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RESEARCH ARTICLE

Mothers' employment and child behaviour: new evidence for Scotland

*Marita Jacob, marita.jacob@uni-koeln.de
University of Cologne, Germany*

*Michael Kühhirt, michael.kuehhirt@uni-koeln.de
University of Cologne and Goethe University Frankfurt, Germany*

Given increasing maternal labour-market participation in many European countries, there is an ongoing scientific and public debate on the potential consequences for children's development. Previous research has used both cross-sectional measures of maternal employment at a particular age of the child and measures capturing maternal employment history. Whereas the former approach cannot capture the cumulative impact of maternal employment on developmental outcomes, studies following the second approach have so far not accounted for the possibility that mothers may repeatedly change their labour-force participation in response to their children's development or other dynamic context factors that are themselves affecting developmental outcomes.

The present study combines statistical techniques that can account for time-varying confounders with cumulative measurement of maternal employment to investigate its link with children's behavioural problems around age eight. In addition, our study explores whether the effect of maternal employment history differs by mothers' education. Using data from the Growing Up in Scotland study, we find that children's behavioural problems around age eight are the less pronounced the more years their mothers have worked full-time or part-time. However, these associations reduced in size once we adjusted for potential confounders and they do not significantly differ between mothers with and without a tertiary degree. These results suggest that the association between maternal employment history and behavioural problems around age eight is mostly driven by confounding factors such as maternal education, child health and socio-economic status.

Key words maternal employment • socio-emotional development • child behaviour • Scotland

Key messages

- The study investigates the link between maternal employment history until age 6 and children's behaviour around age 8.

- It accounts for interdependencies with other family characteristics like economic resources, maternal health and family structure.
- The analyses provide no strong evidence either for a substantive positive nor negative effect of maternal employment history.

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Introduction

Whether and in what respects maternal employment affects child outcomes has been the subject of much research and controversial public debate, particularly maternal employment before the child's school entry. On the one hand, maternal employment may negatively affect child development because employed mothers have less time to spend with their child and, in addition, they may be more stressed than non-employed mothers. On the other hand, increased family income and satisfaction derived from work may have positive effects (Heinrich, 2014).

These concerns stand against the background of considerable maternal labour-market participation in many European countries. For example, in Scotland, which we examine in this paper, the employment rate of mothers with dependent children was 77% in 2019 (Office for National Statistics UK, 2019). For children born in 2004/05 and 2010/11 about 60% of mothers with children aged ten months were in paid work, and well over 60% of mothers with children at age three, and the share of employed mothers further increases with the child's age (Knudsen et al, 2017: 25).

Empirical evidence on the association between maternal employment and child development is mixed. Until very recently, most empirical studies applied a static approach, examining maternal employment and child outcomes at a particular point in time. For example, many studies focused on maternal employment in the first, second or third year after birth and child outcomes at a later age (for instance, for the UK, Cooksey et al, 2009; Verropoulou and Joshi, 2009; Lekfuangfu et al, 2015). However, child development is the outcome of a cumulative process and snapshot measurements cannot adequately capture the full impact of maternal employment unless we assume that it is stable over time. This is particularly problematic as child development and maternal employment might be interrelated (Nes et al, 2014; Hope et al, 2017). In addition, when analysing maternal employment and child development, the observed association might be biased due to the omission of (time-variant) confounding factors that are related to both maternal employment and child outcomes, such as partnership status, household income or number of siblings in the household (for a review, see Gregg et al, 2005).

In our paper, we contribute to research on the link between maternal employment and child behaviour in three ways. First, we use longitudinal data that allows us to disentangle the dynamics of mother's employment and child development as both develop over time. Hence, we extend previous cross-sectional research as we evaluate child outcomes as a cumulative consequence of mothers' employment history. Second, we use statistical techniques that can account for interdependencies

between maternal employment and factors potentially affecting both mother's labour-market participation and child outcomes. Third, we compare children with differently educated mothers assuming that working in low-skilled occupations or stressful working conditions is more likely to be experienced by women with low educational attainment. In this regard, studying the heterogeneous effects of maternal employment on child behaviour may shed light on processes of cumulative (dis-)advantages in a very early phase of life.

For our empirical analyses we use data from Growing Up in Scotland (GUS) and focus on behavioural problems at age eight, assuming that child behaviour and socio-emotional development is crucial for success in school and later life chances. Regarding information about mothers, the GUS data provide yearly information on mothers' employment allowing a dynamic model of mothers' employment histories from ages one to six years. We apply inverse probability of treatment weighting to control for time-variant confounders that may partially mediate the effect of maternal employment on child's socio-emotional functioning.

Theoretical considerations and previous research

Maternal employment and children's socio-emotional development

There are a number of mechanisms through which maternal employment may affect children's socio-emotional development, some suggesting a positive and others a negative effect (Heinrich, 2014). On the one hand, maternal employment may be harmful for children due to the reduced time that mothers can spend with their child compared to non-working mothers. Maternal care itself might also be affected if employment causes stress or affects a mother's health and thus parenting quality. Hence, mothers' long working hours, limited flexibility in work schedules or a heavy workload may have an adverse impact on children's socio-emotional development and behaviour. In addition, dual-earner couples may have higher risks of conflict and relationship dissolution that may also lead to behavioural problems in children.

On the other hand, maternal employment may have a positive effect on child outcomes for two reasons. First, maternal employment increases family income which in turn may add to a beneficial home environment for the child. Higher income may even allow to a mother to spend more time with the child if domestic services can be purchased. Second, satisfaction derived from work may also have positive consequences for the quality of maternal childcare. Hence, it is theoretically unclear whether maternal employment has a positive or negative (net) effect on children's socio-emotional development.

Furthermore, the effect of maternal employment may differ depending on mothers' socio-economic backgrounds. For example, if highly educated mothers are able to provide a more stimulating environment for their children, the mothers' absence might be more harmful but, at the same time, these mothers may gain more satisfaction from their work than less educated mothers, who are more likely to work in less favourable working conditions. Vice versa, for mothers with lower education, the additional income may allow them to significantly improve the family income.

