However, this latter group entered PT work before childbirth rather than immediately after childbirth and therefore may benefit from being able to stay with the same employer over the childbirth period; current work has shown little evidence of hours flexibility within jobs, (Blundell et al, 2005).

[9] The woman must be observed in at least 3 consecutive months on FT employment to be in this category.

The results in table 1 show that those mothers who are only ever observed in PT employment receive a much lower average hourly wage than the mothers who worked PT immediately before and immediately after childbirth but who do have a spell of FT employment at some point in their career, suggesting that PT employment is damaging to career progression. The mothers who worked PT immediately before and immediately after the most recent childbirth but who have a spell of FT employment at some point receive a greater average hourly wage as compared to those mothers who moved to PT employment over the most recent childbirth. This suggests that the latter group of women suffer as a result of having to change jobs, or move to PT jobs which are relatively more damaging to their career prospects.

Any movement down the occupational scale[10] diminishes the average hourly wage to a similar extent as does d_{it}. The impact of occupational downgrading is exaggerated when there is additionally a movement to PT employment (π_{it}). The negative wage effect of π_{it} generates a larger average hourly wage penalty than J_{it}, suggesting that the negative wage impact of J_{it} is not just being driven by occupational effects.

Table 1 indicates that the wage is influenced by ethnicity, educational qualifications, occupational and sector status, these variables are therefore included in x_{1it}, alongside age and its square, months of experience in full and PT employment and their squared values, job tenure and its square, and region of residence.

6. Results

The significance of the inverse Mills ratio in column 2 of table 2 suggests that the subsequent regressions should be corrected for selection bias. In table 3 the inverse Mills ratio has been computed using predicted values from a probit model, which predicts the

[10] The occupational scale used to define occupational downgrading is that suggested by Connolly and Gregory (2008), see table A1 in appendix 1 for details.

probability, a woman will have a non-missing wage using the entire sample of women. Table B1 in appendix 2 shows the results from the selection equation from column 2 of table 2, and the probit model used to predict employment and calculate the inverse Mills ratio used in both columns of table 3.

Columns 1-5 in table 2 indicate that having one child generates a pay penalty of around 7%; furthermore the presence of two or more children reduces pay by 17% on average. As discussed in section 3, motherhood status my be endogenous in a wage equation, therefore column 1 of table 3 uses fixed effects estimation[11] to correct for any unobserved time-invariant attribute which may be correlated with the presence of children and the wage. The results in column 1 of table 3 provide little evidence that the motherhood pay penalties in table 2 exhibit endogeneity bias, this result is consistent with previous findings for the motherhood wage penalty in Britain (Waldfogel, 1998; and Waldfogel, 1995).

The results in table 2 show that PT employment generates a significant negative wage effect of around 7%. This is consistent with previous findings which suggest that PT jobs are segregated in to low skill level occupation groups where there is fewer opportunities for career progression and human capital development, (Blackwell, 2001; Manning and Petrongolo, 2008; and Connolly and Gregory, 2008). A switch to PT work from FT work will involve as loss of such opportunities and therefore is likely to generate an additional negative wage effect. The movement to PT employment may additionally generate a negative wage effect due to poor job matching in to PT jobs, or if those who move to PT employment are perceived as having low work commitment. The results in table 2 show that switching to PT employment from FT employment generates a negative wage effect of around 6% which acts additionally to the 7% pay penalty associated with current PT status. The 6% pay penalty associated with movement to PT employment is smaller than the 7% pay penalty found by Connolly and Gregory (2009), however the regressions in the current

[11] A random effects models was also ran and a Hausman test confirmed the need for using the fixed effects model. Appendix 3 shows details of the random effects model and of the Hausman test.

analysis additionally control for personal, household and demographic characteristics which the previous work (Connolly and Gregory, 2009) has not done.

The 6% pay penalty to moving to PT employment acts independently of motherhood status. Thus, a mother of one child who moves to PT employment receives a pay penalty of 13%, and a mother of two or more children who moves to PT employment will receive a pay penalty of 22%.

Instrumental variable estimation is used in column 2 of table 3 in order to correct for the potential endogeneity of the switch to PT employment. Using marital status to instrument for the switch to PT employment indicates that the switch to PT employment has no significant impact on the wage. However, the Anderson LM statistic suggests that marital status is not very well correlated with the movement to PT employment and the Sargan statistic indicates that the instrument is correlated with the error terms from the wage equation (table 5).

Previous findings suggest that there is a large pay penalty associated with moving down the occupational scale, and that this effect is larger when combined with switching to PT employment (Connolly and Gregory, 2009). The current analysis has extended this previous work by controlling for a wider set of personal, household and job characteristics. The results in table 2 show that even after the inclusion of these controls large pay penalties are still found as a result of occupational downgrading. Moving to a lower skill level occupation receives an 8% pay penalty. Furthermore, moving down the occupational scale and simultaneously moving to PT employment generates an even larger pay penalty of 12% which acts over and above the pay penalty to the switch to PT employment and again is independent of the motherhood pay penalties. The increased probability of occupational downgrading on movement to PT employment (Connolly and Gregory, 2008) suggests that many mothers of one child who move to PT employment will receive pay penalties over twice as large as originally suggested.

The results in table 4 show the impact of interacting motherhood status with employment behaviour over the most recent childbirth. In column 1 of table 4 the presence of one child or of two or more children is interacted with whether the mother remained in FT or PT employment, or switched to PT employment over the most recent childbirth. In column 2 of table 4 whether the mother remained in FT or PT employment, or switched to PT employment over the most recent childbirth is interacted with motherhood status. Mothers who remain in FT or PT employment over their most recent childbirth will receive a pay penalty which is of a smaller magnitude than the average penalties to the presence of one or two or more children. However switching to PT employment over the most recent childbirth generates much larger negative wage effects; column 2 of table 4 indicates that on average a mother who moves from FT to PT employment over the childbirth period receives a pay penalty of 18% in the post-childbirth period. Column 1 of table 4 shows that a mother of one child who moves from FT to PT employment over childbirth earns on average 12% less in the post childbirth period, furthermore a mother of two or more children who switched to PT employment over childbirth will receive a 28% pay penalty.

