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

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Abstract:

In Britain, part time employment is typically used to combine work and motherhood: 60% of employed mothers in Britain work part time, and this usually involves a transition from full time employment around the first childbirth. Part time jobs are often situated in lower level occupational groups and so a transition from full to part time employment may reduce the wage. Using the British Household Panel Survey this study investigates the wage impact of switching from full to part time employment. Furthermore, mother-specific wage impacts of re-entering employment after childbirth via part time employment are analysed. A mother of one child receives a pay penalty of 7%, switching to part time employment increases this to 15%. Mothers who move from full to part time employment over childbirth receive lower wages than mothers who remained in full or part time employment over childbirth for 10 years after the birth.

Keywords: part time, motherhood pay penalty, childbirth

JEL codes: J13, J16, J21.

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

1. Introduction

The institutional setting in the UK largely reflects the male-breadwinner gender arrangement combined with a liberal welfare state, which means that there is limited access to quality childcare. In the UK, full time net childcare fees for the average dual earner couple are almost 33% of family income; however the OECD average is just 13% of family income. Additionally, for the average single parent family the full time net childcare fee is 15% of family income as compared to an OECD average of 11% (OECD, 2007). Furthermore, in the UK traditional cultural ideals and social norms typically reflected the idea that a mother should remain at home in the early maternal years. Restricted access to affordable childcare coupled with such social norms means that part time (PT) employment in the UK is often used to combine employment and motherhood, currently 60% of employed mothers in Britain are working PT (ONS, 2008). Mothers' PT employment commonly occurs as an interruption to a full time (FT) employment career, and a movement from FT to PT employment often occurs around the timing of the first childbirth. Paull (2008) has shown that 43% of mothers move from FT to PT employment over the first childbirth.

The focus on the transition from FT to PT employment is motivated by findings which have highlighted the poor quality of PT jobs in the UK. Figure 1, alongside recent analysis (Manning and Petrongolo, 2008; and Connolly and Gregory, 2009) confirms the presence of a large wage penalty associated with female PT employment in the UK. This pay penalty has increased over recent decades; in 1975 there was a 15% pay gap between FT and PT women, but by 2001 this was 25% (Jaumotte, 2003). This is likely to be a result of the segregation of PT jobs in o low skill level occupational groups,

(Manning and Petrongolo, 2008). Furthermore, a positive probability of occupational downgrading on entry in to PT employment has been identified (Connolly and Gregory, 2008).

This paper analyses whether there is a negative wage effect associated with the movement from FT to PT employment which acts to exaggerate the motherhood pay penalty. Furthermore, this paper extends the literature on the motherhood pay penalty by examining variations in the motherhood wage penalty by employment behaviour over childbirth; the wages of mothers who move from FT to PT employment over childbirth are compared to the wages of those who remain in FT or PT employment over childbirth. Previous work (Connolly and Gregory, 2009) has found that moving from FT to PT employment reduces the wage by 7%. However, no demographic or household characteristics are included in these wage equations, which this paper is able to do. Furthermore, no previous research has analysed differences in the motherhood pay penalty by employment behaviour around the childbirth period.

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 serve to increase gender inequality in the labour market. The negative wage effect of moving to PT employment will have further implications for family inequality in the labour market due to the high proportion of mother moving in to PT employment over childbirth (Paull, 2008). Analysis of the wage penalty due to movement in to PT 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 human capital.

The rest of the paper is structured as follows; section 2 reviews the background 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. Background

The time allocation decision, (Becker, 1965) provides the appropriate theoretical background for the analysis. Women maximise their utility by supplying a positive amount of hours to the labour market if the market wage exceeds their reservation wage. Mothers of young children are likely to have steeper indifference curves between the demand for consumption goods and the demand for leisure time, and therefore higher reservation wages than women with no children. This will occur if mothers derive a greater amount of utility from time spent in leisure and home production relative to time spent in the labour market than their childless counterparts do. Thus, compared to childless women, and holding all else constant, mothers will be less likely to enter the labour market. Even if entry does occur, mothers will be likely to maximise utility at a point where fewer hours are supplied to the labour market. Because of a change in preferences on entry into motherhood we expect to see a reduction in the hours of work over the childbirth period for those mothers who choose to remain in employment. This impact is likely to be exaggerated by any changes in the wage offer distribution for mothers relative to that for their childless counterparts.

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.

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 experiencing 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 having 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 is 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 are 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 analysing the existence of a pay penalty associated with the movement from FT to PT employment, which often occurs over the first childbirth period.

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 FT 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 PT 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; and 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.

Blackwell (2001) has found women switching from FT 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 are often 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.

3. Methodology

The analysis will investigate the wage implications of transitions to PT employment using traditional Mincerian earnings functions. Equation (1) identifies the wage effect of moving to PT employment where the dependent variable is the log of gross real hourly pay (w_{it})

$$\ln w_{it} = CH_{it} b_{1it} + PT_{it} b_{2it} + SWITCH_{it} b_{3it} + DG_{it} b_{4it} + CONTROLS_{1it} b_{5it} + u_{it} \quad (1)$$

CH_{it} is a vector of variables which indicates the presence of one or of two or more children; PT_{it} is a dummy variable indicating current PT status; $SWITCH_{it}$ records

whether the individual has switched from FT to PT employment since the previous employment observation; DG_{it} indicates that there has been a movement down the occupational scale since the previous employment observation; $CONTROLS_{1it}$ is a vector of conditioning variables which include age and its square, ethnicity, region of residence, current public sector status, education, experience in FT and PT employment and job tenure.