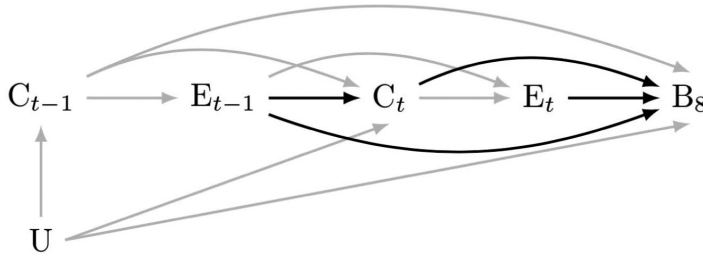
Previous research: cross-sectional and longitudinal approaches

Many previous studies applied a point-in-time approach focusing on *maternal employment during the first year after birth* assuming that the first year is particularly important for a child's development. These studies have revealed mixed empirical evidence. For the UK, [Joshi and Verropoulou \(2000\)](#); [Cooksey et al \(2009\)](#) and [Lombardi and Coley \(2017\)](#) found no significant association between early maternal employment and behavioural outcomes neither for children born in 1970 in the British Cohort Study ([Joshi and Verropoulou, 2000](#); [Cooksey et al, 2009](#)) nor for children born in 2000–01 in the UK Millennium Cohort Study ([Lombardi and Coley, 2017](#)). In contrast, the analyses of [Huerta et al \(2011\)](#), using the same data as [Lombardi and Coley \(2017\)](#), indicate that children of mothers who returned to full-time work during the first six months after birth had a greater risk for conduct problems at ages four and seven and attention problems at ages six and seven compared to children whose mothers were not employed during the first year after birth.

Empirical evidence regarding this association for *maternal employment after the first year* following birth for children in the UK is also mixed, ranging from negative to positive associations. For example, the results of [Lekfuangfu et al \(2015\)](#) of children born in 1991 and 1992 in the Avon area of the UK indicate that early maternal employment is not consistently associated with emotional outcomes of children. Only children whose mothers were in full-time employment at the 18th month showed worse behavioural outcomes at later ages. In addition, these unfavourable working circumstances accumulate in single-mother and low-income families. Other studies also cast doubt on a negative association between maternal employment in early childhood and child behaviour. The aforementioned study of [Joshi and Verropoulou \(2000\)](#) even found a positive association in early childhood. Maternal employment when the child was aged one to two, or three to four, years had a small positive association with socio-emotional outcomes. These results are confirmed in a later study by the same authors showing that mother's work when the child is aged one to four has a strong and positive association with non-aggression and non-anxiety measures of the child ([Verropoulou and Joshi, 2009](#)). A positive association of maternal employment and children's socio-emotional outcomes is also reported by [Fiori \(2020\)](#) focusing on children of lone mothers born in 2004–05 and 2010 in the GUS data. For children of lone mothers, maternal employment at age three is beneficial for the socio-emotional well-being of the child at age five which is partly due to higher income and psychological well-being of employed mothers.

Finally, *cumulative employment of mothers during early childhood* has been examined in several studies. [Hope et al \(2014\)](#) counted maternal employment at four different ages of the child (nine months, three, five and seven years) using the Millennium Cohort Study. Children from families in which no parent was employed for one or more sweeps were at a greater risk of socio-emotional problem behaviour compared to those in which a parent was continuously employed. With the same dataset, [McMunn et al \(2012\)](#) found that cumulative labour-market participation of mothers in early childhood was not associated with children's socio-emotional behaviour at age five. However, looking at different family structures, full-time maternal employment was associated with increased behavioural difficulties among children of lone mothers but not those of married mothers. Dynamic (panel) analysis with *monthly or yearly observations of mothers' employment* have been mainly conducted with US and Australian data. According to the results of [Salimiha et al \(2018\)](#), Australian

Figure 1: Hypothesised causal relations between maternal employment (E), behaviour at age eight (B), measured confounders.



children of employed mothers show better socio-emotional outcomes than children of non-employed mothers, in particular for internalising behaviour. [Dunifon et al \(2005; 2013\)](#) point out that their dynamic approach leads to different conclusions from previous cross-sectional analyses in the US, that is, no significant negative association between maternal employment and child behaviour problems, even for non-standard work, shift work or long working hours. However, the data used by Dunifon and colleagues differ from most of the UK cohort studies as they use a survey of women (and their children) from a birth cohort study of children born to predominantly low-income and single mothers. Using the same data on children in disadvantaged families, [Pilkauskas et al \(2018\)](#) focused on stability of maternal employment from birth to age five and found that stability in maternal employment was associated with less externalising behaviour.

Current study

Previous analyses used either cross-sectional measures of maternal employment at a particular age of the child or measures capturing maternal employment history, such as stability of employment and number of weeks or years worked during early childhood. Whereas the former approach cannot capture the cumulative impact of maternal employment on developmental outcomes (without assuming employment status is stable throughout early childhood), studies following the second approach have so far not accounted for the possibility that mothers may repeatedly change their labour-force participation in response to their children's development or other dynamic context factors that are themselves affecting developmental outcomes.

[Figure 1](#) illustrates that this is problematic as potential time-varying confounders such as family income, maternal health or number of children may lead to a spurious association between maternal employment history and later child behaviour. At the same time, it is theoretically plausible that these factors may mediate part of the effect of earlier maternal employment on child behaviour. For example, the number of children in the household may affect current employment status ([Baranowska-Rataj and Matysiak, 2016](#)) and children's development ([de La Rochebrochard and Joshi, 2013](#)), thus acting as a confounder at one time point. But there is also evidence of an influence of women's employment on fertility ([Matysiak and Vignoli, 2008](#)), which renders number of children a mediator of the effect of previous maternal employment on child outcomes. Therefore, controlling for the number of children and other time-varying characteristics acting in this way in a standard regression framework would

control away some of the effect of interest, potentially leading to underestimating the association between maternal employment history and child behaviour. Moreover, including time-variant confounders may also induce a spurious association between maternal employment and child behavioural problem via additional (unmeasured) common causes of these time-variant confounders and child outcomes (that is, endogenous selection bias, see [Elwert and Winship, 2014](#)).