The results in column 3 of table 4 follow the same pattern as those in column 2 of table 4, however the mothers who remained in PT employment over the most recent childbirth are split up into those who work FT at some point in their careers[12] and those who are only ever observed in PT employment. Column 2 in table 4 indicates that any mother who remains in PT employment over the most recent childbirth receives an average pay penalty of 14% in the post-childbirth period. The results in column 3 of table 4 show that those who remain in PT employment over the most recent childbirth but who do work FT at some point in their careers will earn on average 11% less, however those who remain in PT employment over childbirth and only ever work PT earn on average 33% less in the post-childbirth period. A mother who works in PT employment immediately before and immediately after childbirth but works FT at some point in their career receives higher wages

[12] For at least 3 months

on average than a mother who moved from FT to PT work over childbirth, this is likely to reflect the negative wage effects of moving employer and job.

Column 4 of table 4 shows how the motherhood wage penalty varies by occupational movements over childbirth and the number of children. Mothers of one child who remain in the same occupation, or move up the occupational scale over childbirth receive a 3% pay penalty and mothers of two or more children receive a 16% pay penalty. However, any mother who moved down the occupational scale over the most recent childbirth will receive a pay penalty of between 22-24%.

7. Discussion

Previous work has suggested that PT jobs are typically situated in low skill level occupational groups (Manning and Petrongolo, 2008; Blackwell, 2001; McRae, 1991) such findings have therefore led to concern that women who switch to PT work are accepting jobs below their skill level in return for shorter hours and work life balance, leading to an underutilization of human capital. This is a greater concern for mothers who have a higher value of non-market time and are therefore more likely to work in PT jobs (Paull, 2008). This paper has shown a mother of one child who moves to PT employment receives a pay penalty of 13%, over 50% larger than the average pay penalty to the presence of one child (8%). If there is additionally a movement down the occupational scale the penalty to one child becomes 20%, over twice as large as the average penalty to one child. Furthermore, this analysis has confirmed that the motherhood wage penalty differs by employment behaviour over childbirth.

PT employment generates a pay penalty of 7%, consistent with previous research this result suggests that PT jobs are segregated in to low skill level occupation groups. Movement to PT employment will decreases wages by a further 6%, the fact that this pay penalty declines when occupational downgrading is included in the wage equation suggests that this negative wage effect partially suggests a movement to a ‘worse’ job, reflecting a

loss of human capital development, career progression and promotion opportunities. The 4% pay penalty which remains to switching in to PT employment in columns 4 and 5 of table 2 indicates that there is poor job matching in to PT jobs, or that those moving from FT to PT jobs are viewed as having low levels of work commitment. The large pay penalty associated with moving down the occupational scale and switching to PT work suggests that PT jobs in lower skill level occupational groups appear to be particularly damaging to women's careers in terms of reduced opportunities for career progression or human capital development.

The pay penalty associated with entering PT employment acts independently of the motherhood pay penalties. This is of particular importance for the British labour market where the proportion of mothers in PT employment is one of the highest among developed countries and where mothers have an increased probability to switch to PT employment (Paull, 2008). Any mother who moves to PT employment will be particularly disadvantaged as compared to her childless counterpart. Paull (2008) has indicated that at any employment observation a mother has a 25% probability of moving to PT employment. This analysis therefore illustrates that there is a 25% probability a mother will receive an additional 6% pay penalty. Furthermore, if a movement down the occupational scale accompanies the movement to PT employment then an additional 12% pay penalty will be received. The switch to PT employment appears to be a major source of gender and family inequality in the labour market in Britain. The poor job matching and occupational downgrading effects associated with the movement to PT employment generate large wage penalties which will mostly be felt by mothers. The fact that this effect becomes larger on movement down the occupational scale will strengthen the impact on gender and family inequality in the labour market as previous research has indicated that mothers are more likely to be situated in lower skill level occupational groups (Blackwell, 2001; and Hakim, 1998).

Large persistent wage penalties to children have previously been shown for mothers in Britain, Davies and Pierre (2005) find a 12% penalty to having two children and a 15% penalty to having three children but no significant penalty to one child, Waldfogel (1998) and

Waldfogel (1995) have found a 9% penalty to one child and a 16% penalty to two or more children for a sample of British women. Harkness and Waldfogel (1999) find an 8% penalty to one child and a 24% penalty to two children. After controlling for switches to PT employment, the average pay penalties to the presence of one child (7%) and to the presence of two or more children (17%) found in the current analysis are of similar magnitude to those previously found in the literature. This paper contributes to the literature on the motherhood wage penalty by showing that the motherhood wage penalties differ by employment behaviour over childbirth.

The results from table 4 suggest mother's labour market behaviour over the childbirth period is crucial in determining the mother's future labour market experiences. Mothers who remain in FT or PT employment over childbirth receive smaller than average pay penalties. However those who switch to PT employment suffer much greater pay penalties throughout the early maternal years. Furthermore, this effect acts independently of the negative wage effect associated with switching to PT employment. The PT jobs which mothers move in to on return from childbirth (those with more flexible benefits) are likely to be particularly damaging to the subsequent career progression due to reduced opportunities for human capital development and career progression.

Figure 2 plots the predicted wages from column 2 of table 4 for all mothers, mothers who remained in PT employment over the most recent childbirth and for mothers who switched to PT employment over the most recent childbirth, against years since childbirth. Figure 2 illustrates that switching to PT employment over the most recent childbirth will contribute to reduced earnings as well as slower earnings growth over at least the first 12 years after childbirth, this effect occurs independently of current PT status. The movement in to flexible PT jobs over childbirth appears to have a scarring impact on the wage as the impact of missed human capital development and career progression opportunities accumulates over time; even after the child has reached an age when they no longer require a great amount of care a large pay differential persists between those who remained in PT

employment and those who switched to PT employment over the most recent childbirth. Figure 3 indicates that remaining in FT employment over the most recent childbirth period increases wages above the average motherhood pay penalty.

