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ABSTRACT

Maternal Working Hours and the Well-Being of Adolescent Children

This study investigates how maternal working hours are related to various outcomes in children aged 11 to 15 using a sample of mothers and adolescents in the British Household Panel Survey. Research that examines the effects of maternal employment on children has been motivated by the rapid increase of female participation rates in the labour market and increased shares of children living in female-headed or single-mother households. The existing literature on this issue is very limited, mostly based on American data, and provides conflicting results. Fixed effects have been used in the present analysis to control for characteristics of children and families that do not vary over time. The results suggest that full-time maternal employment (as opposed to part-time) has little or no effect on the propensity of adolescents to smoke, their life satisfaction, self-esteem, or intention to leave school at 16. These results are stable and consistent across various specifications of the model and different socio-economic status.

JEL Classification: I10, J13, J22

Keywords: maternal working hours, adolescent well-being, children smoking

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1 Introduction

Adolescence is a phase in which very important changes occur, in many different areas — physical, psychological and emotional. Teenagers often experiment with risky behaviours, such as smoking tobacco and marijuana and drinking alcohol, and their emotional and psychological well-being is easily affected by their life circumstances.

The objective of this study is to understand whether maternal working hours have an effect on the risk of adolescent children smoking, having low levels of psychological well-being, or leaving education at 16, using data from the British Youth Panel. The existing literature on the effects of maternal employment mostly focuses on early childhood, and only a very limited number of studies analyse effects on older children. These studies are mostly based on American data and provide conflicting results.

The well-being of children is currently of major public and government interest in most Western countries. The British Government's 2003 vision for childhood well-being is articulated in *Every Child Matters: Changes for Children* (ECM), a national initiative to build services around the needs of children and young people. The ECM framework identifies five outcomes as important for child well-being: being healthy, staying safe, enjoying and achieving, making a positive contribution and achieving economic well-being.

Research that examines the effects of maternal employment on children has been motivated by the rapid increase of female participation rates in the labour market (in the UK, women labour market participation rate increased from less than 40% in the early Sixties, to 50% in the Nineties and more than 56% after 2000¹) and increased shares of children living in female-headed or single-mother households (the Office of National Statistics in the UK reported that there were nearly 1.5 million lone mothers with dependent children in the UK in 1996 and this figure increased to 1.8 million in 2012).

A great deal of literature in various disciplines examines the consequences of this phenomenon on changes in child-care arrangements and, more generally, in the parent-child relationship. Developmental psychologists generally recognise the primacy of the mother-child relationship, and some interesting recent literature in social sciences has questioned the traditional view that children of working mothers spend less time with their parents now than they did in the past (Bianchi, 2000; Sandberg and Hofferth, 2001; Auhinbauh and Gittleman, 2004). The recent emphasis in welfare policies on promoting parental work underscores the need to investigate the consequences of maternal employment on children and adolescents. As Willis and Brauer (2012) note, the socio-economic context of maternal employment is different from what it was decades ago. For instance, child care is now more readily available (and arguably of higher quality), cultural attitudes about women's work roles have become more egalitarian as women have established rewarding and successful careers, and fathers have assumed more active parenting responsibilities within families.

Most of the existing literature analyses the effect of maternal employment on very young children, and generally shows a deleterious effect during a child's first year (see Harvey, 1999; Goldberg et al., 2008 for reviews; and also Han et al., 2001; Waldfogel et al., 2002; Baum, 2003; Ruhm, 2004; Berger et al., 2005; James-Burdumy, 2005; Joshi and Verripoulou,

¹ See Sorrentino, 1983 and World Development Indicators, 2013 (available at <http://data.worldbank.org/indicator/SL.TLF.CACT.FE.ZS>) for a discussion of female labour force participation in developed countries

2000). Prior research focuses on cognitive development in the first few years of age, paying less attention to possible effects on older children. Whether any effects occur during adolescence is unclear, and most studies on adolescents do not account for the problem of heterogeneous child and family characteristics. Few recent papers in the economic and social science literature analyse the effect of maternal work on older children, but those that do mostly focus on US data and provide conflicting results (Anderson et al. 2003; Aughinbaur and Gittleman, 2004; Loopo, 2004; Gennetian et al., 2008; Ruhm, 2008).

The present study contributes to these gaps in the literature by providing new evidence on the relationship between maternal working hours and different indicators of child well-being, using evidence in recent data from the UK. The indicators comprise the risk of smoking, having low levels of psychological well-being and intentions regarding tertiary education. The paper pays special attention to the different effects by the child's gender, or that which occurs for children from various socio-economic backgrounds (including single-parent families).

The results show that maternal working hours have little or no effect on the risk of children smoking or having low levels of psychological well-being, and a mildly positive effect on the intention to seek further their education after finishing school. Some negative effects are found regarding the risk of low levels of psychological well-being for children from advantaged socio-economic backgrounds, but most of these vanish when an individual's or family's fixed characteristics are taken into account.

The rest of this paper is organised as follows: Section 2 provides some background for this analysis and an overview of the existing literature. Section 3 describes the data and briefly presents some indicators of well-being. Section 4 discusses the estimation methods, Section 5 presents the main results and Section 6 discusses the results and offers some conclusions.

2 Background and overview of existing literature

Full-time maternal employment can affect adolescents' well-being through a variety of different pathways. Mothers who work long hours may have less time to provide emotional support, monitor their child's behaviour and foster their child's involvement in school and recreational activities. Maternal employment may also weaken the social capital in the parent-child relationship, with children being less likely to identify with parental goals and values (Colemann, 1988), while making it more difficult to create social networks within one's neighbourhood (Aughinbaur and Gittleman, 2004). Employed women might be more likely to suffer from role conflict and difficulties with reconciling work and family life (Jacobs and Gerson, 2004; Stone, 2007). Adolescents who do not have a stay-at-home parent are also likely to have greater responsibilities, and the effects of these factors may be positive for some teenagers, but negative for others (Lerner and Ree Noh, 2000). However, maternal work also brings additional income to the family that may be invested in educational and recreational activities (Bianchi, 2000 and Heckman, 2000). These factors may reduce parental stress about financial circumstances, and this could have a positive effect on the parent-child relationship (Guo and Harris, 2000). Some mothers who work long hours may arrange their non-work hours so that the amount of time they spend with their children is not reduced, and a mother who is working could be a positive role model for her children, and thereby may be more likely to promote independence to her children (Aughinbaur and Gittleman, 2004). Recent research also suggests that women's employment is linked to improvements in their physical and mental health (Kostiainen et al., 2009). Therefore, children are more likely to benefit from spillover effects associated with having a mother who is engaged in a rewarding career.