The first part of the analysis uses equation (1) in order to examine whether there is a negative wage effect associated with moving to PT employment (b_{3it}<0), and whether this effect acts 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,

$$\ln w_{it} = \left(CH_{it} * CB_{it}\right)\ b_{1it} + PT_{it} b_{2it} + SWITCH_{it} b_{3it} + DG_{it} b_{4it} + CONTROLS_{1it} b_{5it} + u_{it} \quad (2)$$

CB_{it} is a vector of variables which indicates whether the mother remained in FT employment, remained in PT employment, or switched from FT to PT employment over the most recent childbirth. Interacting CB_{it} with CH_{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. The rest of the variables included in (2) are as defined for equation (1). Henceforth, $\mathbf{x}_{it}$ will define the entire set of variables used in (1) and (2) for individual i at time t.

Equation (1) is firstly estimated using a pooled OLS log wage equation, with robust standard errors corrected for intra-individual correlation. However, in estimating (1) and (2) it is important to correct for sample selection, if selection in to employment is positively correlated with the wage then estimates from (1) and (2) will suffer from selection bias. Thus, the Heckman (1979) two-stage procedure is utilised in which

estimates from the probit model (3) are used to derive the inverse Mills ratio, which is then used as an additional regressor in (1) and (2);

$$y_{it} = 1[CONTROLS_{2it} b_{6it} + v_{it} \rangle 0]$$

(3)

Where y_{it} is the binary labour force participation indicator, $CONTROLS_{2it}$ includes all of the variables which are not dependent on employment in (1) and (2), as well as age of the youngest child and household income as predictors for labour force participation. b_{6it} are the coefficients on these variables, and v_{it} is the error term in the participation equation. w_{it} is only observed when $y_{it} = 1$, any correlation between w_{it} and y_{it} will generate selection bias. Again robust standard errors corrected for intra-individual correlation are computed.

Selection corrected OLS estimation of (1) and (2) will produce consistent estimates under the assumption of exogeneity, $E(u_{it} | \mathbf{x}_{it}) = 0$. However, there are two potential sources of endogeneity in (1) and (2). Firstly, exogeneity will not hold if there are individual specific unobservable effects fixed over time and which are correlated with the explanatory variables. In this case the error term becomes $u_{1it} = a_{it} + h_{1i}$. h_{1i} is the individual specific variation which is fixed over time, if $E(h_{1i} | \mathbf{x}_{it}) \neq 0$ then $E(u_{it} | \mathbf{x}_{it}) \neq 0$ and inconsistent 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 wage and with the probability of entry into motherhood. Therefore, equation (1) is additionally estimated using the fixed effects linear estimator in order to generate consistent estimates in the case where $E(h_{1i} | \mathbf{x}_{it}) \neq 0$.

The second potential source of endogeneity in (1) and (2) arises if the switch in to PT employment and the wage rate are jointly determined. The switch to PT employment will occur if the opportunity cost of FT employment is larger than the wage rate. If the wage rate and movement to PT employment are jointly determined then $E(u_{it}|\mathbf{x}_{it}) \neq 0$ then the estimated regression coefficients from the pooled OLS selection-corrected log wage equations, (1) and (2) will be biased and inconsistent. Instrumental variable estimation can be used to correct for this bias. If it is the case that $E(u_{it}| \ SWITCH_{it}) \neq 0$ then a variable z_{it} can be used to predict $SWITCH_{it}$ such that, $Corr(z_{it}, SWITCH_{it}) \neq 0$ and $E(u_{it}|z_{it}) = 0$. Marital status is used as an instrument for the switch in to PT employment in one specification of (1) because of the increased value of time spent in home production, Waldfogel (1998). 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[1]. The efficient two-step GMM estimator is used to estimate the instrumental variable specification of (1), Hansen's J statistic test for overidentifying restrictions is presented with the results to illustrate the validity of the instrument. Furthermore, the significance of the marital status variable in a regression which predicts the probability of switching from FT to PT employment is observed in order to assess the strength of the instrument.

[1] Using Stata version SE 9.2, the two stage Heckman command is not available for the fixed effects and instrumental variables specifications of (1). Instead a separate first stage probit model is run (presented in appendix 2) and the predicted values from this are used to generate the inverse Mills ratio. Bootstrapping is then applied to the standard errors in the fixed effects specification of (1) in order to generate consistent standard errors. This is done using the option 'vce(bootstrap)' in Stata and using 50 bootstrap replications.

4. Data and Sample

The analysis of movements into 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 1-14 (1991-2004) 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 spell-based retrospective labour market history information and monthly inter-wave data for each individual. The first 14 waves of the BHPS panel are used since work-life history data is only available up to the end of wave 14.