Figures 4 and 5 illustrate the average motherhood wages of those who remained in PT employment over the most recent childbirth by whether they ever work FT or not. The mothers who remained in PT employment over the most recent childbirth but who do work in FT employment at some point in their careers earn, on average, slightly less than the average mother over the first 5 years post childbirth, however after 7 years post-childbirth these mothers will earn more than the average mother. Unlike those who move to PT work over childbirth, these mothers are less likely to have lost any job or firm specific human capital over the childbirth period. However, mothers who only ever work PT receive much lower average hourly wages than the average mother and even much lower average hourly wages than those who moved from FT to PT work over the most recent childbirth in the post-childbirth period. The mothers who only ever work in PT employment receive the lowest wages out of all mothers, again this suggests that experience in PT employment is damaging to the future career and wages due to reduced access to career progression and human capital development opportunities.

Mothers who move down the occupational scale over the childbirth period earn much larger wage penalties than the average motherhood penalties. Figure 6 shows the predicted wages from column 4 of table 4 for all mothers, mothers who remained in the same occupation or moved up the occupational scale over childbirth and for mothers who moved down the occupational scale over the most recent childbirth, against years since childbirth. As with the switch to PT employment over childbirth, a movement down the occupational scale over childbirth acts to decreases mothers' wages by a large amount over the first 12 years after childbirth, although there is some reconciliation in the wages at around 12 years post-childbirth. This suggests that lower skill level jobs favoured by mothers of young children are associated with poor career progression and human capital development

opportunities, resulting in a loss of earnings on movement in to such jobs and a scarring effect on wages as the impact of missed opportunities accumulates over time. This scarring effect appears to last until the child reaches 12 years of age.

8. Conclusions

Due to the increased probability of mothers to switch to PT employment in Britain, the aim of the current analysis was to analyse whether there is a negative wage effect due to switching to PT employment which acts additionally to the motherhood pay penalty. The negative wage effect of the switch to PT employment remains statistically significant and of a moderate magnitude (6%) despite including personal, household and job characteristics in to the wage equation. Therefore, this 6% pay penalty acts independently of the motherhood pay penalty. A mother of one child earns an average pay penalty of 7%, moving to PT employment increases this pay penalty to 13%. Given that 43% of mother move to PT employment over the first childbirth, this shows that mothers are at a more disadvantaged position than previously suggested in the British labour market.

The negative wage effect associated with the switch to PT employment suggests a loss of opportunities for career progression and human capital development and additionally indicates that those who move from FT to PT work may be viewed as having low work commitment. These negative implications of PT employment are consistent with previous findings, (Russo and Hassink, 2005; and Hirsch, 2004) and are found to be stronger for PT jobs in low skill level occupation groups. These results suggest that by increasing the career progression and human capital development opportunities available to PT workers and thus reducing the occupational segregation of PT jobs will act to reduce gender inequality in the labour market and promote a more efficient use of educational investments.

Although the evidence surrounding the harmful implications of PT employment on women's labour market experiences is very clear it is important to recognise that women working in PT employment are likely to have greater levels of job satisfaction than those

working in FT employment (Booth and Van Ours, 2009). Furthermore FT employment in the early maternal years has been shown to limit the child's development (Berger et al, 2005; and Baum, 2003), further research into the extent of this trade off is needed.

The unexplained pay penalties to children are of similar magnitude to those previously found, (Waldfogel, 1995; Waldfogel, 1998; and Davies and Pierre, 2005). However, the results in this analysis have shown that the penalties to motherhood differ greatly depending on mothers' employment behaviour over the childbirth period. Mothers who switched to PT employment over childbirth, or who moved down the occupational scale over childbirth appear to struggle in terms of career progression and wages in the post-childbirth period, these effects last for up to 12 years after childbirth. The PT jobs most popular with new mothers (those with increased flexibility benefits in low level occupational groups) are particularly harmful to mothers' post childbirth career progression, strengthening gender and family inequality in the labour market.

The findings in this paper therefore suggest that PT jobs and low skill level jobs most popular with new mothers are very damaging to the mothers' career for up to 12 years post-childbirth. These findings support policies such as increased access to quality childcare which would allow mothers to better combine the increased time pressures of young children with FT employment. Additionally, increasing rights to flexible working among the higher skill level occupation groups would prevent movements to 'worse' jobs on movement to PT employment and allow mothers to maintain their career progression whilst working PT, limiting the extent of gender inequality in the labour market.

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Table 1 Mean of gross hourly pay (£)

Variable	Real hourly pay[2] (£)
All employed	9.13
Family Status	
Mother	8.17
One child	8.23
Two or more children	8.07
Married or cohabiting	9.27
Full time / Part time Status	
Part time	7.24
Full time	9.61
Switch from full to part time work	7.41
Full time / Part time Status over childbirth	
Stayed in full time work over the most recent childbirth	9.16
Stayed in part time work over the most recent childbirth	7.66
Switch from full to part time work over the most recent childbirth	7.19
Stayed in part time work over the most recent childbirth but don't always work part time	7.99
Stayed in part time work over the most recent childbirth and always work part time	5.84
Occupational Transitions	
Occupational downgrade	7.45
Switch from full to part time work & move down the occupational scale	6.96
Occupational Transitions over Childbirth	
Same occupation or upgrade over the most recent childbirth	8.48
Downgrade over the most recent childbirth	7.21
Individual and Human Capital Characteristics	
White	9.34
Degree	12.15
A level	8.99
O level	7.50
No qualifications	6.52
Occupational and Sector Status	
Teacher	14.11
Other professional	13.44
Nurse	11.24
Associate professional	10.67
Corporate manager	13.16
High skill services	10.24
High level clerical	7.91
Other manager	7.68
Skilled trader	6.89
Low level clerical	7.52
Caring services	6.21
Other personal services	5.91
Sales assistant	5.31
Other low skill	7.10
Cleaners	4.87
Public sector	9.81

Notes:

1. An individual is classified as being in employment if their economic activity status shows they are employed and if they give non-missing pay information. Individuals who report being in employment but who have missing wage information have been dropped from the sample.
2. Wages are given at January 2006 prices.
3. Any individuals reporting earning less than 50p and hour or more than £90 an hour have been dropped from the sample.