Table 1 provides an overview of the most relevant and recent studies on maternal employment and adolescence in the literature. These studies lead to mixed conclusions. Some research

shows that the well-being of children is harmed by maternal employment (Muller, 1995; Anderson et al. 2003; Loopo, 2005; Gennetian et al. 2008; Ruhm, 2008; Morril, 2011; Sherburne et al. 2009; Morrissey et al., 2011); whereas other studies demonstrate that no negative effects are associated with maternal employment (Harvey, 1999; Vander Ven et al., 2001; Aughinbaugh and Gittleman, 2004; Greve, 2011; Willis and Brauer, 2012;) and that negative effects found in previous studies are either overstated or explained by selection factors such as maternal education and economic background (Harvey, 1999; Willis and Brauer, 2012). Still other papers find positive or mixed effects of maternal employment on child well-being, especially when maternal employment increases family income (Menaghan et al. 2000; Loopo, 2004; Kalil and Ziol-Guest, 2005; Miller, 2008).

Table 1. Summary of the most recent studies that examine the impact of maternal employment on adolescence

Author (in chronological order)	Data	Outcome	Identification strategy	Effect
Muller, 1995	NELS	Mathematics test scores	OLS	Negative effect of full-time work on test scores
Harvey, 1999	US NSLT	Cognitive skills, self-esteem, behaviour	OLS	Minimal or no effect
Menaghan et al., 2000	NLSY	Behavioural problems	OLS	Children of mothers who never worked are most prone to oppositional behavioural problems
Han et al., 2001	NLSY	Cognitive outcomes up to ages 7–8	OLS	Negative effect persists up to age 7–8, but not for ethnic minorities
Vander Ven et al., 2001	NLSY	Delinquency	OLS	Maternal work has relatively little or no influence on delinquency, but does have a slight indirect effect through supervision
Anderson et al., 2003	US NSLY	Obesity	Sibling differences FE and IV: local labour market conditions and welfare reforms	Maternal employment increases the risk of the child's obesity
Aughinbaugh and Gittleman, 2004	NLSY 79	Risky behaviours	Sibling differences fixed effect and IV: variation in child-care regulations; child care workers' wages; welfare benefits levels; welfare reform	No effect for employment in first three years of adolescence
Aizer, 2004	1998 NSLY	Cognitive achievements and risky behaviours	OLS and FE	Children with adult supervision are less likely to skip school, use alcohol or marijuana, etc.

Author (in chronological order)	Data	Outcome	Identification strategy	Effect
Loopo, 2004	US NELS	Teenage childbearing	LPM and school FE	Positive effect for low-income children and negative effect for high-income ones
Loopo, 2005	US NSLY	Risk of spending time at home alone	FE logit model	Children whose mothers work more than 30 hours are more likely to spend time alone home
Kalil, 2005	NLSY79	Psychological and school outcomes	OLS	Adolescents whose mothers lose a job and leave the labour market have poorer psychological outcomes
Gennetian et al., 2008	US — low income	School outcomes	Child FE	Full-time work increases the risk of skipping school, behavioural problems and decreases school performance
Miller, 2008	NLSY	Obesity	OLS	Negative effect at ages 9–11 and positive at 6–8
Ruhm, 2008	US NSLY	Obesity and cognitive development	Maternal work over since the child's birth Sibling FE and PSM	Negative effect for advantaged children
Bishop, 2011	HILDA — Australia	Obesity	IV: average working hours for women in the same industry and local unemployment rate	Part-time or full-time work is associated with children being overweight
Buheler, 2011	NICHD — UK	Mother and family wellbeing	Multivariate analysis of covariance	Mothers working part time show more involvement in the children's school activities
Greve, 2011	Danish data	Obesity	IV: municipal unemployment	Quality of child care explains part of the difference between the results on maternal employment and children being overweight in Denmark and other countries
Morril, 2011	US National Health Interview Survey (NHIS)	Health outcomes	IV: youngest sibling kindergarten eligibility	Maternal employment is associated with adverse health events for school-aged children

Author (in chronological order)	Data	Outcome	Identification strategy	Effect
Morrissey et al., 2011	US NICHHS	BMI of children aged 8–12	RE and child FE	Increasing the total time a mother is employed is associated with an increase in her child's BMI
Willis and Brauer, 2012	NLSY	Individual achievement tests in language and mathematics and behavioural problems	Random and fixed effect	Maternal employment largely is inconsequential to child well-being regardless of birth cohort

As noted in Ruhm (2008) and Aughinbaugh and Gittleman (2004), caution is required when interpreting the results presented in this literature from a causal perspective: mothers who work long hours may have different characteristics from those who work part time, and the decision to work (whether part- or full-time) may be related to other individual or family characteristics that also affect child behaviour. Reverse causation also may affect the results, where maternal working hours are influenced by child outcomes. For these reasons, estimation performed through ordinary least squares regression (OLS) is likely to be biased, although various techniques can be used to correct this issue.

Table 1 also presents the identification strategies used in the existing literature on maternal employment and adolescent well-being. While a substantial number of studies in the literature still rely on OLS estimation, the more sophisticated of these use fixed effects or instrumental variable estimation. Fixed effects allow control for unobserved time-invariant characteristics of the child or the mother (exploiting the presence of siblings in the sample) while providing consistent estimates under the assumption that any correlation between maternal employment and the error term is attributable to a mother- (or child-) specific fixed effect. These models remove the effects of unobserved individual or family heterogeneity that are constant over time; but the results will be biased if, for instance, maternal employment and child behaviour vary because of a time-specific shock. Furthermore, identification of the effect of maternal work relies on intra-individual variations in the outcomes, and individuals with no variation in outcome do not contribute to the identification process.