The BHPS Combined Work-Life History Data was expanded by the monthly length of each spell and each BHPS panel was expanded 12 times in order to generate pseudo monthly observations. These two files were merged together by month, producing a dataset based on monthly observations; this data set was used to correctly infer the months in which movements from FT to PT employment or down the occupational scale had occurred and to accurately measure the associated change in the hourly wage rate. Furthermore, the monthly-based dataset allowed accurate measurement of employment transitions over the break in employment over childbirth.

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 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[2]. Thus, mothers' observations were only kept if it was possible to observe employment transitions around the childbirth period. Self-employed women have been dropped[3] since due to the variables available in the BHPS Combined Work-Life History Data it is impossible to tell whether these women work FT or PT. Only observations where there was non-missing information from the BHPS Combined Work-Life History Data and the BHPS Consolidated Marital, Cohabitation and Fertility Histories Data were included in the sample. The sample consists of 2194 individuals observed for between 1 to 164 months. This amounts to 183,910 total observations and 78,936 employment observations. All estimation was carried out using Stata version SE 9.2.

5. Variables and Descriptive Statistics

The dependent variable in the analysis is the log of real hourly gross pay (w_{it})[4]. The summary statistics presented in table 1 show that on average motherhood status has a

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

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

[4] 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.

moderate 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 it may be the case that the increased time pressures associated with a greater number of children translates in to lower pay.

The summary statistics in table 1 show that current PT status has a very large negative effect on the average hourly wage (b_{2it} <0) and the negative wage impact of switching from FT to PT employment is likely to additionally be large. The mean penalties to PT status and switching to PT employment 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 employment behaviour over the childbirth period suggests that there is a large amount of variation in the motherhood pay penalty. Firstly, whether the mother stayed FT over childbirth, stayed PT over childbirth or switched FT to PT over childbirth[5] is interacted with motherhood status. The descriptive statistics 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.

Secondly, separating those who remained in PT employment over childbirth in to those who only ever work PT and those who have some FT experience[6] at some point in

[5] Only 0.38% of monthly employment observations recorded moving from PT to FT employment over childbirth. These observations have been dropped from the sample.

[6] At least 3 consecutive months recorded in FT employment.

their careers is useful 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 and therefore may benefit from being able to stay with the same employer over the childbirth period. The summary statistics in table 1 show that those mothers who are only ever observed in PT employment receive a much smaller 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. 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.

Any movement down the occupational scale[7] diminishes the average hourly wage to a similar extent as does part time status (b_{4it} <0). Because previous work has shown that movements down the occupational scale are common on movement in to PT employment, this suggests that this negative wage effect could exaggerate that felt by those move from FT to PT employment.

Table 1 indicates that the wage is influenced by ethnicity, educational qualifications, occupational and sector status, these variables are therefore included as $CONTROLS_{1it}$ in (1) and (2), alongside age and its square, months of experience in FT

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

and PT employment and their squared values, job tenure and its square, and region of residence.

6. Results

The significant negative inverse Mills ratio found in tables 2 and 3 provides evidence of selection in to employment and suggests that the estimates would be upwardly biased had selection not been taken account of. Table B1 in appendix 2 shows the results from the selection equation.

Columns 1-5 in table 2 indicate that having one child generates a pay penalty of around 8%; furthermore on average the presence of two or more children reduces pay by 14%. These results are consistent with those previously found in the literature (Waldfogel, 1995; Waldfogel, 1998; and Harkness and Waldfogel, 1999).

The results in table 2 show that current PT status generates a very large significant negative wage effect of around 15%. If PT employment is consistent with fewer human capital development and career progression opportunities then a switch to PT work from FT work will involve a loss of such opportunities and may 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 columns 1-2 of table 2 show that switching to PT employment from FT employment generates a negative wage effect of around 8% which acts additionally to the 15% pay penalty associated with current PT status. The 8% pay penalty associated with movement to PT employment is of a comparable magnitude to the 7% pay penalty found by Connolly and Gregory (2009).

The 8% pay penalty associated with moving to PT employment acts to exaggerate the motherhood pay penalty; a mother of one child who moves from FT to PT employment receives a pay penalty of 16%, and a mother of two or more children who moves from FT to PT employment will receive a pay penalty of 22%.

The results in column 3 of table 2 show that even with the inclusion of an occupational downgrading control the wage impact of moving from FT to PT employment remains significant. Moving to a lower skill level occupation receives an additional 8% pay penalty and when this variable is included the wage impact of moving from FT to PT employment falls to 7%. The increased probability of occupational downgrading on movement to PT employment, which has previously been demonstrated in the literature (Connolly and Gregory, 2008), suggests that many mothers who move from FT to PT employment may receive additional pay penalties of around 15%, much larger than originally suggested.

The results in table 3 show the impact of interacting motherhood status with employment behaviour over the most recent childbirth. In column 1 of table 3 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 3 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 or similar magnitude to the average penalties to the presence of one or two or more children. In fact, mothers of one child who remain in FT or PT employment over childbirth do not receive any significant pay penalty.