Table 2 Hourly log wage regression

Variables	1	2	3	4	5
One child	-0.048***	-0.068***	-0.068***	-0.068***	-0.068***
	(0.004)	(0.006)	(0.008)	(0.006)	(0.006)
Two or more children	-0.134***	-0.166***	-0.166***	-0.167***	-0.168***
	(0.004)	(0.007)	(0.007)	(0.008)	(0.008)
Part time	-0.064***	-0.066***	-0.062***	-0.066***	-0.066***
	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)
Switch FT/PT			-0.058***	-0.033***	-0.032***
			(0.016)	(0.016)	(0.017)
Occupational downgrade				-0.081***	
				(0.014)	
Occupational downgrade and Switch FT/PT					-0.121**
					(0.049)
Human capital controls	**ü**	**ü**	**ü**	**ü**	**ü**
Household / demographic controls	**ü**	**ü**	**ü**	**ü**	**ü**
Job characteristics	**ü**	**ü**	**ü**	**ü**	**ü**
Inverse Mills Ratio		-0.875***	-0.875***	-0.875***	-0.875***
		(0.002)	(0.002)	(0.002)	(0.002)
Observations	157541	292707	292707	291651	291651

*** p<0.01, ** p<0.05, * p<0.1 Standard errors in parentheses

Notes:

1. The results show regression coefficients from various specification of equation (1). The dependent variable is the log of gross real hourly pay, where pay is given at January 2006 prices.
2. Column 1 is ran using only the employed observations (157541). Columns 2-5 are ran using all observations in the sample (292707).
3. Any individuals reporting earning less than 50p and hour or more than £90 an hour have been dropped from the sample.
4. Columns 2-5 are estimated using the Heckman selection correction.
5. The human capital controls are experience in full and part time work and their squared values, tenure and tenure squared and the individual's highest educational qualification. Household and demographic controls are age and it's squared value, whether the individual is white and region of residence. The job characteristics category includes public sector status.

Table 3 Hourly log wage regressions

Variables	1 (Fixed effects)	2 (Instrumental variables)
One child	-0.078***	-0.123***
	(0.045)	(0.036)
Two or more children	-0.164***	-0.257***
	(0.077)	(0.061)
Part time	-0.062***	-0.072
	(0.005)	(0.234)
Switch FT/PT	-0.037**	-4.027
	(0.025)	(3.788)
Human capital controls	**ü**	**ü**
Household / demographic controls	**ü**	**ü**
Job characteristics	**ü**	**ü**
Inverse Mills Ratio	-0.324***	-0.221***
	(0.111)	(0.016)
Observations[1]	155250	156907

*** p<0.01, ** p<0.05, * p<0.1 Standard errors in parentheses

Notes:

1. The results show regression coefficients from the fixed effects and instrumental variables specifications of equation (1). The dependent variable is the log of gross real hourly pay, where pay is given at January 2006 prices.
2. Because there is no Heckman selection estimator for the fixed effects or instrumental variables regression models, columns 1 and 2 are both ran just using the employed observations in the sample.
3. Any individuals reporting earning less than 50p and hour or more than £90 an hour have been dropped from the sample.
4. The inverse Mill's ratio is predicted by a separate probit regression (shown in table B1 in appendix 2) and then included in to the fixed effects and instrumental variables regression. Bootstrapping was applied to the fixed effects model in order to generate consistent standard errors.
5. The human capital controls are experience in full and part time work and their squared values, tenure and tenure squared and the individual's highest educational qualification. Household and demographic controls are age and it's squared value, whether the individual is white and region of residence. The job characteristics category includes public sector status.

Table 4 Hourly log wage regressions

Variables	1	2	3	4
One child- FT over most recent CB	-0.048***			
	(0.007)			
Two or more children –FT over most recent CB	-0.137***			
	(0.009)			
One child- remain PT over most recent CB	-0.0334***			
	(0.011)			
Two or more children- remain PT over most recent CB	-0.161***			
	(0.008)			
One child- switch to PT over most recent CB	-0.116***			
	(0.008)			
Two or more children- switch to PT over most recent CB	-0.281***			
	(0.011)			
Remained FT over most recent CB		-0.092***	-0.092***	
		(0.007)	(0.007)	
Remained PT over most recent CB		-0.137***		
		(0.007)		
Switched FT/PT over most recent CB		-0.175***	-0.177***	
		(0.008)	(0.008)	
Remained PT over most recent CB- not always in PT employment			-0.108***	
			(0.008)	
Remained PT over most recent CB- always observed in PT employment			-0.326***	
			(0.012)	
One child- same or higher occupation over most recent CB				-0.029***
				(0.006)
Two or more children- same or higher occupation over most recent CB				-0.155***
				(0.008)
One child- occupational downgrade over most recent CB				-0.239***
				(0.010)
Two or more children- occupational downgrade over most recent CB				-0.223***
				(0.010)
Human capital controls	**ü**			**ü**
Household / demographic controls	**ü**			**ü**
Job characteristics	**ü**			**ü**
Inverse Mills Ratio	-0.877***	-0.877***	-0.877***	-0.877***
	(0.002)	(0.002)	(0.002)	(0.002)
Observations	292707	292707	292707	291651

*** p<0.01, ** p<0.05, * p<0.1 Standard errors in parentheses

Notes:

1. The results show regression coefficients from various specifications of equation (2). The dependent variable is the log of gross real hourly pay, where pay is given at January 2006 prices.
2. Any individuals reporting earning less than 50p and hour or more than £90 an hour have been dropped from the sample.
3. Columns 1-4 are all estimated on the entire sample using the Heckman selection correction.
4. The human capital controls are experience in full and part time work and their squared values, tenure and tenure squared and the individual's highest educational qualification. Household and demographic controls are age and it's squared value, whether the individual is white and region of residence. The job characteristics category includes public sector status.