In this study, we follow a recent approach in the child development literature (for example, [Sampson et al, 2008](#); [Wodtke et al, 2011](#); [Wodtke, 2013](#)) that combines cumulative measurement with statistical techniques that can account for time-varying confounders ([Robins and Hernán, 2009](#)). This approach has been used to analyse the link between maternal employment history with Scottish children's cognitive ability at age five ([Kühhirt and Klein, 2018](#)) and children's overweight in Germany ([Kühhirt, 2020](#)) but not behavioural problems. In addition, our study explores whether the association of maternal employment history differs by mothers' education after adjusting for other time-constant and time-varying confounders.

Methods

Data and sample

For our empirical analyses, we need data on children that include repeated measures of maternal employment, information on children's behaviour, and variables that capture the most important time-constant and time-varying confounders. These requirements are met in Birth Cohort 1 of the GUS study ([ScotCen Social Research, 2019](#)), a representative panel that includes children born between June 2004 and May 2005 and living in Scotland at the time of sampling. The first wave of data collection for this cohort took place when children were around ten months old. Subsequent waves were conducted annually until children were six years old and then biannually for older ages ([Anderson et al, 2007](#)). In our study, we used information from the first seven waves.

We restricted our analytical sample to children of mothers who were born in the UK, were 20–39 years at the birth of the child, were the respondent in the first wave of data collection, and had ever worked before the first survey. The resulting 4,112 children made up 79% of the full sample. We followed these child until the seventh wave of data collection (around age eight) when behavioural problems were measured. Any children that dropped out of the study for at least one year, had any missing values on the relevant variables, or whose mothers stopped being the primary respondent was classified as lost to follow-up. Any analyses of the association between maternal employment and behavioural problems were based on the remaining 1,942 children. In comparison to the original restricted sample in the first wave, the final sample, on average, contains more children with highly educated mothers (51% vs 42%) and with mothers who worked during pregnancy (82% vs 76%). Moreover, the final sample displays a higher proportion of planned pregnancies (71% vs 64%) and births to mothers in their 30s (63% vs 55%). We addressed selectivity in the loss to follow-up by using panel attrition weights as described later.

Variables

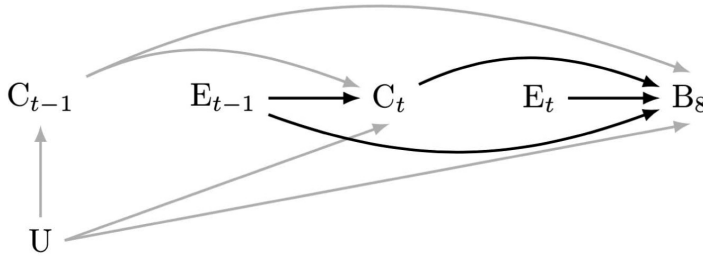
As main outcome, we are interested in children's behavioural problems. In waves 5, 6, 7 and 8, GUS collected mothers' responses to the *Strengths and Difficulties Questionnaire* (SDQ) (Goodman, 1997), one of several instruments for measuring children's socio-emotional and behavioural development. In the UK, several studies have used the scale to study children's behaviour (Gutman et al, 2019) and its link to maternal employment (for example, Cooksey et al, 2009; McMunn et al, 2012; Lekfuangfu et al, 2015; Lombardi and Coley, 2017; Fiori, 2020).

The SDQ consists of 25 items regarding social, behavioural and emotional functioning of the child. For each item, the respondent (in this case, the mother) was asked to indicate whether the statement holds 'not true' (0), 'somewhat true' (1) 'certainly true' (2) for their child over the past six months. Table A1 in the Appendix lists the SDQ-items used in GUS. The SDQ can be divided into five subscales, each consisting of the responses to five items. These subscales capture emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems and prosocial behaviour. Because our focus was on behavioural problems, we only used the first four subscales. To ensure the correct time order of our main variables, we focused on these subscales around age eight in our main analyses. We conducted additional analyses for behavioural problems at age ten that are shown in the Appendix (Figures A1 and A2).

Our key independent variables were based on mothers' self-reported employment status at each of the first six interviews (at around 10, 22, 34, 46, 58 and 70 months) as full-time employed, part-time employed or not working. From this information we constructed two variables counting the years in full-time employment and part-time employment, respectively, during the first six years after the birth of the child. If both variables take on the value zero, this indicates a mother was non-working in the first six years after birth. In our final sample ($n = 1,942$), there are 261 children whose mother never worked across the six waves of data collection. For 159 children, the mother reported constant full-time employment and for 282 children constant part-time employment. For 462 children (24%), one change in maternal employment status was recorded and for 435 (22%) two changes. Some 343 children (18%) experienced three or more changes in their mothers' employment status.