A few relevant papers in the literature use instrumental variable estimation to correct the above-mentioned issue (see Table 1). Unfortunately, this technique is not a panacea; it will only provide consistent estimates of the parameter of interest if the instruments are correlated with maternal employment but not related to child outcomes (except via the relationship with maternal employment). Furthermore, if the relationship between the instruments and maternal employment is weak, then the estimated coefficients will be biased and inconsistent (Aughinbaugh and Gittleman, 2004). Examples of instruments for maternal employment used in previous studies include local labour market conditions (e.g., the local unemployment rate or average number of hours by industry, as used in Bishop, 2011; Aughinbaugh and Gittleman, 2004; Greve, 2011), family circumstances (e.g., younger siblings' kindergarten eligibility, as used in Morril, 2011); and welfare reforms (as used in Aughinbaugh and Gittleman, 2004). However, violations of the key assumptions abound for most of these instruments, depending on the outcome variables of interest; for example, local labour market conditions are likely to affect the child's psychological well-being and propensity to smoke, and the same is true for family circumstances, especially those related to the presence of

younger siblings. Characteristics of maternal employment, such as the sector or industry of employment and size of company, are also unlikely to be suitable instruments because mothers can self-select into different sectors based on available work hours.

This paper follows the approach proposed by Aughinbaugh and Gittleman (2004) and Ruhm (2008), but provides new evidence based on British data, and employs different indicators of children's well-being (i.e., smoking status, psychological well-being and intentions regarding further education). The results are consistent with Aughinbaugh and Gittleman (2004), and have also been estimated separately for girls and boys, for two subsamples stratified by socio-economic status, and for children living with single mothers.

This study used fixed effects to address the problem of children and families' unobserved heterogeneity. It compares two different versions of the model: the first including a child fixed effect (to allow for the unobservable characteristics of children that may affect the outcomes) and then alternatively including mother fixed effects (to allow for the fact that a mother may have more than one child in the survey and could therefore have some unobserved fixed characteristics that might affect the results). It is very difficult to devise instruments with the power to predict maternal choice of full-time compared to part-time work without having an effect on children's risks of smoking or suffering from low levels of psychological well-being, and the risk of choosing an endogenous or weak instrument is very high. Therefore, this study estimates a range of specifications, adding additional variables to each specification to control for possible sources of heterogeneity, and relies on fixed effects estimation, rather than instrumental variables to test the results. The stability of results across various models is reassuring, and the qualitative pattern of the results is therefore unlikely to be affected.

As with all non-experimental analyses, caution is required in interpreting the causal links of these relationships. Nevertheless, a very rich set of control variables is included, and various sensitivity tests were conducted to confirm the results from the main model.

3 Data

This study uses a sample of all children living with mothers in paid employment in first 13 waves of the British Youth Panel (BYP), from 1994 to 2006. The original British Household Panel Survey (BHPS) sample was 5,050 households containing 9,092 interviewed adults at wave 1 (1991) with a response rate of 74% of eligible households. The sample was a stratified clustered design and was designed to be representative of the British population. The same individuals were re-interviewed every year at the same time of the year (usually September-October) in all successive waves and, if they split-off from original households, all adult members of their new households were also interviewed.

In previous literature, BHPS data have generally been considered unlikely to suffer from any serious bias resulting from attrition, and the sample remained broadly representative of the population of Britain as it changed during the 1990s (Taylor et al, 2006). For example, Nathan (1999) undertook a systematic analysis of the effects of attrition upon the BHPS. He compared responses to those from Census data, the General Household Survey (GHS) and the Family Expenditure Survey (FES), and concluded that cumulative attrition in the BHPS is limited and does not lead to serious bias (see also Taylor, 1994 for a similar analysis and results).

Since 1994, the BHPS has contained a section aimed at children of ages 11–16 in each household. The main advantage of this dataset is that it may be complemented with information from the main BHPS about family circumstances. The BHPS is a nationally representative sample of approximately 5500 households that were recruited in September 1991.

The BYP is a relatively unexplored dataset that contains information directly collected from children regarding a large set of behavioural, psychological and attitudinal outcomes. The analysed sample contains children born between 1978 and 1995 who were between 11 and 16 years old at the interview date. The sample is limited to children who were living with their mother at the interview date. This includes over 8,000 observations of children and 3,000 mother–child groups, including mothers with more than one child in the survey.

Outcomes

In this study, I analyse the impact of maternal working hours on: children smoking, low self-esteem, low life satisfaction and intention to leave education at 16. The choice of outcomes follows the literature (see for example Ermisch et al., 2001) and is also driven by the availability of information in the British Youth Panel: this data set includes various questions on adolescents' outcomes and behaviours, but few of them have been asked consistently in all waves. Therefore, I decided to investigate the effect of maternal hours of work on those particular outcomes, for which information was available in all the 15 waves included in the study.

Smoking among adolescents continues to present a major challenge to the public health community, and the British government has put a great deal of effort into reducing smoking rates among teenagers. WHO statistics on smoking show that approximately one in five young teens aged 13–15 smokes worldwide, and that between 80,000 and 100,000 children worldwide start smoking every day. The evidence shows that approximately 50 per cent of those who start smoking during their adolescent years will go on to smoke for 15 to 20 years. Statistics from Cancer Research UK has shown that trying just one cigarette can make children more likely to start smoking several years later, and that children who smoke often become regular adult smokers. They also suffer immediate health consequences from smoking (such as coughs, increased phlegm, wheezing and shortness of breath) and take more time off school. Today, smoking is known to be the single biggest cause of cancer in the world, and it accounts for one in four cancer deaths in the UK.

The BYP survey asks a variety of questions regarding the smoking behaviour of the child. For the purposes of this study, a child is defined as a smoker if they have smoked at least one cigarette in the last seven days or if they self-categorised as someone who sometimes smokes, but not every week. While there may be obvious concerns about children accurately self-reporting their smoking behaviour, the children's surveys are designed to be fully confidential, with the questionnaire being completed independently by the child using questions taped on a personal headset, rather than given as direct answers to an interviewer.