However switching to PT employment over the most recent childbirth generates much larger negative wage effects; column 2 of table 3 indicates that on average a

mother who moves from FT to PT employment over the most recent childbirth period receives a pay penalty of 20%. Column 1 of table 3 shows that a mother of one child who moves from FT to PT employment over childbirth earns on average 17% less in the post childbirth period, furthermore a mother of two or more children who does so earns wages that are 30% smaller than that received by the average woman. Figure 2 indicates that switching from FT to PT employment over the most recent childbirth will contribute to reduced earnings for at least the first 10 years after childbirth, and this effect occurs independently of current PT status.

The results in column 3 of table 3 follow the same pattern as those in column 2 of table 3; 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 and those who are only ever observed in PT employment. Column 2 in table 3 shows that the average pay penalty felt by any mother who remained in PT employed over the most recent childbirth is 13%. The results in column 3 of table 3 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 10% less than the average woman, however those who remain in PT employment over childbirth and only ever work PT earn on average 39% less in the post-childbirth period. Figure 3 illustrates 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 more than the average mother in the post-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 for at least 10 years after childbirth.

Column 4 of table 3 shows how the motherhood wage penalty varies by occupational movements over childbirth. Mothers of one child who remain in the same occupation, or move up the occupational scale over childbirth receive a 6% pay penalty and mothers of two or more children receive a 15% pay penalty. However, any mother who moved down the occupational scale over the most recent childbirth will receive a pay penalty of between 23-28%. Figure 4 shows that as with the switch to PT employment over childbirth, a movement down the occupational scale over childbirth acts to decrease mothers' wages by a large amount over the first 10 years after childbirth.

As discussed in section 3 there are two potential sources of endogeneity in the current model which could lead to potential sources of bias in the regression results. Firstly, motherhood status may be endogenous in a wage equation if there are unobserved time-invariant attributes which are correlated with the presence of children and the wage. A Breusch Pagan test on the random effects specification confirms at the 0.001% significance level that serial correlation is present and a Hausman test suggests that at the 0.001% significance level there is a significant difference between the random and fixed effects results, therefore column 4 of table 2 uses fixed effects estimation in order to generate consistent results in the face of individual level unobserved fixed effects. The results in column 5 of table 2 provide little evidence that the motherhood pay penalties in columns 1-4 of table 2 suffer from endogeneity bias, the coefficients on the children variables do not decrease when fixed effects estimation is used. This result is consistent with previous findings for the motherhood wage penalty in Britain (Waldfogel, 1998; and Waldfogel, 1995). The results from the fixed effects specification suggest around a third of the pay penalty to current PT status can be explained by unobserved characteristics. Furthermore, the results suggest that the pay penalty to moving in to PT employment is increased when unobserved effects are controlled for, suggesting that

those who move to PT employment have unobserved characteristics which are positively correlated with the wage. This is unexpected and may be explained by the lack of variation in this variable over time.

The second potential source of endogeneity in the model arises from the possibility that the switch to PT employment and the wage are jointly determined. Instrumental variable estimation is used in column 5 of table 2 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 confirms that the switch to PT employment reduces the wage by around 8%. The p value from the Hansen J statistic test presented in table 2 indicates that the instrument is valid. Furthermore, table C1 in appendix 3 presents the result from regressing the probability of switching into PT employment on marital status as well as all other regressors found in (1). Marital status has a positive significant (at the 10 percent significance level) impact on moving from FT to PT employment, suggesting that the instrument has some predictive strength.

7. Discussion

This analysis has found a negative significant pay penalty associated with the transition from FT to PT employment, there is additionally a pay penalty associated with the movement down the occupational scale which is likely to exaggerate this former effect. Furthermore, these effects act to inflate any existing motherhood pay penalties. The second notable finding is that the motherhood pay penalties greatly differ by mothers' employment behaviour over the childbirth period.

PT employment generates a pay penalty of 15%, consistent with previous research this result suggests that PT jobs are segregated in to low skill level occupation groups (Manning and Petrongolo, 2008; Blackwell, 2001; McRae, 1991). Movement from

FT to PT employment will decreases wages by a further 8%, the fact that this pay penalty only slightly declines (7%) when occupational downgrading is included in the wage equations suggests that it mostly reflects poor job matching on movement in to PT employment or the fact that moving from FT to PT signals reduced productivity to employers. The larger pay penalty (8%) associated with moving down the occupational scale suggests that moving to a PT job in a lower skill level occupational groups will be particularly damaging to women's careers in terms of reduced opportunities for career progression or human capital development. This is of particular concern since recent findings have shown that occupational downgrading is likely to occur on movement in to PT employment (Connolly and Gregory, 2008).

The 7% pay penalty associated with entering PT employment, and the 8% penalty associated with occupational downgrading act 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). Paull (2008) has indicated that at any employment observation a mother has a 25% probability of moving to PT employment and therefore receiving a 7% pay penalty. If a movement down the occupational scale accompanies the movement to PT employment then an additional 8% 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 occupational downgrading effects associated with the movement to PT employment generate large wage penalties which will mostly be felt by mothers.