As control variables, we focused on potential common causes of maternal employment in a given year and child behavioural problems around age eight. On the one hand, there are time-constant factors such as child's sex, low birth weight (< 2.5 kg), medical treatment during pregnancy, and whether the child attended a special care unit or a neonatal unit. We also accounted for parents' intention regarding pregnancy ('planned', 'not really planned', 'not planned at all'), mothers' age at birth ('20–29' vs '30–39', provided by GUS as categorical variable only), mothers' education at first interview ('below ISCED 3', 'ISCED 3C', 'ISCED 3A', 'ISCED 5A/B'), and whether the mother worked during pregnancy. In addition, we included time-variant factors that may at one point in time affect mothers' employment and at a subsequent point in time be influenced by earlier maternal employment status. These were the number of siblings living in the household ('none', 'one', 'two or more'), an indicator combining marital status and partners' education ('no partner', 'cohabitation with a partner with upper secondary education or below', 'cohabitation with a partner with postsecondary qualification or above', 'married with a partner with upper secondary education or below', 'married with a partner with postsecondary qualification or

Figure 2: Hypothesised causal relations between maternal employment (E), behaviour at age eight (B), measured confounders.



above’), maternal health and child health both measured by indicators of whether the mother reported that she and the child were not in good health (‘fair’ and ‘poor’ vs ‘excellent’, ‘very good’ and ‘good’), respectively. We used household income, a dummy for homeownership, the SIMD quintile in which the current residential area was located, and an indicator on whether the family lived in an urban area (defined as population $\geq 10,000$) to cover economic resources and opportunities. To account for possible reverse causality between child development and maternal employment we also included an indicator for whether the mother was concerned about the focal child’s development in a given year.

Statistical analyses

Our core analyses estimated the associations between years of full-time and part-time maternal employment and the four SDQ subscales. We first estimated these associations without adjusting for any covariates (but correcting for selective loss to follow-up using attrition weights). Second, we estimated four weighted least squares regressions of the respective SDQ subscale on the maternal employment measures and the time-constant control variables. Instead of explicitly controlling for time-varying covariates in these models, we used inverse probability of treatment (IPT) weighting to create a pseudo-population in which maternal employment status at a given time point is independent of time-variant confounders (Robins and Hernán, 2009). Figure 2 depicts the resulting causal relations in the pseudo-population with the causal arrows from time-variant confounders to maternal employment deleted while the other causal relations remain intact. After weighting, the number of children and other time-varying characteristics, like household income or maternal health, are independent of subsequent maternal employment status. This removes any confounding by these variables and at the same time avoids controlling away the indirect effect of maternal employment through subsequent number of children, maternal health and other time-varying factors, as these characteristics are not explicitly included when modelling the association between child outcomes and maternal employment.

The pseudo-population was created by reweighting each child with the stabilised treatment weight,

$$sew_{6i} = \prod_{t=2}^6 \frac{P(E_t = e_{it} | E_{(t-1)i}, E_{1i}, C_{1i})}{P(E_t = e_{it} | E_{(t-1)i}, E_{1i}, C_{(t-1)i}, C_{1i})}, \quad (1)$$

that is, the ratio of the probability that the child experiences the observed maternal employment status at time t conditional on previous maternal employment status, maternal employment status at baseline and covariates at baseline and the same probability conditional also on time-variant covariates at time $t-1$ multiplied over years two to five. Consequently, children with covariate histories over-represented in the current maternal employment status are given less weight, whereas children with less frequent covariate histories receive a higher weight, so that confounders in the previous year, $t-1$, are equally distributed among all values of maternal employment status at any time t after reweighting. Because both probabilities are unknown, we estimated them using multinomial logistic regression (Fewell et al, 2004).

In addition to stabilised IPT weights, we estimated stabilised inverse probability of attrition (IPA) weights,

$$saw_{6i} = \prod_{t=2}^6 \frac{P(A_t = 0 | A_{t-1} = 0, E_{(t-1)i}, E_{ti}, E_{1i}, C_{1i})}{P(A_t = 0 | A_{t-1} = 0, E_{(t-1)i}, E_{ti}, E_{1i}, C_{(t-1)i}, C_{1i})}, \quad (2)$$

to correct for non-random loss to follow-up in our data (Robins et al, 2000). Analogous to the procedure described for IPT weighting, reweighting renders loss to follow-up independent of measured time-variant covariates; it creates a pseudo-population in which attrition occurs at random with respect to these covariates. We estimated the necessary probabilities using logistic regression models and incorporated the resulting IPA weights by multiplying them with the IPT weights from Equation 1 (Fewell et al, 2004) and the sampling weights provided by GUS.

Causal interpretation of our estimates rests on the strong assumptions of no unmeasured confounding, positivity, and correct parametric specification of the weight models and the outcome models. The assumption of no measured confounding was represented in both Figures 1 and 2 in that none of the unmeasured characteristics directly affected maternal employment status at any time. It cannot be tested empirically and its plausibility depends on whether all or, more realistically, most theoretically relevant confounders were measured and included in the analyses. Positivity demands that a comparison of 'like with like' be feasible by requiring a non-zero probability to experience each possible maternal employment status within any combination of covariate values. Our weight with a mean value around 1 and a moderate standard deviation provided no evidence for violations of positivity and mis-specification of the weight models (Cole and Hernán, 2008).

We then compared the resulting estimates with associations obtained from models that explicitly controlled for time-varying covariates by including their averages over the first six years after birth and from models that only controlled for time-constant covariates. While the first alternative model faces the risk of controlling away part of the effect of maternal employment mediated by time-varying covariates such as maternal health or family structure, the second alternative model is likely biased by confounding.

Results

Sample description

Table 1 contains descriptive statistics for time-invariant characteristics in the sample of children not lost to follow-up until age 8 ($n = 1,942$). All four SDQ subscale scores can vary between 0 and 10. Hyperactivity/inattention has by far the highest average