The BYP contains a rich set of information about adolescents' subjective psychological well-being. This analysis focuses on two indicators of self-esteem and life satisfaction and on children's intentions regarding schooling after compulsory education. This study used a constructed continuous measure of self-esteem combining the following items: 'I feel I have a number of good qualities', 'I certainly feel useless at times', 'I am a likeable person', 'I am inclined to feel I am a failure' and 'At times I feel no good at all' (see Ermisch et al., 2001). Individuals could answer these questions on a scale from 1 to 4, with 1 representing 'strongly agree' and 4 representing 'strongly disagree'. The self-esteem score was calculated by summing up the number of times the child placed themselves in the fairly negative or highly negative category. This measure ranged from 0 to 5, with 5 representing the lowest level of self-esteem. The analysis also used a binary indicator of low self-esteem which was equal to 1 if the continuous measure of self-esteem was greater than or equal to 3. Life satisfaction was measured through the responses to the question, 'Can you describe how you feel about your life?' Answers ranged on a scale from 1 to 7, in which 1 was completely happy and 7 was completely unhappy. To compare results on this indicator with previous scores, a binary

variable was constructed that was equal to 1 for children giving a score greater than or equal to 5. Finally, for each wave, the children were asked whether they intended to leave education when they turned 16.

Maternal employment

This analysis is based on a sample of children living with mothers in paid employment. Thus, the results are conditional on mothers being employed, and the analysis does not compare these children with those who had mothers that were self-employed or out of the labour force. This means that the study does not model the process of mothers' selection into employment. The decision to limit the sample to mothers in paid employment was driven by the fact that self-employed mothers have greater flexibility in choosing their working hours. I have run a few sensitivity analyses that include self-employed mothers or those outside the labour force, and the results of these analyses are similar to those of the main model (see the Appendices tables).

At each wave, individuals were asked about hours usually worked per week in their main job in the BHPS. This information distinguished mothers who worked part-time from those who worked full-time, and estimated three versions of the model, comparing:

- mothers who worked fewer than 25 hours (included) per week with mothers who worked more than 25 hours per week (part-time work compared to full-time work)
- mothers who worked fewer than 30 hours (included) per week with mothers who worked more than 30 hours per week (part-time or long part-time work compared to full-time work)
- mothers who worked fewer than 35 hours (included) per week with mothers who worked more than 35 hours per week (part-time or full-time work compared to long hours of work).

Paternal hours of work were included as a control variable in some sensitivity tests of the model, but these were never found to have an effect on the well-being of children, which is consistent with previous findings in the literature (see, for example, Ruhm, 2008). The present analysis studied the effect of contemporaneous maternal working hours on child outcomes, focusing on the contemporaneous effects of maternal employment on child well-being. A possible extension of this study includes an average of maternal working hours over a child's life.

Other explanatory variables

This analysis exploits the extensive information available in the BHPS, and the choice of regressors follows those used in the literature. Family and child characteristics included in the main model are the child's gender, mother's and child's ages, the mother's education, household non-labour income, the number of children in the household, the mother's smoking habits and the mother's marital status. This analysis also estimates another two versions of the model, including paternal characteristics such as age, education, labour income, smoking habits and additional background characteristics of the mother. All models control for region of residence and year of interview. Table 2 lists the explanatory variables used in the empirical models.

Table 2. Variable definitions

Model 1	
Child	
Age	
Gender of the child	Boy = 1
Mother	
Maternal education	Degree (omitted); higher education (not degree); junior high school graduate (GCSE A*-C) lower high school or other qualification; no qualification
Maternal smoking status	= 1 if the mother is a smoker
Age	
Single mother household	= 1 if the mother is not married and does not live with a partner
Family	
Household non-labour income	Current household non-labour income (in thousand £; base year = 2005)
Number of children in the household	
Region of residence	
Year of interview	
Model 2 (main variables as in Model 1)	
Father's characteristics	
Employment status	Binary variables for: employed; unemployed; out of the labour market
Education	Degree (omitted); higher education (not degree); junior high school graduate (Gcse a*-c); lower high school or other qualification; no qualification
Smoker	= 1 if father is a smoker

Socio-economic status

Following Ruhm (2008), this study evaluates the differential effects for advantaged and disadvantaged youths using a multivariate indicator of socio-economic status constructed by regressing total family income on mother's age at birth, education and marital status. Youths are then ordered by predicted incomes and classified as 'advantaged' if in the upper half of the distribution, or 'disadvantaged' if in the lower half of the distribution. This SES index simultaneously accounts for a larger number of determinants than simple income while removing some sources of endogeneity.

Descriptive statistics

Table 3 presents descriptive statistics for the estimation sample. In this sample, more than one woman in every four worked more than 35 hours per week, and approximately half of the women worked part time. Mothers who worked long hours were more likely to have attended university (49% compared to 35%), have fewer children (1.78 compared to 2.21) and have a

managerial or professional occupation (29% compared to 16%) than those who worked part-time. Children whose mothers worked more than 35 hours per week were less likely to intend to leave school at 16 than those whose mothers worked part time. In the sample under study, children whose mothers worked more than 35 hours per week had lower levels of self-esteem and life satisfaction, and a higher incidence of smoking. These disparities do not necessarily reveal causal effects, and may mainly reflect factors other than maternal employment.