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 (8%) and to the presence of two or more children (14%) 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 3 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 similar or smaller than average pay penalties. However those who switch to PT employment suffer much greater pay penalties throughout the early maternal years. The PT jobs which mothers move in to on return from childbirth are likely to be particularly damaging to the subsequent career progression due to reduced opportunities for human capital development and career progression.

Figure 2 illustrates that the movement into 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. The type of PT jobs which mothers will want to move in to in the early maternal years are likely to be those with the most flexible benefits. The results indicate that such jobs are particularly damaging to subsequent career progression.

Figure 3 illustrates that unlike those who move from FT to PT work over childbirth, 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 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 the lowest wages out of all mothers, 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 4 shows 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 10 years of age.

8. Conclusions

The aim of the current analysis was to analyse the wage impact of maternal transitions from FT to PT employment. The negative wage effect of the switch to PT employment is of a moderate magnitude (7%) and acts to exaggerate the motherhood pay penalties. A mother of one child earns an average pay penalty of 8%, moving to PT employment increases this pay penalty to 15%. Given that 43% of mother move to PT employment over the first childbirth the analysis indicates that mothers are at a more disadvantaged position than previously suggested in the British labour market.

The results have shown that any negative wage effect on movement in to PT employment is further exaggerated by the wage effect associated with a movement to a ‘worse job’. The 8% wage effect of moving down the occupational scale indicates that a loss of career progression and human capital development opportunities will act to

reduce the wage to a large extent if there is additionally a movement down the occupational scale. Because previous work has shown that movements down the occupational scale are common when moving from FT to PT employment (Connolly and Gregory, 2008; and Manning and Petrongolo, 2008), these results suggest that by increasing the career progression and human capital development opportunities available to PT will act to reduce gender inequality in the labour market and promote a more efficient use of human capital 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 10 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.

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 (£)
All employed	9.61
Family Status	
Mother	8.88
One child	8.82
Two or more children	8.94
Married or cohabiting	9.70
Full time / Part time Status	
Part time	7.61
Full time	10.04
Switch from full to part time work	7.31
Full time / Part time Status over childbirth	
Stayed in full time work over the most recent childbirth	10.15
Stayed in part time work over the most recent childbirth	8.94
Switch from full to part time work over the most recent childbirth	6.97
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	7.81
Same occupation or upgrade over the most recent childbirth	9.16
Downgrade over the most recent childbirth	7.45
Individual and Human Capital Characteristics	
White	9.68
Degree	12.58
A level	9.37
O level	7.76
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	11.07

Table 2 Hourly log wage estimates of (1)

Variables	1	2	3	4	5
				Fixed Effects	**Instrumental variables**
One child	-0.081***	-0.086**	-0.084**	-0.078***	-0.123***
	(0.031)	(0.035)	(0.035)	(0.045)	(0.036)
Two or more	-0.126***	-0.137***	-0.137**	-0.164***	-0.257***
children	(0.043)	(0.053)	(0.054)	(0.105)	(0.061)
Part time	-0.146***	-0.146***	-0.149***	-0.109***	-0.154***
	(0.035)	(0.035)	(0.035)	(0.032)	(0.036)
Switch FT/PT	-0.078***	-0.078***	-0.065**	-0.083***	-0.078***
	(0.026)	(0.026)	(0.026)	(0.022)	(0.026)
Occupational downgrade			-0.075*** (0.019)		
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		-0.892***	-0.893***	-0.324***	-0.221***
		(0.019)	(0.020)	(0.111)	(0.016)
Observations	78936	126644	126019	78631	78631
P value from Hansen J statistic test					0.3783

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

Notes:

1. Column 1 shows the results from a pooled OLS regression, Columns 2 and 3 show the results from pooled OLS log wage equations using the two stage Heckman selection correction technique. In columns 4 and 5 the inverse Mill's ratio is predicted by a separate first stage probit regression (shown in table B1 in appendix 2) and then included in to the fixed effects and instrumental variables regression.

2. The standard errors in columns 1-3 and 5 are robust and correct for intra-individual correlation. Due to the inclusion of a first stage predicted variable, bootstrapping was applied to the standard errors in the fixed effects model.

3. 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 its squared value, whether the individual is white and region of residence. The job characteristics category includes public sector status.

4. The p value from the Hansen J statistic test tests the null hypothesis that the instrument is valid.

Table 3 Hourly log wage estimates of (2)

Variables	1	2	3	4
One child- FT over most recent CB	-0.058			
	(0.042)			
Two or more children –FT over most recent CB	-0.124**			
	(0.075)			
One child- remain PT over most recent CB	-0.050			
	(0.080)			
Two or more children- remain PT over most recent CB	-0.164**			
	(0.064)			
One child- switch to PT over most recent CB	-0.173***			
	(0.049)			
Two or more children- switch to PT over most recent CB	-0.300***			
	(0.082)			
Remained FT over most recent CB		-0.093**	-0.093**	
		(0.045)	(0.045)	
Remained PT over most recent CB		-0.128**		
		(0.056)		
Switched FT/PT over most recent CB		-0.200	-0.202***	
		(0.049)***	(0.049)	
Remained PT over most recent CB- not always in PT employment			-0.101**	
			(0.057)	
Remained PT over most recent CB- always observed in PT employment			-0.387***	
			(0.112)	
One child- same or higher occupation over				-0.063*
most recent CB				(0.036)
Two or more children- same or higher occupation over most recent CB				-0.153***
				(0.056)
One child- occupational downgrade over most recent CB				-0.227***
				(0.070)
Two or more children- occupational downgrade over most recent CB				-0.284***
				(0.090)
Human capital controls	**ü**	**ü**	**ü**	**ü**
Household / demographic controls	**ü**	**ü**	**ü**	**ü**
Job characteristics	**ü**	**ü**	**ü**	**ü**
Inverse Mills Ratio	-0.895***	-0.895***	-0.895***	-0.895***
	(0.019)	(0.019)	(0.019)	(0.020)
Observations	126019	126019	126019	126019