Table 1: Descriptive statistics for time-constant characteristics in the sample

	Full sample		Never worked	Always PT	Always FT
	M/%	SD	M/%	M/%	M/%
SDQ subscale scores at age 8					
Emotional symptoms	1.37	1.66	1.75	1.11	1.25
Conduct problems	1.33	1.41	1.62	1.31	1.21
Hyperactivity/inattention	3.25	2.47	3.68	3.03	3.24
Peer problems	0.98	1.43	1.39	0.76	0.91
Years full-time employed age 1 to 6	1.35	2.03	0.00	0.00	6.00
Years part-time employed age 1 to 6	2.73	2.23	0.00	6.00	0.00
Child is male	0.51		0.51	0.52	0.49
Child in special care unit or neonatal unit	0.09		0.10	0.06	0.12
Low birth weight (< 2.5 kg)	0.04		0.05	0.03	0.03
Medical attention during pregnancy	0.37		0.37	0.31	0.38
Pregnancy intention					
Planned	0.71		0.62	0.75	0.70
Not really planned	0.13		0.17	0.13	0.14
Not planned at all	0.16		0.21	0.12	0.16
Mother aged 30–39 at birth (vs 20–29)	0.63		0.59	0.72	0.77
Mother's education level at birth					
Below ISCED 3	0.04		0.10	0.04	0.01
ISCED 3C	0.23		0.35	0.21	0.19
ISCED 3A	0.22		0.20	0.23	0.19
ISCED 5A+5B	0.51		0.34	0.52	0.60
Mother worked during pregnancy	0.82		0.36	0.97	0.98
N		1,942	261	282	159

Note: Statistics pertain to children who have been continuously observed until age eight.

score ($M = 3.25$, $SD = 2.47$) and peer problems the lowest ($M = 0.98$, $SD = 1.43$). The values for emotional symptoms ($M = 1.37$, $SD = 1.66$) and conduct problems ($M = 1.33$, $SD = 1.41$) are in between. On average, the children's mothers were full-time employed for 1.35 years and part-time employed for 2.73 years between the child's birth and around age six. Boys make up a little more than half of the sample. Low birth weight and stays in a special care unit or a neonatal unit were rare, each in below 10% of the cases. Medical attention during pregnancy, however, was common. Most pregnancies were reported as planned but almost one third were not (really) intended. The mothers of most children in our sample were in their 30s at birth and were employed at some point during pregnancy. Mothers of around half of the children in the sample had a tertiary degree (ISCED 5A+5B).

Table 1 also includes descriptive statistics for select groups of children whose mothers never worked in the six years after birth and those whose mothers always worked part-time (PT) or full-time (FT). It can be seen that children of mothers who never worked display the most behavioural problems, on average, followed by children of mothers who always worked full-time. In terms of covariates, children whose mothers never worked are more likely to come from an unplanned pregnancy and to be born to mothers in their 20s. They are, however, much less likely to have a mother who is highly educated and who has worked during pregnancy. This group

Table 2: Descriptive statistics for time-varying characteristics in the sample by child's age

	Age					
	1	2	3	4	5	6
Maternal employment status						
Full-time	0.19	0.21	0.20	0.22	0.26	0.27
Part-time	0.44	0.47	0.46	0.46	0.45	0.45
Not working	0.37	0.32	0.34	0.32	0.29	0.27
Child not in good health	0.05	0.06	0.05	0.06	0.04	0.05
Mother concerned about development	0.06	0.11	0.11	0.11	0.09	0.09
Mother not in good health	0.12	0.09	0.11	0.11	0.10	0.12
No. of siblings in household						
None	0.47	0.42	0.31	0.22	0.18	0.16
One	0.35	0.39	0.48	0.54	0.56	0.55
Two or more	0.17	0.19	0.22	0.24	0.26	0.29
Partner characteristics						
No partner	0.10	0.10	0.11	0.10	0.11	0.13
Lower education + cohabiting	0.16	0.15	0.13	0.13	0.11	0.10
Lower education + married	0.33	0.35	0.35	0.36	0.36	0.35
Higher education + cohabiting	0.07	0.05	0.04	0.05	0.04	0.04
Higher education + married	0.35	0.36	0.37	0.37	0.37	0.38
Household income (in 1,000 GBP)	23.60	25.13	25.85	26.40	26.36	26.55
Homeowner	0.78	0.78	0.78	0.78	0.79	0.79
Urban area	0.64	0.63	0.64	0.65	0.64	0.64
SIMD quintile	2.73	2.72	2.70	2.69	2.69	2.66

Note: Statistics pertain to children who have been continuously observed until age five ($n = 1,942$). GBP = pounds sterling. SIMD = Scottish Index of Multiple Deprivation.

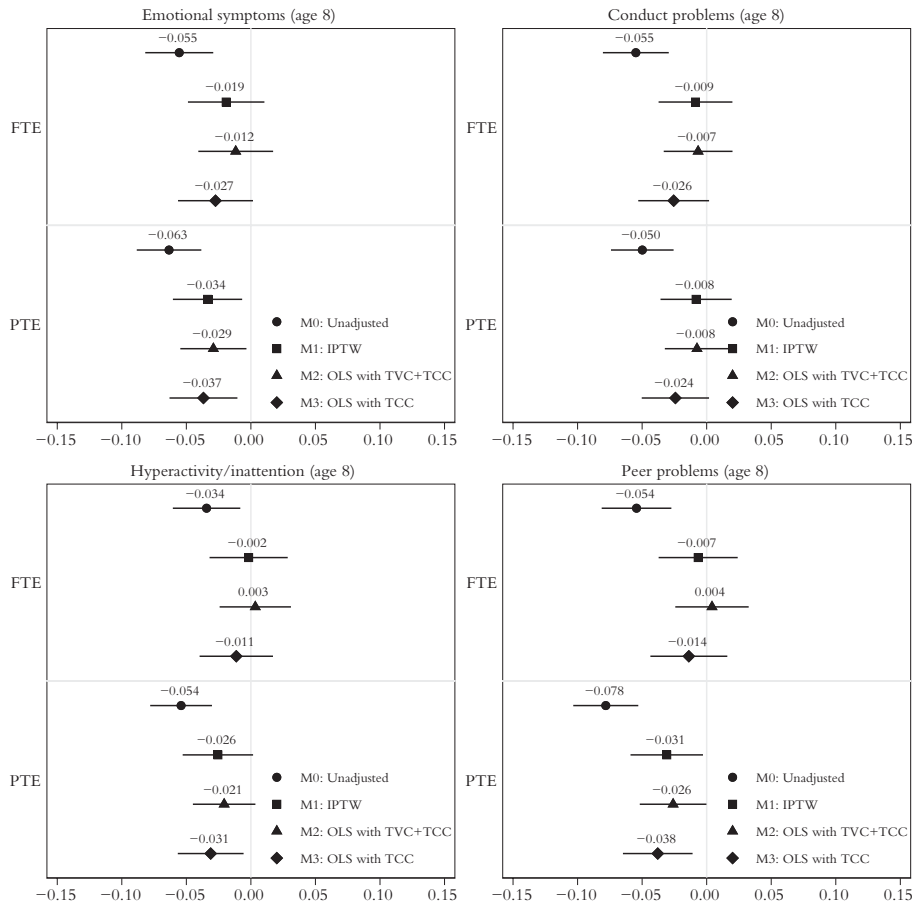
comparison already hints at an association between maternal employment history and behavioural problems but also at observed differences in background variables that may explain this association (in part).