Table 5 Validity tests of instruments for the switch to part time employment

Test	Null hypothesis	Chi-sq p value
Anderson LM statistic	Instruments are not correlated with endogenous regressor	0.0480
Sargan statistics	Instruments are uncorrelated with error term	0.0000

Notes:

1. The table shows Chi-squared p values from the Anderson LM and the Sargan statistic tests on instrumental variables.
2. The tests assess the validity of using marital status as an instrument for the switch to part time employment in column 2 of table 3.

Figure 1 Mean real hourly wages, wages are given at January 2006 values.

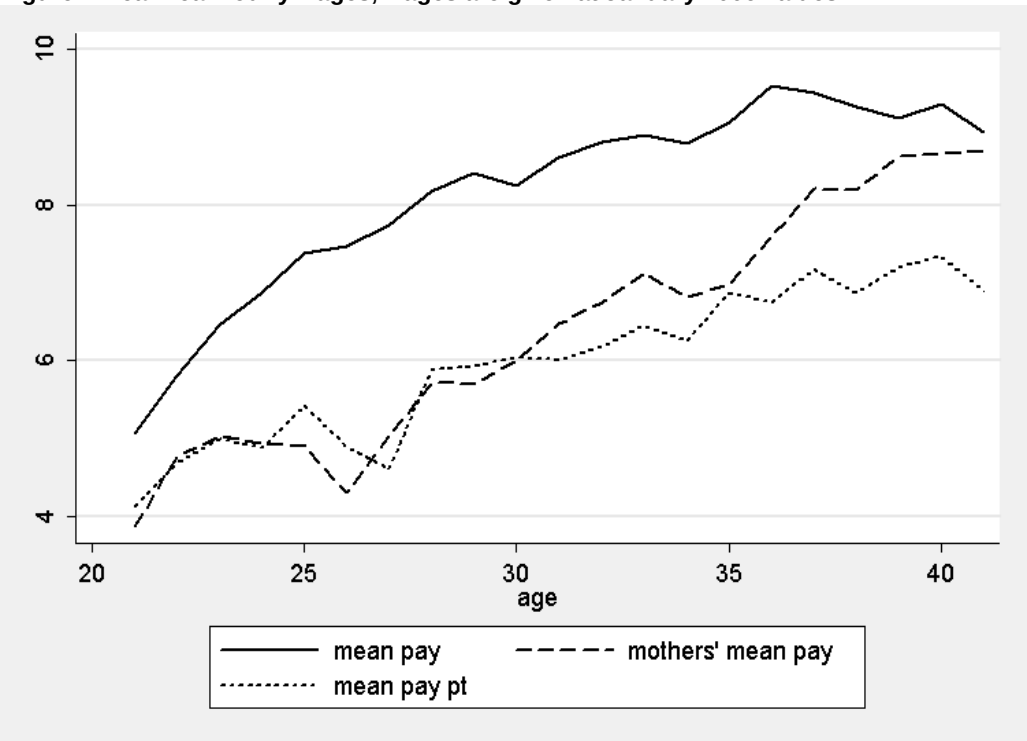


Figure 2 Predicted real hourly wages from column 2 of table 4, wages are given at January 2006 values.

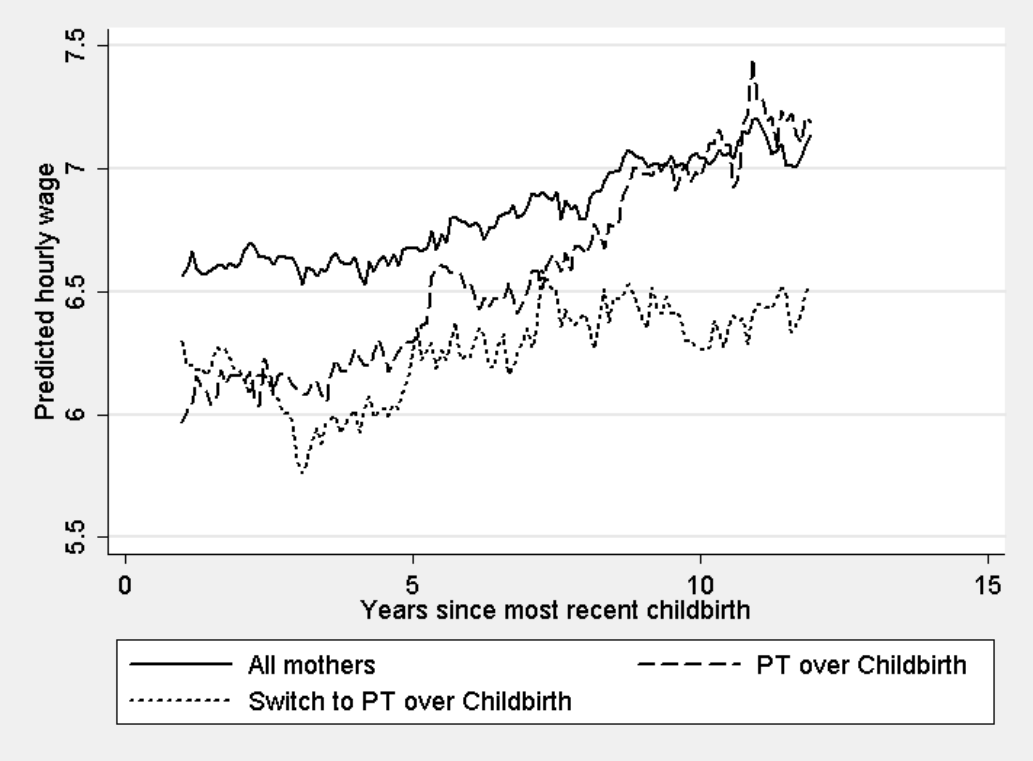


Figure 3 Predicted real hourly wages from column 2 of table 4, wages are given at January 2006 values.