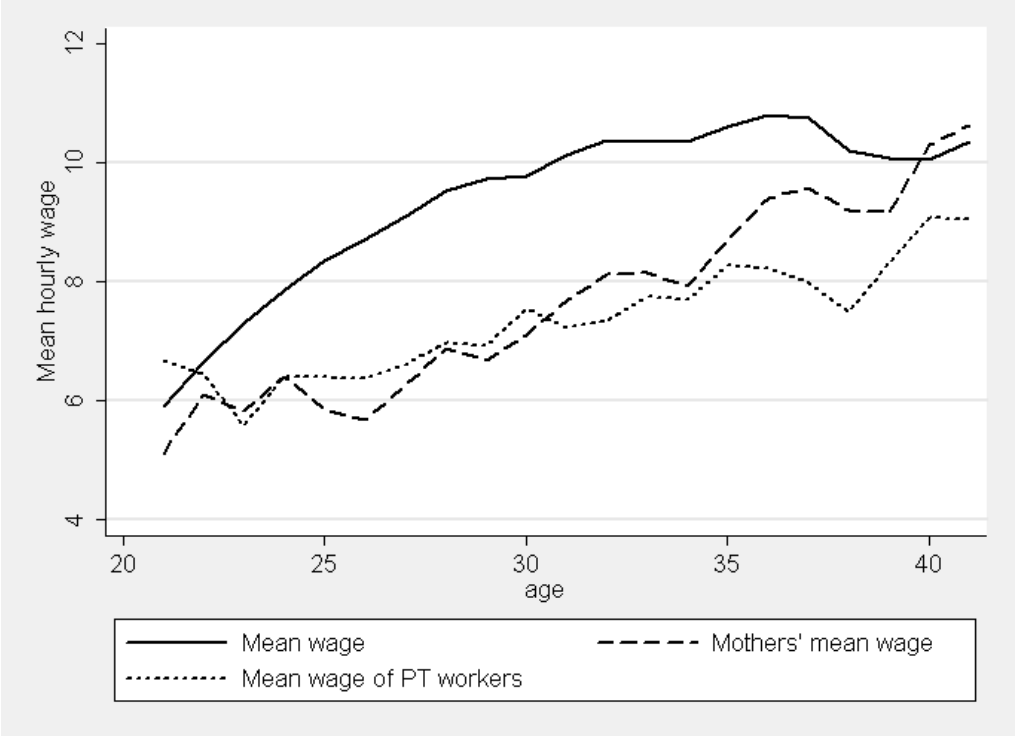
*** p<0.01, ** p<0.05, * p<0.1 Standard errors in parentheses

Notes:

1. Columns 1-4 are pooled OLS log wage equations estimated using the Heckman two stage selection correction technique. All standard errors are robust and correct for intra-individual correlation.

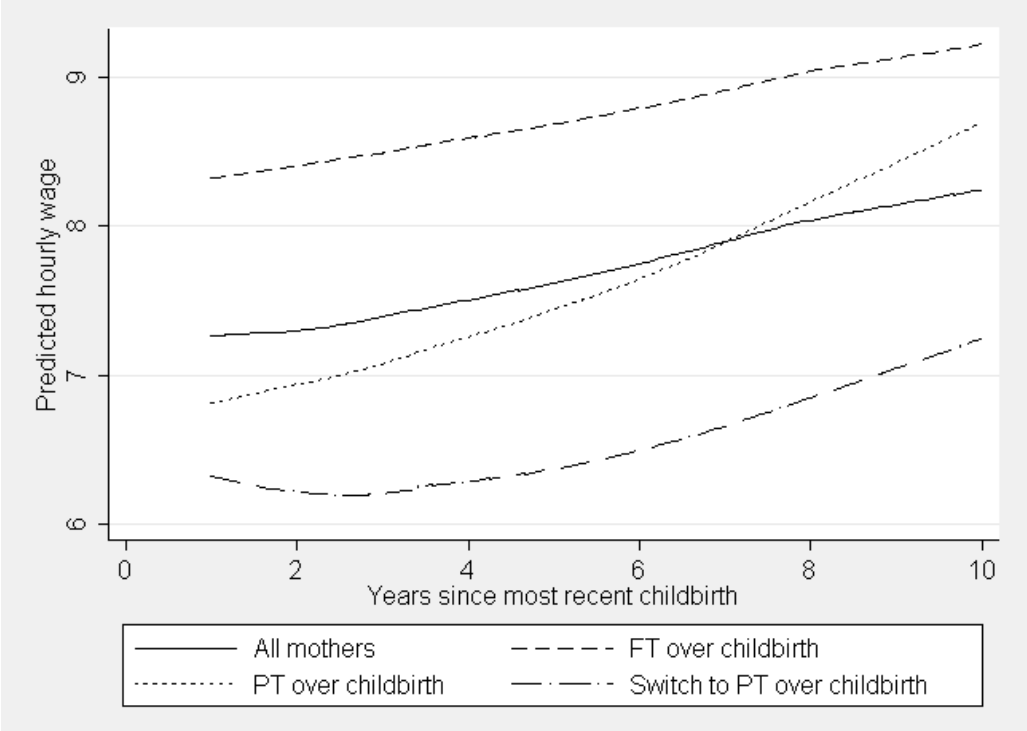
2. The human capital controls are experience in full and part time work and their squared values, tenure and tenure squared and the individual's highest educational qualification. Household and demographic controls are age and it's squared value, whether the individual is white and region of residence. The job characteristics category includes public sector status.