Table 3. Descriptive statistics

Variables	Full Sample		Mothers working part-time		Mothers working >35 hours	
	Mean	Stand. Dev.	Mean	Stand. Dev.	Mean	Stand. Dev.
Maternal working hours	26.4	10.66	17	5.61	38.8	4.00
Part-time work (< 25 hours per week)	0.49	0.50	1.00	0.00	na	na
Long hours of work (> 35 hours per week)	0.27	0.45	na	na	1.00	0.00
N. of children in the household	1.93	0.81	2.07	0.86	1.76	0.75
Child is a smoker	0.12	0.32	0.11	0.31	0.14	0.34
Child has low self-esteem	0.09	0.28	0.08	0.27	0.11	0.32
Child has low life satisfaction	0.04	0.21	0.04	0.19	0.06	0.24
Child intends to leave school at 16	0.11	0.32	0.12	0.33	0.11	0.31
Single mother	0.16	0.37	0.14	0.35	0.18	0.39
Household non labour income (£)	4244	5050	4569	4813	3985	5625
Mother's Education						
High Degree or other higher qualification	0.43	0.49	0.37	0.48	0.49	0.50
Nursing qualification or High School Graduate (GSCE A*-C)	0.13	0.34	0.13	0.34	0.12	0.33
Low high school graduate or other qualifications	0.32	0.46	0.34	0.47	0.29	0.45
No qualifications	0.12	0.33	0.15	0.36	0.09	0.29
Mother is a smoker	0.29	0.45	0.28	0.45	0.33	0.47
Father is a smoker	0.27	0.44	0.26	0.44	0.29	0.45
Father's Education						
High Degree or other higher qualification	0.48	0.50	0.48	0.50	0.47	0.50
Junior High School Graduate (GSCE A*-C)	0.12	0.32	0.12	0.32	0.13	0.33
Low high school graduate or other qualifications	0.25	0.43	0.24	0.43	0.24	0.43
No qualifications	0.13	0.33	0.14	0.34	0.14	0.35

4 Estimation method

In the empirical analysis that follows, the various indicators of children's well-being are modelled as:

$$C_{it} = \alpha + \beta_t H_{it} + \gamma_t X_{it} + \varepsilon_{it} \quad (1)$$

where C_{it} is the outcome variable (risk of smoking; psychological well-being; intentions to leave school at 16) for child i at age t ; H_{it} is a binary variable indicating maternal working hours (and various thresholds in different specifications of the model) at time t ; X_{it} is a vector of other mother and child characteristics at time t ; and ε_{it} is an individual error term, which is assumed to be normally distributed. The variance of the idiosyncratic error term is normalised to be equal to 1.

In general, estimating Equation 1 will not lead to an estimate of the causal relationship between maternal working hours and children's well-being, because mothers who work full time are different from those who work part-time, and both mothers and children have unobserved characteristics that may make a child more (or less) likely to exhibit low levels of well-being. Furthermore, the decision to work short or long hours may be endogenous and related to complex factors, such as those related to marital status, partner's labour force participation or child behaviour.

This study used two different approaches to deal with the problem outlined above. First, it estimated a series of specifications of the model, including additional variables for each specification. It is not possible to control for all sources of heterogeneity, but the pattern of coefficients and stability across various specifications with different variables offers some reassurance about the stability of the main results. Ruhm (2004) uses a similar approach in his analysis of the effects of parental employment on cognitive development, and observes that the results will underestimate the negative effects of parental employment if parents who work full time also have some characteristics that foster child cognitive development. For this reason, this study used panel data methods to control for both person-specific unobserved heterogeneity and observed heterogeneity that is captured by the explanatory factors. The underlying assumption is that an individual, unobserved, time-invariant component of child well-being exists, which can be accounted for by using panel data estimation. Therefore, the estimated model can be written as:

$$C_{it} = \alpha + \beta_t H_{it} + \gamma_t X_{it} + \varepsilon_{it} + c_i \quad (2)$$

where c_i is a child fixed effect that takes into account intrinsic differences in well-being and unobservable time-invariant individual characteristics. To control for the unobserved time-invariant characteristics of the mother, the results from the estimation of Equation 2 are compared with results from the estimation of a model in which c_i is a mother's fixed effect, allowing us to consider the presence of siblings in the sample. Sibling differences fixed effects are not appropriate in this context because the study did not observe enough differences in outcomes among siblings at the same age in different points in time.

Equation 2 was estimated using a linear probability model with child (or mother) fixed effects, and the results are compared with those resulting from the estimation of a linear probability model without fixed effects. The comparison of two models including two different sources of fixed effects (child and mother) allows the verification of the stability of the main results. Similar results were obtained by estimating the model through random effects and correlated random effects. However, these are not presented for parsimony as they do not represent the preferred specification of the model.

Fixed effects are an improvement with respect to LPM, but this method has some limitations. The main assumption underlying this model is that any correlation between maternal employment and the error term is attributable to a child- (or mother-) specific fixed effect, which indicates that the estimates may not be consistent if there are some specific time-varying shocks that affect both maternal employment and child outcomes. However, given the wide set of control variables in the model and the stability of results across various specifications, this is unlikely to affect the qualitative pattern of the results. Furthermore,

identification of the effect of maternal work relies on intra-individual variation in outcomes and an adequate variation in maternal hours of work across time is required to identify the relevant effects. The LPM with fixed effects performs the estimation using a within-group estimator, and the observations with no variations in outcomes do not contribute to the identification process. However, the study used 13 waves of the BHPS data, and sufficient intra-individual variations in outcomes and in maternal hours of work in the sample occur, so this is unlikely to affect the sign and significance of the results.

All the results are conditional on maternal employment status (i.e., mothers who are self-employed or not employed were excluded from the sample).

The results from the present study were analysed separately by gender of the child, socio-economic status and single-mother status. Selection into socio-economic or single-mother status was not modelled, and the results must be interpreted as conditional on belonging to one of the two groups. This indicates that the model does not control for the possibility that unobserved factors simultaneously affect maternal working hours, children's well-being and socio-economic or single-mother status. Additional sensitivity checks were run to control for some of these factors.

To check the stability of the results, the results on the contemporaneous effects of maternal working hours on child outcomes were compared with results from a model that controls for maternal employment since the child was 10 years old. These results are not shown (for the sake of parsimony), but are available on request.

5 Results

The results from the estimation of the effects of maternal working hours on children's well-being are presented in Tables 4-7. A causal interpretation of level and difference estimators relies on very strong assumptions, and it is therefore safest to interpret all of these sets of estimates as suggestive associations, with the fixed effects estimates controlling for more aspects of child and family backgrounds than the level estimates.

Table 6 summarises the effects of maternal working hours on the probability of smoking, low self-esteem, low levels of life satisfaction and intentions to leave school at 16 (see Section 3 for a definition of the outcomes). Estimation is by linear probability model (LPM) and LPM with child or mother fixed effects. Model 1 includes all of the main control variables listed in Table 2. Model 2 also includes the father's characteristics (see Table 2), although the sample size is reduced (approximately 5300 observations compared to 8000 in Model 1) because of the exclusion of children living alone with their mother or with a new partner. A further sensitivity check includes the estimation of a LPM model including all of the covariates in Model 1 and maternal background characteristics, such as grandparent education, maternal district of birth and maternal home environment during childhood. These results are consistent with those presented in the rest of the paper and are available on request. However, these characteristics do not vary over time, and it is therefore not possible to include them in the fixed effects estimations.