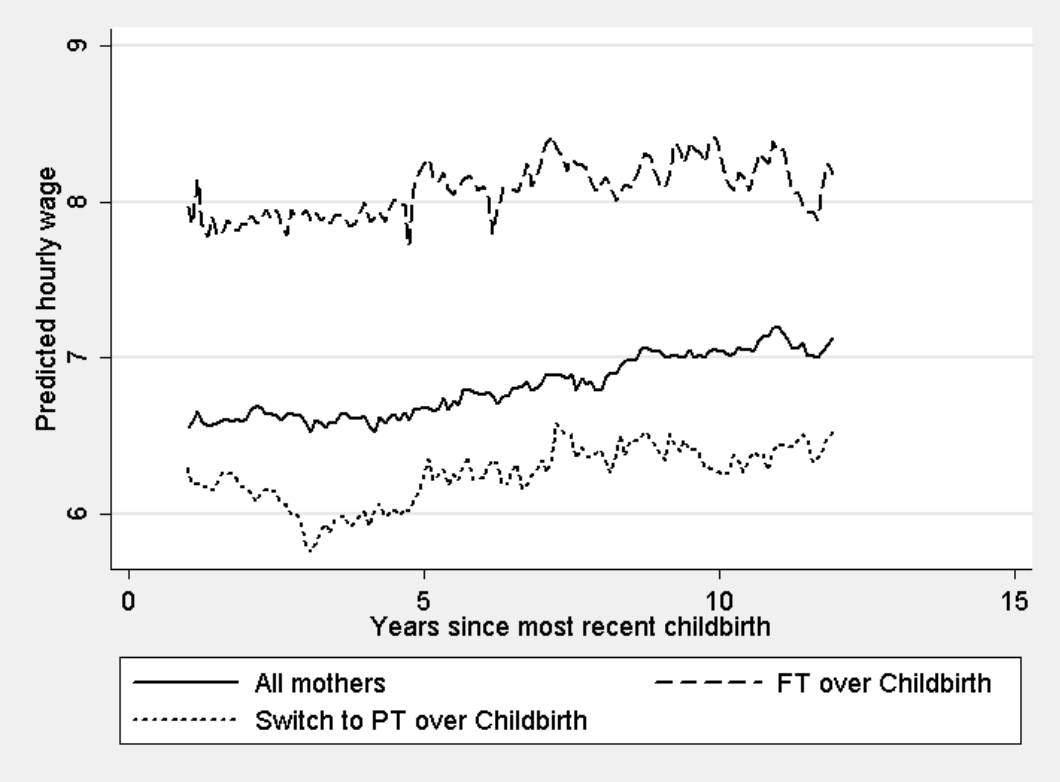


Figure 4 Predicted real hourly wages from column 3 of table 4, wages are given at January 2006 values.

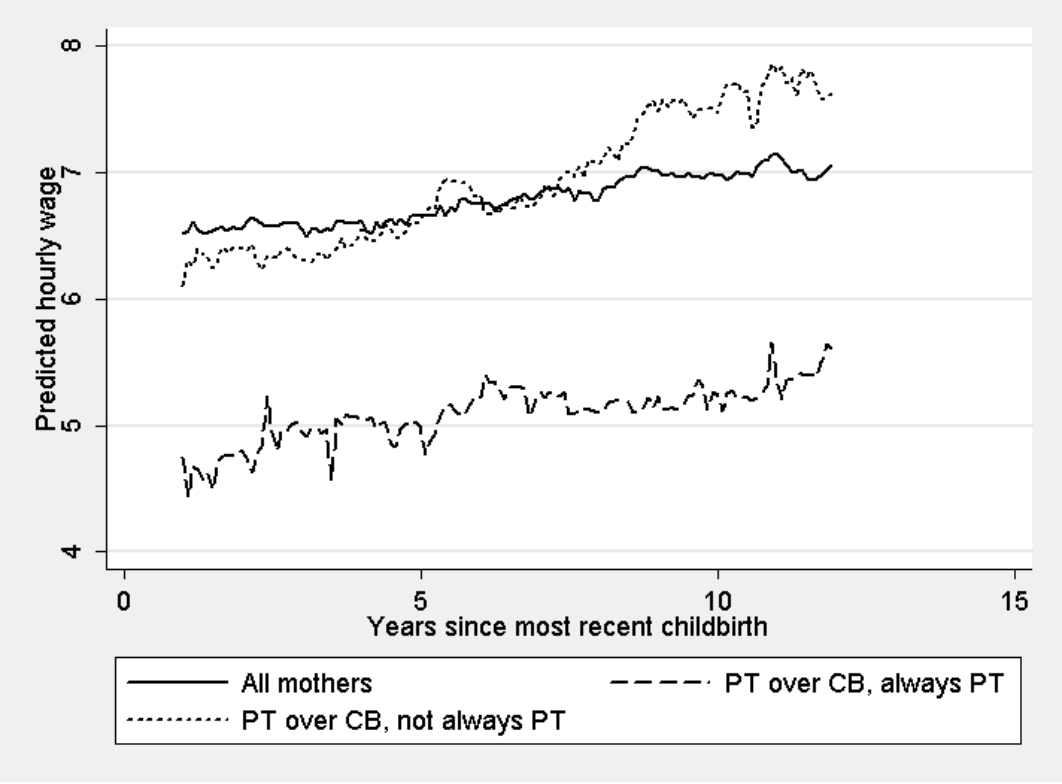


Figure 5 Predicted real hourly wages from column 3 of table 4, wages are given at January 2006 values.