Figure 1 Women's mean real hourly wages



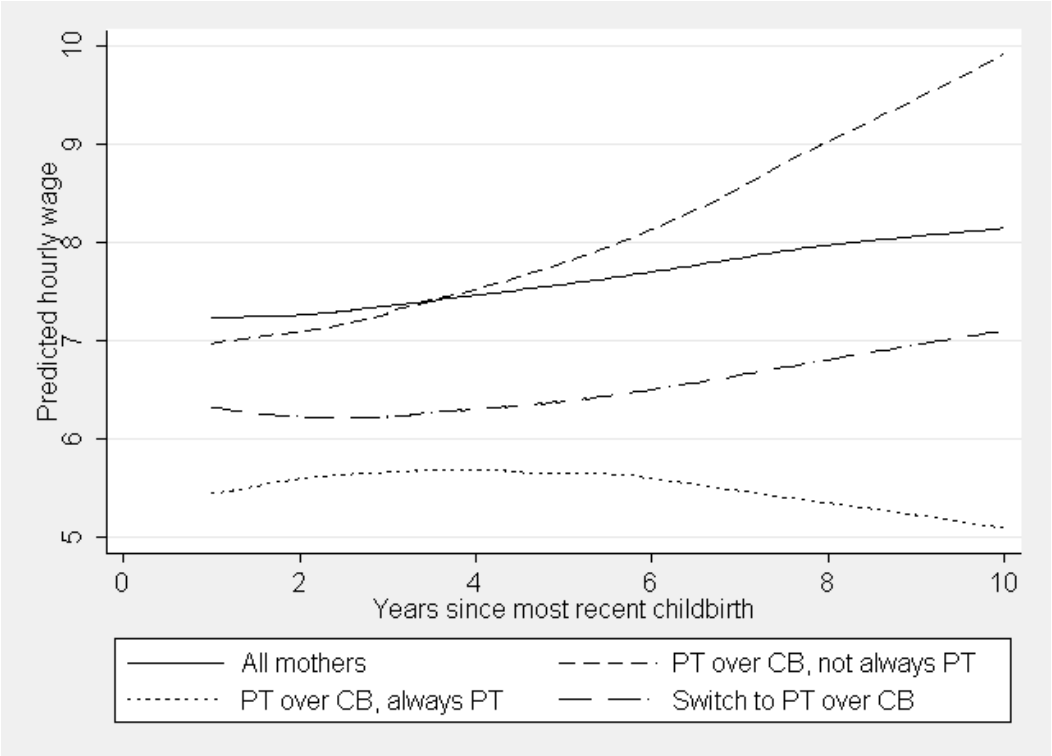
Source: British Household Panel Survey 1991-2006.