The evidence presented in Table 4 implies that more hours of maternal employment do not make a teenage child more likely to become a smoker or have low levels of psychological well-being. An increase of 15 hours of maternal work per week has a limited effect on the child's propensity to smoke (approximately 1 percentage point, p.p.) in the LPM, but the effect vanishes completely when child fixed effects are introduced to the model. Notably, the effect remains present when maternal (rather than child) fixed effects are introduced.

Increasing maternal working hours decreases the child's risk of leaving education at 16, but again, this result becomes smaller and more insignificant when fixed effects are introduced. The size and precision of these effects are consistent with the results presented by Aughinbaugh and Gittleman (2004), and the coefficients are small, with relatively small standard errors. Therefore, the results are unlikely to be driven by imprecision in the estimation or by limited variation in the sample.

Table 4. Effect of maternal working hours on child outcomes — increase by 15 hours per week

Outcomes	Linear probability model	Model 1		Linear probability model	Model 2	
		LPM with child's fixed effects	LPM with mother's fixed effects		LPM with child's fixed effects	LPM with mother's fixed effects
Smoking	0.011 (0.005)*	0.006 (0.005)	0.016 (0.01)+	0.015 (0.006)*	0.006 (0.013)	0.021 (0.012)
Low self-esteem	0.014 (0.005)*	0.007 (0.01)	0.002 (0.009)	0.013 (0.006)*	-0.000 (0.013)	-0.014 (0.012)
Low life satisfaction	0.009 (0.004)*	-0.002 (0.008)	-0.013 (0.007)	0.009 (0.004)	0.000 (0.010)	-0.014 (0.009)
Intend to leave school at 16	-0.011 (0.006)*	-0.015 (0.011)	-0.016 (0.011)	-0.009 (0.007)	-0.009 (0.013)	-0.009 (0.013)
Number of observ.	8012	8012	8012	5547	5547	5547

Table 5. Mother working > 25 hours per week — effect on child outcomes

Outcomes	Linear probability model	Model 1		Linear probability model	Model 2	
		LPM with child's fixed effects	LPM with mother's fixed effects		LPM with child's fixed effects	LPM with mother's fixed effects
Smoking	0.029 (0.009)**	0.025 (0.018)	0.025 (0.016)	0.019 (0.009)*	0.014 (0.016)	0.031 (0.016)*
Low self-esteem	0.019 (0.007)*	0.01 (0.013)	0.01 (0.012)	0.018 (0.008)*	0.01 (0.016)	-0.005 (0.015)
Low life satisfaction	0.01 (0.005)*	0.009 (0.01)	-0.005 (0.009)	0.011 (0.006)*	0.013 (0.012)	-0.009 (0.011)
Intend to leave school at 16	-0.009 (0.008)	-0.001 (0.01)	-0.01 (0.01)	-0.005 (0.009)	0.009 (0.016)	0.008 (0.016)
Number of observ.	8098	8098	8098	5623	5623	5623

Notes: Standard errors (in brackets) are robust to correlation across time for the same households.

+ indicates that the underlying coefficient is significant at 10% level, * at 5% level and ** at 1% level.

Table 6. Effect of long hours of work (> 35 hours per week) on child outcomes

Outcomes	Model 1			Model 2		
	Linear probability model	LPM with child's fixed effects	LPM with mother's fixed effects	Linear probability model	LPM with child's fixed effects	LPM with mother's fixed effects
Smoking	0.017 (.008)*	0.008 (.014)	0.020 (0.0137)	0.024 (0.01)*	0.020 (0.017)	0.029 (0.017)
Low self-esteem	0.035 (0.007)**	0.0157 (.013)	0.015 (0.013)	0.032 (0.009)**	-0.007 (0.017)	-0.013 (0.016)
Low life satisfaction	0.023 (0.006)**	0.008 (0.01)	-0.002 (0.01)	0.023 (0.007)**	-0.009 (0.013)	-0.014 (0.012)
Intend to leave school at 16	-0.003 (0.009)	-0.024 (0.014)+	0.028 (0.014)+	0.001 (0.01)	-0.008 (0.017)	-0.005 (0.017)
Number of observations	8261	8261	8261	5623	5623	5623

Notes: Standard errors (in brackets) are robust to correlation across time for the same households.

+ indicates that the underlying coefficient is significant at 10% level, * at 5% level and ** at 1% level.

Using a linear variable measuring maternal work hours implicitly assumes that each additional hour of work will produce an identical effect on children's well-being. However, various papers in previous literature shown that the effects of maternal employment on child outcomes are non-linear (see Aughinbaugh and Gittleman, 2004; Loopo, 2005a; and Gennetian et al., 2008). This issue was therefore worth exploring further, using an examination of the effect of part-time compared to full-time work. As Harvey (1999) notes, defining variables to describe maternal employment is particularly complicated, and an infinite number of ways exist to formulate the needed categories. Therefore, the results are shown from a model that includes continuous hours of work (Table 4), and this is compared with results from three other different specifications of the model in which hours of work are categorised in various ways (Tables 5 and 6).

This study used two different thresholds to define part-time work. The first was set at 30 hours per week, a level commonly used in the literature (see, for example, Gennetian et al., 2008). This threshold is also used in the BHPS to distinguish part-time and full-time work. The second one is 25 hours per week, which has been used to distinguish mothers with short part-time jobs from the rest of the sample. Results from these two specifications are very similar and only those from the second definition of part-time work are presented.

Table 5 presents results from a model that defines part-time work as constituting fewer than 25 hours per week. The results are consistent with previous findings. No evidence emerges that hours worked during the child's adolescence are related to their risk of smoking or having low levels of psychological well-being.

Results regarding intentions regarding further education are relatively similar to those presented above. No cases occur in which a significant association exists between children's well-being and maternal employment. In the first specification of the model, women who work more are more likely to have a child who smokes or has low self-esteem and low levels of life satisfaction, but these results are not robust to the inclusion of child fixed effects.