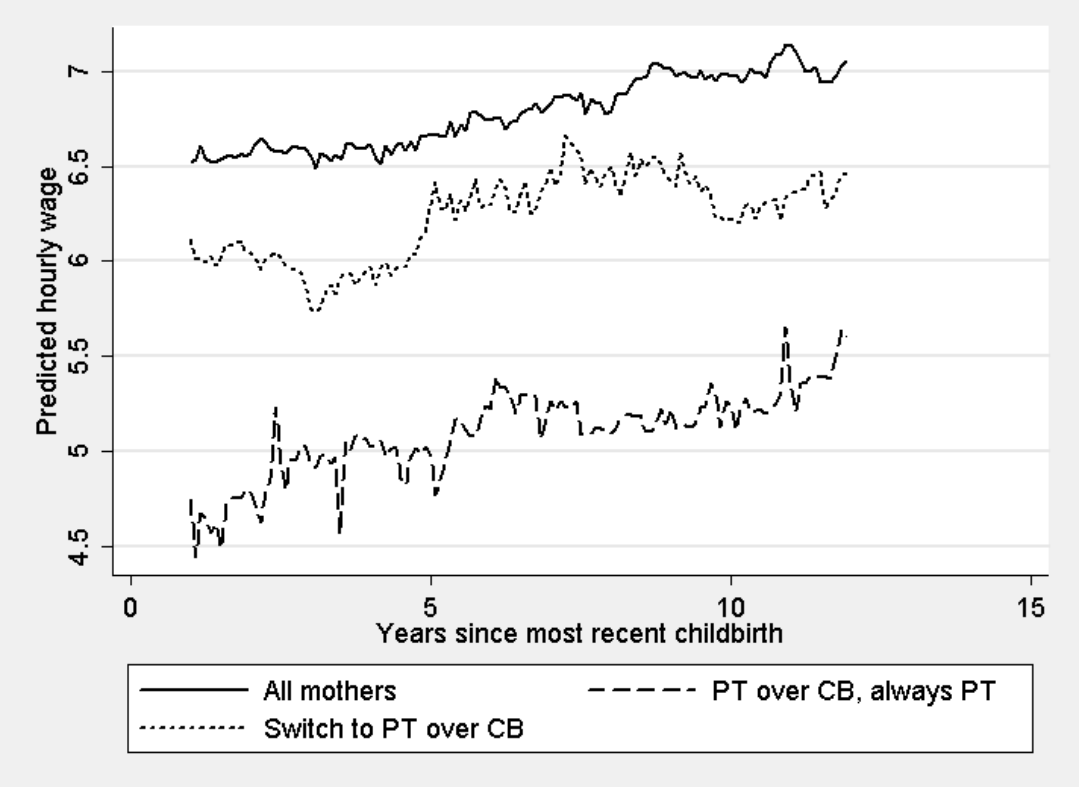
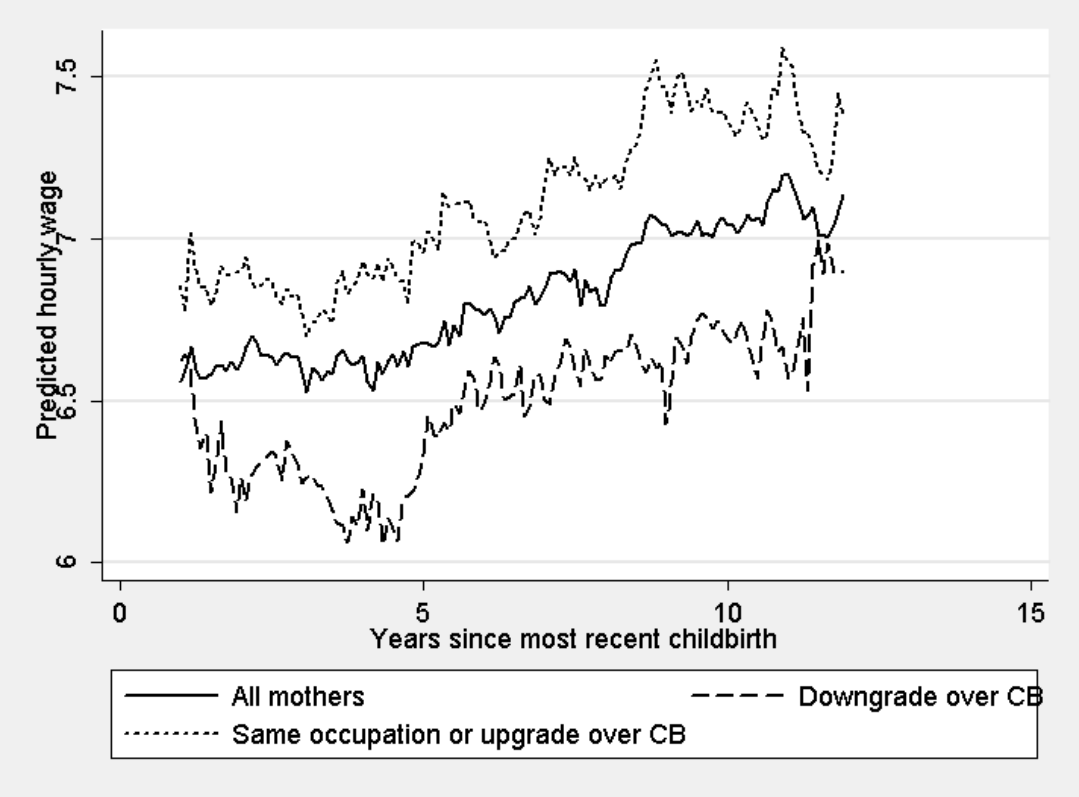


Figure 6 Predicted real hourly wages from column 4 of table 4, wages are given at January 2006 values.