Figure 2 Predicted real hourly wages from column 2 of table 4



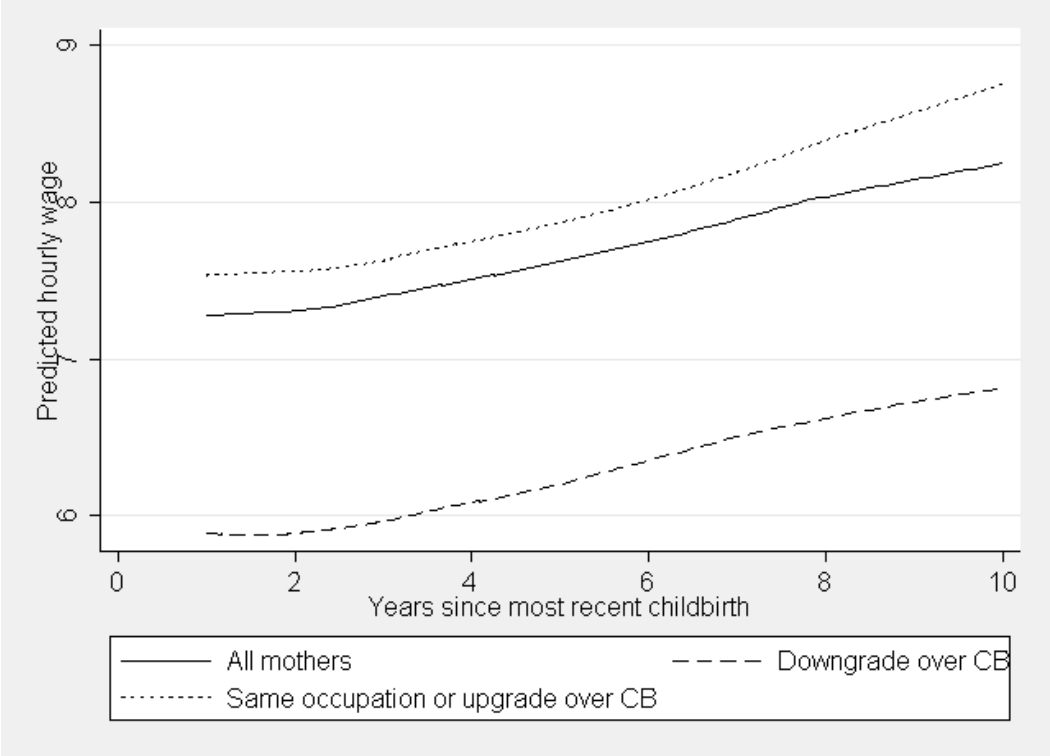
Source: British Household Panel Survey 1991-2006. Locally weighted regressions of the mean yearly predicted wages for each group of mothers on years since childbirth have been computed in order to generate the smoothed variables.

Figure 3 Predicted real hourly wages from column 3 of table 4



Source: British Household Panel Survey 1991-2006. Locally weighted regressions of the mean yearly predicted wages for each group of mothers on years since childbirth have been computed in order to generate the smoothed variables.

Figure 4 Predicted real hourly wages from column 4 of table 4



Source: British Household Panel Survey 1991-2006. Locally weighted regressions of the mean yearly predicted wages for each group of mothers on years since childbirth have been computed in order to generate the smoothed variables.

Appendix 1

Table A 1 Occupational ranking and summary statistics

Ranked Occupation	SOC90 Unit groups	Average Level of Qualification*	Average Level of Qualification**	Average Level of Qualification ***
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	78,246

* 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.

*** Derived using the sample of employed women from the BHPS used in the analysis, as described in section 4.

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 A1.

Appendix 2

Table B1 Probit estimates of the probability of employment (3)

Variables	Selection equation from Heckman procedure used in columns 2 and 3 of table 2	Pooled probit model predicting employment, used to generate inverse Mills ratio used in columns 5 and 6 of table 2
Age	0.221***	0.239***
	(0.024)	(0.024)
Age squared	-0.003***	-0.003***
	(0.003)	(0.003)
One child	-1.070***	-1.021***
	(0.082)	(0.083)
Two or more children	-1.899***	-1.870***
	(0.097)	(0.098)
White	0.105***	0.105***
	(0.035)	(0.035)
Degree	0.758***	0.769***
	(0.115)	(0.117)
A level	0.618***	0.635***
	(0.112)	(0.113)
O level	0.621***	0.638***
	(0.108)	(0.109)
Household income	-0.004***	-0.002***
	(0.001)	(0.002)
Youngest child aged 0-2 years	-0.090	-0.068
	(0.069)	(0.070)
Youngest child aged 3-4 years	0.082	0.063
	(0.072)	(0.072)
Youngest child aged 5-11 years	0.134*	0.109
	(0.080)	(0.080)
North West	-0.039	-0.029
	(0.104)	(0.105)
North East	-0.216	-0.238
	(0.171)	(0.166)
Yorkshire and Humber	0.096	0.116
	(0.115)	(0.115)
East Midlands	-0.203*	-0.166
	(0.105)	(0.106)
West Midlands	0.002	0.031
	(0.112)	(0.115)
East	0.372***	0.415***
	(0.123)	(0.122)
South East	0.094	0.108
	(0.076)	(0.075)
South West	-0.151	-0.124
	(0.103)	(0.103)
Observations	126644	126019

*** 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. All standard errors are robust and correct for an intra-individual correlation.

3. The instruments (age of the youngest child and household income) 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.

Appendix 3

Table C1 Probit estimates of the probability to switch from FT to PT employment (reduced form equation)

Variables	
Married or cohabiting	0.093*
	(0.064)
All other regressors included in column 5 of table 2 (structural equation)	**ü**
Observations	126019

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes:

1. The instrumental variables technique is used in column 5 of table 2 in order to allow for the potential endogeneity of movements in to PT employment. The two-stage GMM method is used in order to ensure efficiency.

2. Two tests are carried out on the instrument (marital status). The first test is the Hansen test of overidentifying restrictions, the result of which is presented in table 2. This tests ensures the validity of the instrument. The second test is an observation of the significance of marital status in a probit regression which predicts the probability to switch from FT to PT employment.

3. Table C1 present the regression coefficient and cluster robust standard error on the marital status variable in this reduced form regression. The result in table C1 shows some evidence that marital status can be used to predict movements in to PT employment.