Finally, table 6 investigates the effect of very long hours of work on children, and distinguishes mothers who work more than 35 hours per week from the rest of the sample. Little or no evidence of an effect of prolonged maternal absence on child outcomes emerges. Only one case occurs in which the relationship is significant in models with child fixed effects, with the coefficient suggesting a reduced risk of leaving school at 16.

Table 7 presents results from the other independent variables introduced to the model. The risk of smoking increases steadily with age and girls are more likely to smoke than boys. Notably, the risk of children smoking increases with the mother's age, but this risk decreases with family non-labour income. Maternal smoking and single-marital status increase the chances that the child will smoke, but these variables are not significantly different from zero when fixed effects are introduced. The geographical location of the family is also relevant, because children living in the London area were more likely to be smokers than their peers living in regional areas during the study period. Family income also had a protective role regarding low levels of psychological well-being, and boys are generally less likely than girls to experience low levels of life satisfaction or self-esteem. Maternal education and marital status did not play important roles in determining children's psychological well-being.

Table 7a. Results from other independent variables in the Model 1: smoking and low self-esteem

	Outcome: smoking			Outcome: low self-esteem		
	LPM	LPM with child's fixed effect	LPM with mother's fixed effect	LPM	LPM with child's fixed effect	LPM with mother's fixed effect
Age of the child	0.059 (0.003)***	0.261 (0.100)***	0.058 (0.003)***	0.004 (0.002)*	0.047 (0.095)	0.001 (0.003)
Gender of the child — boy	-0.022 (0.007)***	omitted	-0.040 (0.010)***	-0.046 (0.007)***	omitted	-0.044 (0.009)***
Mother's age	-0.001 (0.001)*	0.023 (0.009)***	0.027 (0.009)***	-0.002 (0.001)***	-0.004 (0.008)	-0.004 (0.009)
HH non-labour income	0.005 (0.640)	-1.898 (1.056)*	-0.788 (1.023)	0.635 (0.661)	-0.602 (1.019)	-0.621 (0.974)
Number of children in household	-0.006 (0.005)	-0.006 (0.012)	0.004 (0.011)	0.009 (0.005)**	0.014 (0.012)	0.017 (0.010)
Mother's education						
HND — A level	0.018 (0.011)	0.039 (0.033)	0.038 (0.029)	0.011 (0.010)	0.072 (0.032)**	0.043 (0.027)
CSE	0.013 (0.009)	-0.054 (0.030)*	0.018 (0.027)	0.005 (0.008)	0.008 (0.029)	0.002 (0.025)
No qualification	0.046 (0.014)***	-0.069 (0.068)	-0.027 (0.057)	0.030 (0.012)**	0.045 (0.065)	0.005 (0.055)

	Outcome: smoking			Outcome: low self-esteem		
	LPM	LPM with child's fixed effect	LPM with mother's fixed effect	LPM	LPM with child's fixed effect	LPM with mother's fixed effect
Mother is a smoker	0.042 (0.009)***	0.010 (0.023)	-0.003 (0.022)	0.015 (0.008)*	-0.013 (0.022)	-0.014 (0.021)
Single mother	0.023 (0.011)**	0.034 (0.022)	0.015 (0.021)	0.014 (0.010)	0.025 (0.022)	0.030 (0.020)
Constant	-0.598 (0.049)**	-2.57 (0.70)**	-1.647 (0.325)**	0.126 (0.048)	-0.145 (0.666)	0.279 (0.311)

Notes: See also Table 4.

Region and year binary variables are omitted for parsimony. Results are available on request. Standard errors (in brackets) are robust to correlation across time for the same households

+ indicates that the underlying coefficient is significant at 10% level, * at 5% level and ** at 1% level.

Table 7b. Results from other independent variables in the Model 1: low life satisfaction and intention to leave school at 16

	Outcome: low life satisfaction			Outcome: intention to leave school at 16		
	LPM	LPM with child's fixed effect	LPM with mother's fixed effect	LPM	LPM with child's fixed effect	LPM with mother's fixed effect
Age of the child	0.005 (0.002)***	0.107 (0.071)	0.002 (0.002)	0.012 (0.003)***	0.045 (0.091)	-0.003 (0.003)
Sex of the child — boy	-0.017 (0.005)***	omitted	-0.011 (0.007)	0.085 (0.008)***	omitted	0.086 (0.010)***
Mother's age	-0.001 (0.001)*	0.006 (0.006)	0.004 (0.007)	-0.005 (0.001)***	0.006 (0.009)	0.002 (0.010)
HH non-labour income	-0.536 (0.419)	-1.379 (0.748)*	-0.617 (0.723)	0.040 (0.650)	0.808 (1.018)	0.378 (1.044)
Number of children in household	0.008 (0.003)**	0.003 (0.009)	0.010 (0.008)	-0.014 (0.005)***	-0.009 (0.012)	-0.012 (0.012)
Mother's education						
HND — A level	-0.009 (0.007)	-0.003 (0.023)	-0.006 (0.020)	0.010 (0.011)	0.034 (0.033)	0.027 (0.031)
CSE	-0.010 (0.005)*	0.016 (0.021)	0.027 (0.019)	0.040 (0.009)***	0.017 (0.029)	0.031 (0.028)

	Outcome: low life satisfaction			Outcome: intention to leave school at 16		
	LPM	LPM with child's fixed effect	LPM with mother's fixed effect	LPM	LPM with child's fixed effect	LPM with mother's fixed effect
No qualification	0.002 (0.008)	-0.060 (0.048)	-0.042 (0.041)	0.115 (0.016)***	-0.049 (0.071)	-0.270 (0.060)***
Mother is a smoker	0.005 (0.005)	-0.025 (0.016)	-0.032 (0.015)**	0.045 (0.010)***	-0.032 (0.023)	-0.049 (0.023)**
Single mother	0.011 (0.007)	0.013 (0.016)	0.012 (0.015)	0.009 (0.011)	0.022 (0.023)	0.032 (0.022)
Constant	0.005 (0.030)	-0.836 (0.499)*	-0.095 (0.231)	0.102 (0.055)*	-0.157 (0.648)	0.288 (0.346)

Notes: See also Table 4.