Appendix 1

Table A 1 Occupational ranking and summary statistics

Ranked Occupation	SOC90 Unit groups	Average Level of Qualification*	Average Level of Qualification**	Sample of employed women (%)
1.Teachers	230-239	6.6	6.5	7.5
2. Other Professionals	220-224,240-293	5.7	5.9	3.9
3. Nurses	340-341	4.7	5.5	4.8
4. Other associate professional	300-332,342-399	4.5	5.1	8.7
5. Corporate managers	100-139, 150-155, 169-170, 176-177,190-199	4.2	4.8	7.7
6. Higher-skill services	600-613,700-719,790-792	3.2	4.5	2.2
7. Higher-level clerical	400-411,420-421,490-491	3.0	4.2	13.6
8. Other managers	140-142,160,171-175,178-179	2.8	3.9	2.9
9. Skilled trades	500-599	2.5	3.4	2.2
10. Lower level clerical	412, 430, 440-463	2.4	3.4	13.4
11. Caring services	640-659	2.3	3.7	9.7
12. Other personal services	614-631, 660-699	2.1	3.2	5.1
13. Sales assistants	720-732	2.0	2.7	7.4
14. Other low skill occupations	800-899. 900-957, 959-999	1.6	3.0	7.0
15. Cleaners	958	1.1	2.0	4.0
Sample size		36,556	6,964	157541

* As reported by Connolly and Gregory (2008) using a sample of men and women aged 22-59 in full time employment from the Labour Force Survey 2000 and the following ranking of educational qualifications:
0 no qualifications
1 sub GCSE/O-level
2 GCSE/O-level of equivalent
3 A-level or equivalent
4 Nursing qualifications
5 HND or equivalent
6 Teaching qualifications
7 Degree level of above

** Derived using a sample of men and women aged 22-59 in full time work from wave 16 of the BHPS and the same ranking of educational qualifications as above.

Notes:

1. The purpose of this analysis is to examine occupational downgrading as a movement to a job which demands a lower level of skill. The Standard Occupational Classification (SOC) (1990) ranks occupations by both the basis of similarity of qualifications, training, skills and experience and by the nature of work activities. This means that at high levels aggregation it only partially provides an occupation hierarchy by skill, which is the point of interest in this analysis. Thus, Connolly and Gregory have devised a 15 point scale (table 1) which ranks occupations primarily by the average level of qualifications of the workers in each occupation and secondly by similarity in working activities.
2. The scale was constructed by using data on individuals' qualifications in each 370 unit groups distinguished by SOC90 from the Labour Force Survey, 2000.

3. Table 10 presents the occupational ranking alongside the average level of qualification in each occupation and the comparable average qualification level of a sample of working age men and women from wave 16 of the BHPS. The results suggests that the much smaller BHPS sample includes people with more educational qualifications, however with the exception of caring services the ranking of occupations by the average level of educational qualifications remains the same. The percentage of the sample of employed women used in this analysis who fall into each ranking is displayed in the final column of table 10.

Appendix 2

Table B1 Regression models predicting selection into employment

Variables	Selection equation from column 2 of table 2	Probit model predicting employment, used to generate inverse Mills ratio used in table 3
Age	0.168***	0.145***
	(0.003)	(0.002)
Age squared	-0.002***	-0.0019***
	(0.004)	(0.003)
One child	-0.572***	-0.569***
	(0.011)	(0.0110)
Two or more children	-0.959***	-0.950***
	(0.010)	(0.0101)
White	-0.254***	-0.219***
	(0.006)	(0.005)
Degree	0.671***	0.570***
	(0.009)	(0.008)
A level	0.611***	0.509***
	(0.009)	(0.009)
O level	0.613***	0.515***
	(0.009)	(0.008)
Household income	-0.004***	-0.002***
	(0.001)	(0.002)
Youngest child aged 0-2 years	-0.243***	-0.250***
	(0.0112)	(0.011)
Youngest child aged 3-4 years	-0.109***	-0.123***
	(0.014)	(0.013)
Youngest child aged 5-11 years	0.039**	0.048***
	(0.018)	(0.018)
North West	0.177***	0.175***
	(0.009)	(0.009)
North East	0.077***	0.100***
	(0.013)	(0.011)
Yorkshire and Humber	0.214***	0.183***
	(0.011)	(0.009)
East Midlands	-0.065***	-0.032***
	(0.011)	(0.010)
West Midlands	0.026**	0.041***
	(0.011)	(0.010)
East	0.212***	0.237***
	(0.014)	(0.014)
South East	0.162***	0.168***
	(0.008)	(0.008)
South West	-0.005	-0.021**
	(0.011)	(0.010)
Observations	292707	292707

*** p<0.01, ** p<0.05, * p<0.1, Standard errors in parentheses.

Notes:

1. The selection equations include all variables from the log wage equations which are not dependent on employment as well as the chosen instruments for employment; household income, age of the youngest child and the number of working age individuals in the household.
2. The instruments have very significant effects on the probability of employment, and the direction of the effect of these variables on the employment probability is as economic theory suggests. However the magnitude of all of these effects is fairly small.

Appendix 3

Table C1 Log wage equation, random effects model

Variables	1 (Random effects)
One child	-0.102***
	(0.005)
Two or more children	-0.160***
	(0.008)
PT	-0.066***
	(0.031)
Switch FT/PT	-0.047***
	(0.012)
Inverse Mills Ratio	-0.324***
	(0.112)
Human capital characteristics	**ü**
Household / demographic controls	**ü**
Job characteristics	**ü**
Observations[1]	151250

[1] Employment observations

Table C2 Results from Breusch Pagen and Hausman test

Test and model	P value of Test Statistics
Breusch Pagen test for serial correlation, column 1 of table C1	0.0000
Hausman test between column 1 of table 3 and column 1 of table C1	0.0000

Notes:

1. The Breusch Pagen test confirms that serial correlation is present and therefore the data needs to be treated as a panel to avoid autocorrelation problems.
2. The Hausman test between the random and fixed effects models suggests that unobserved effects are present in the data, and therefore it is correct to us the fixed effects rather than the random effects model.