Descriptive statistics over time for time-varying characteristics are shown in [Table 2](#). It can be seen that maternal FTE increased from 19% to 27% as the children grew older while the proportion of non-working mothers dropped from 37% to 27%. The PTE rate remained relatively stable around 45%. We note the strongest changes over time for the number of siblings in the home. At around age one, almost half of the children had no siblings in the household but around age six this was the case for only 16% of the sample. Changes in the distribution of other potentially time-varying characteristics appear small in comparison.

Maternal employment during childhood and behavioural problems at age eight

[Figure 3](#) summarises the results regarding the association between maternal employment in the first six years after birth and behavioural problems at age eight. We distinguish between (years in) full-time and part-time employment and examine the four subscales of the SDQ scale (emotional symptoms, conduct problems, hyperactivity/inattention and peer problems) separately using standardised scores. For each subscale, we run four different regression models (M0–M3) presenting the

Figure 3: Association between years in full-time and part-time employment in first six years after birth and behavioural problems at age eight from linear regression models.

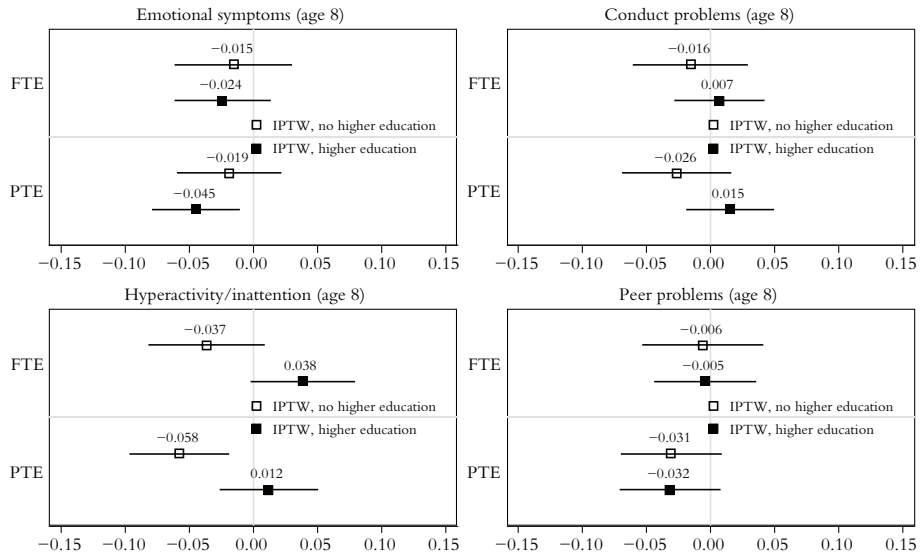


Note: FTE = full-time employment, PTE = part-time employment, IPTW = inverse probability of treatment weighting, OLS = ordinary least squares, TVC = time-varying covariates; TCC = time-constant covariates.

point estimates of each model including 95% confidence intervals. Results for full-time employment (FTE) are shown in the upper part and part-time employment (PTE) in the lower part of each subfigure.

For both FTE and PTE, we see a negative unadjusted association with all four subscale scores (M0, point estimate marked with a circle). Children whose mothers have spent more years in FTE or PTE display fewer behaviour problems around age eight. Adjusting for time-constant and time-varying covariates using IPT weighting substantively reduces these associations (M1). Particularly for years in FTE, the association approaches zero in these models, with the exception of emotional symptoms. The associations for years in PTE remain larger, except for conduct problems. But only those for emotional symptoms and peer problems are statistically significant at the 5% level with -0.034 and -0.031 , respectively. For these two subscales, if we compare children whose mothers never worked since birth with those whose mother worked full-time in all six years after birth, the difference amounts to roughly 0.2 standard deviations in the respective SDQ score.

Figure 4: Association between years in full-time and part-time employment in first six years after birth and behavioural problems at age eight by maternal education.



Note: FTE = full-time employment; PTE = part-time employment; IPTW = inverse probability of treatment weighting.

Finally, we compare the results using IPT weighting with two alternative modelling approaches using standard regression (M2 and M3). For the model that controls for time-varying variables by explicitly including measures of the respective variable's average over the first six years after birth (M2), we see that the standard regression models only slightly underestimate the association, indicating that the extent of over-control bias may be limited. In contrast, the model controlling only for time-constant variables (M3) arrives at somewhat larger point estimates than those obtained by IPT weighting. Especially for years in FTE the difference between M3 and M1 is larger than between M2 and M1, suggesting that confounding by time-varying variables is stronger than over-control bias.

Mother's education and employment, and behavioural problems at age eight

We now rerun our main analyses (M1) separately for children of mothers with higher education (ISCED 5A/B or higher, that is a tertiary degree) and with lower education (ISCED 4 or lower). Figure 4 shows the results, again separately for the four SDQ subscales, each for years in FTE and years in PTE. Point estimates for mothers without higher education are marked with a hollow open square, those for mother with higher education with a black square.