Region and year binary variables are omitted for parsimony. Results are available on request. Standard errors (in brackets) are robust to correlation across time for the same households

+ indicates that the underlying coefficient is significant at 10% level, * at 5% level and ** at 1% level.

6 Sensitivity analyses

This section examines whether the results differ according to the child's gender, socio-economic status and maternal marital status. The results from the sensitivity analyses are not presented for parsimony but are available on request.

The relationship between maternal employment and child well-being is likely to differ by the gender of the child (Gennetian et al., 2007 and Aughinbaugh and Gittleman, 2004). Generally, boys may be more vulnerable than girls to the absence of their mothers, and could therefore be more harmed if their mother works full-time rather than part-time (Han et al., 2001). However, the results do not show significant differences between girls and boys. The coefficients in the estimation of the model for boys are more likely to suggest a negative effect than for girls, but it is rare for these negative coefficients to be statistically significant in the estimation. Long hours of work have a detrimental effect on boys' self-esteem, but this is the only occurrence of a significant effect in the model with fixed effects for children.

The small average effects of maternal employment may mask sharp socio-economic disparities. Differences may arise because of the quality of after-school activities that are available to working mothers according to their socio-economic status, or because of the different effects of the mother's actual presence and her ability to discipline her child, or because of the child's home environment. Following Ruhm (2008), the sample is split by the socio-economic status of the family (see section 3 for a detailed explanation of the SES indicator). As with the regressions by gender, the results by socio-economic status show no evidence of a relationship in most cases, although it may be interesting to know which group is driving the results.

The negative association between maternal employment and smoking or low levels of psychological well-being is concentrated among children with advantaged socio-economic status. These results are consistent with the findings of Ruhm (2008) and with several other recent studies (Ruhm, 2004; Loopo, 2004) that provide evidence showing that high-SES children are particularly disadvantaged by maternal employment. An increase of 15 hours per week in maternal employment is estimated to increase the risk of low self-esteem for advantaged children by approximately 2 p.p. in the model with child fixed effects. However, as noted above, in most cases, the evidence is limited that full-time work is significantly more influential than part-time work when fixed effects are introduced to the model. Interestingly, long hours of maternal employment are associated with a reduction in the likelihood that disadvantaged children will leave school at 16.

As a final sensitivity test, the results were split by maternal marital status. The separate analysis of results for single-mother households is clearly of interest. When a single parent works, there is no other parent to look after the children, and a lack of financial resources may limit the usage of alternative after-school activities. Conversely, the improvement of economic well-being through increases in income, and the decrease in maternal stress arising from financial circumstances, may be greater for single mothers than for partnered women. Therefore, it is very hard to state *a priori* whether maternal full-time employment is more beneficial or detrimental for single mothers' children. Generally, the relationship between hours worked by a single mother and child outcomes is not significant. Notably, increasing maternal working hours (or full-time compared to part-time) decreased the chances that children will smoke or suffer from low levels of psychological well-being, but the coefficients are always very small and insignificant.

Finally, I estimated a model in which non-working mothers have been included in the sample. As previously explained, this is not a preferred specification, because this study does not try to model maternal selection into employment. Additionally, the results presented in tables 6–10 give a cleaner interpretation, being conditional on maternal working status. However, the results are very stable across various specifications, and children whose mothers do not work do not present with significant differences regarding the risks of smoking, suffering from low levels of psychological well-being or intending to leave school at 16.

7 Conclusion and discussion

This paper investigates the relationship between maternal working hours and the well-being of adolescent children, and analyses various indicators of children's well-being, particularly focusing on the risk of smoking, psychological well-being and intentions regarding further education. Existing economics literature mostly focuses on the effect of maternal employment on very young children, and the literature on maternal work and adolescence is limited, is mostly based on American data, and provides conflicting results.

The study uses data from the BYP and the BHPS, and the analysis is limited to children living with the mother in paid employment. Following Ruhm (2008), the study distinguishes between children on the basis of their socio-economic status, and separately analyses the effects on youths from advantaged and disadvantaged backgrounds, including single-mother households.

Using various approaches, very little evidence exists that is consistent with the hypothesis of a strong association between maternal long working hours and the risk that children will smoke, suffer from low levels of psychological well-being or intend to leave school at 16. These

results are consistent with the findings in Aughinbaugh and Gittleman (2004), which show that maternal employment is not related to an increase in adolescents' risky behaviours.

Various reasons can explain this result. First, the assumption that maternal employment significantly reduces the time that parents spend with their children may not have strong empirical foundations. Bianchi (2000) provides a thoughtful discussion of various reasons why the increase in maternal labour force participation has not led to large changes in the amount of time that parents spend with their children. Working mothers may be able to spend less time in other household activities, such as cooking or cleaning, and those with flexible working schedules may be able to organise their work around their children's school and after-school activities. Finally, men are more involved in child rearing than they were in the past, which may have a separate, positive effect on children.

The results indicate that maternal full-time employment during adolescence is not harmful regarding certain specific indicators of children's well-being: the risk of smoking, low levels of psychological well-being or intention to leave school at 16. One possible explanation is that a mother's ability to discipline and monitor her child is not reduced by the fact that she spends more time outside the house, and that the positive effects of working (such as promoting child independence and being a positive role model) may offset the negative effects of her absence. Furthermore, many other factors are likely to have a strong influence on a child's behaviour and well-being, such as peer pressure, peer behaviours, neighbourhood, the presence of siblings and so on. Maternal presence is only one aspect of the family background, but other elements, such as the quality of the mother-child relationship, or the role of the father, may be more important. Other elements outside the family, such as the neighbourhood, community and school, are also likely to play a key role in determining adolescents' behaviour and well-being.

This analysis addresses a very important point that previous research only studies in a limited capacity. As with all empirical analyses, this study has some methodological caveats, and further research is required to supplement these results. Further studies may complement this research by looking at other indicators of children's well-being, such as health outcomes or school performance. However, these results are an important starting point for discussing the implications of welfare policies aimed at increasing labour force participation among women, especially in disadvantaged socio-economic backgrounds.

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