For emotional symptoms, we see a stronger negative association between both FTE and PTE for children of mothers with higher education. But for PTE the group difference is noticeably larger. For peer problems, the associations are virtually identical for both educational groups. A different pattern emerges for conduct problems and hyperactivity/inattention. Whereas the associations of interest remain negative for children of mothers without higher education, it is positive for children of mothers

with higher education. In other words, if a mother has higher education, the child scores higher on these two behavioural problems the more years she has spent in employment, especially for FTE and hyperactivity/inattention. However, these results need to be interpreted with caution as none of the group differences we have observed are statistically significant on the 5% level.

We replicated all analyses using behavioural problem measures around age ten (wave 8). The substantive size of the estimates as well as the overall pattern of results is very similar to those we found around age eight (see [Figures A1](#) and [A2](#) in the Appendix).¹

Discussion

This study investigated the link between maternal employment history in the first six years after birth and child behavioural problems around age eight. We highlighted the causal and temporal interdependencies between maternal employment, other time-varying factors like economic resources, family structure or maternal health, and child development. We used longitudinal data from Growing Up in Scotland and inverse probability weighting to address the specific analytical challenges arising from these independencies, particularly the presence of time-varying confounders that are themselves affected by earlier maternal employment status. Finally, we also explored whether the effect of maternal employment history depends on the mother's education.

Our results show that, on average, children of mothers with higher labour-market participation after birth show fewer behavioural problems. However, these associations substantively reduced once we adjusted for time-constant and time-varying confounders. Only the associations of years in PTE with emotional symptoms and peer problems remained statistically significant at the 5% level. Comparing our main results with those from standard regression models that explicitly control for time-varying characteristics or only control for time-constant variables indicates that the observed unadjusted associations may mainly result from confounding and that over-control bias may be limited. This casts some doubt on the hypothesis stated in previous research that variables such as economic resources, maternal health or family structure mediate part of the effect of maternal employment on children's behavioural problems. Finally, the association of maternal employment and behavioural problems did not markedly differ for children of mothers with and without higher education except for hyperactivity/inattention. We observed that maternal employment is associated with less hyperactivity/inattention for children of mothers without higher education and with more hyperactivity/inattention for children of mothers with higher education. But this group difference was not statistically significant. In sum, our results are in line with previous research using the same analytical approach to investigate children's early cognitive skills and risk of overweight. Once potential confounding factors are taken into account, these analyses do not provide strong evidence for either a substantive negative nor for a positive effect of maternal employment history on these outcomes or the behavioural problems studied here.

Our study also faces several limitations. First, the causal interpretation of our findings is built on the assumptions of positivity, correct specification or our statistical models and, most importantly, no unmeasured confounding. However, compared to other studies that aim to establish a causal link by using fixed-effects and instrumental variables ([James-Burdumy, 2005](#); [Ermisch and Francesconi, 2013](#)

for cognitive outcomes) our statistical approach explicitly focuses on entire maternal employment histories during childhood and can better account for theoretically plausible interdependencies between maternal employment and other determinants of children's outcomes. Furthermore, there is no evidence for severe positivity violations or model mis-specification in our analyses. In contrast, unmeasured confounding cannot be ruled out empirically. Nonetheless, our ability to adjust for the most relevant potential confounders such as socio-economic background, child health, maternal health and family structure increase our confidence that the extent of any remaining confounding is limited. Second, our measure of maternal employment history is based on annual information whereas, ideally, we would need continuous employment calendars. Therefore, we may overestimate mothers' early labour-market participation. Furthermore, there is some ambiguity with regard to the status of non-working mothers, who could be on leave, in education, unemployed or out of the labour force. Third, our measures of child behaviour problems are based on mothers' reports about their children and thus may be distorted by mothers' biased perceptions of their children. Correlations between parental ratings and teacher ratings have been found to range between 0.65 and 0.41 for the subscales used in this study (Goodman, 1997). More importantly, the scale successfully discriminated between psychiatric and non-psychiatric samples which provides some confidence that parents accurately rate their children (albeit with some error).

There are important implications to policy. Children from disadvantaged households, as measured by lower maternal education in this study, are *not* at greater risks of behavioural difficulties if their mothers are engaged in paid work. Hence, directly addressing maternal employment participation via maternal leave policies or welfare-to-work-policies may not provide an effective strategy to reduce child disadvantages and promote social mobility. Policies that aim at establishing and maintaining a positive child-rearing environment, for example via provision of high-quality childcare, stimulating social and cognitive learning for children or growing up in secure neighbourhoods, might be more successful in mitigating social inequalities in children's development.

Note

¹ We have run additional analyses for maternal employment in the first three years and the three subsequent years and added the results to the Appendix (see Table A2). The results also show only a moderate association between maternal employment and child behaviour. The largest difference to the overall measure is present for emotional symptoms, where a significant negative association (indicating fewer behaviour problems) emerges only for maternal employment when the child is between four and six years of age.

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Data availability statement

The data are publicly available under a special license agreement. Materials to replicate the analyses are available at <https://osf.io/4jg6e/>.

Conflict of interest

The authors declare that there is no conflict of interest.

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Appendix

Figure A1: Association between years in full-time and part-time employment in first six years after birth and behavioural problems at age 10.

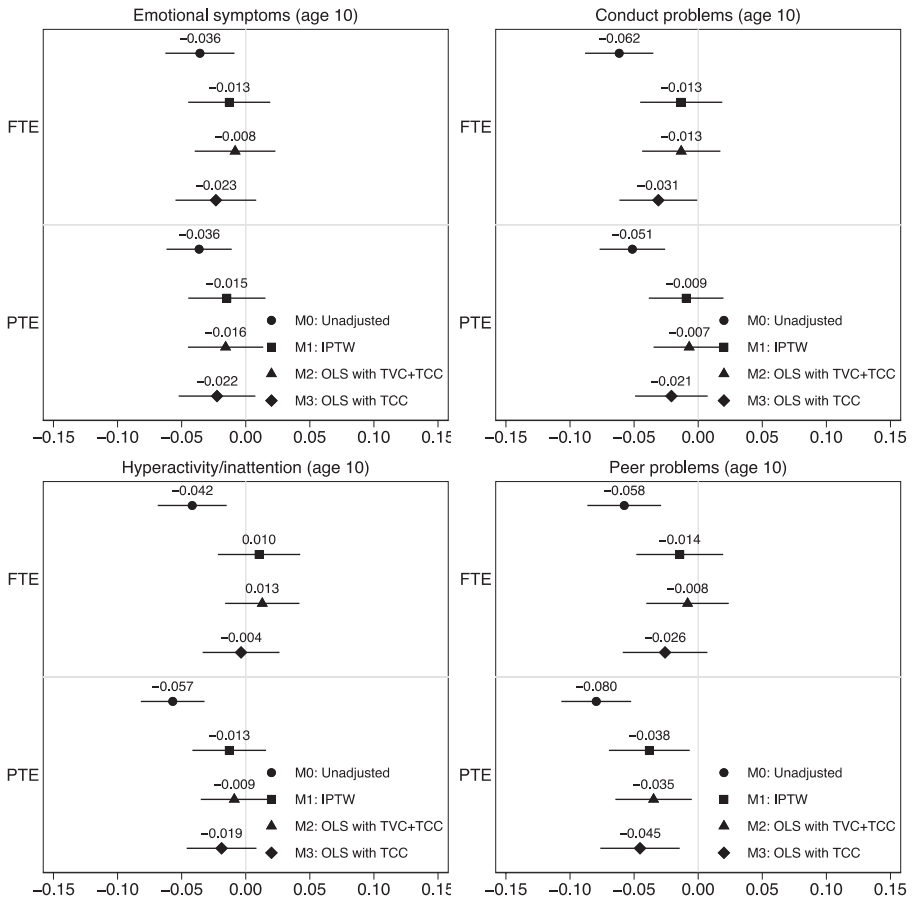


Figure A2: Association between years in full-time and part-time employment in first six years after birth and behavioural problems at age 10 by mother's educational attainment.

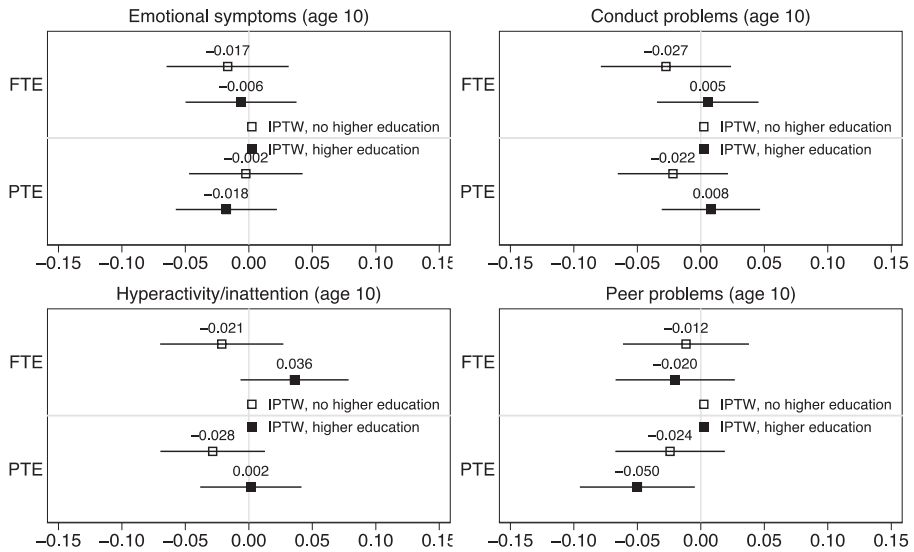


Table A1: Items of Strengths and Difficulties Questionnaire grouped by subscale

Hyperactivity scale
• Restless, overactive, cannot stay still for long
• Constantly fidgeting or squirming
• Easily distracted, concentration wanders
• Thinks things out before acting*
• Sees tasks through to the end, good attention span*
Emotional symptoms scale
• Often complains of headaches, stomach-ache or sickness
• Many worries, often seems worried
• Often unhappy, down-hearted or tearful
• Nervous or clingy in new situations, easily loses confidence
• Many fears, easily scared
Conduct problems scale
• Often has temper tantrums or hot tempers
• Generally obedient, usually does what adults request*
• Often fights with other children or bullies them
• Often lies or cheats
• Steals from home, school or elsewhere
Peer problems scale
• Rather solitary, tends to play alone
• Has at least one good friend*
• Generally liked by other children*
• Picked on or bullied by other children
• Gets on better with adults than with other children
Prosocial Scale
• Considerate of other people's feelings
• Shares readily with other children (treats, toys, pencils, etc.)
• Helpful if someone is hurt, upset or feeling ill
• Kind to younger children
• Often volunteers to help others (parents, teachers, other children)

Note: Items marked with * are reverse coded before calculating the sum score.

Table A2: Associations between maternal employment and behavioural problems at age 8 from WLS (IPTW)

	Emotional symptoms	Conduct problems	Hyperactivity inattention	Peer problems
Years full-time employed age 1–3	0.044 (0.029)	0.004 (0.030)	0.030 (0.031)	–0.012 (0.029)
Years part-time employed age 1–3	0.005 (0.02)	–0.005 (0.022)	–0.022 (0.022)	–0.045 (0.021)
Years full-time employed age 4–6	–0.084 (0.027)	–0.012 (0.030)	–0.040 (0.028)	–0.012 (0.028)
Years part-time employed age 4–6	–0.067 (0.022)	–0.000 (0.025)	–0.037 (0.022)	–0.019 (0.022)
<i>N</i>	1,942	1,942	1,942	1,942

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; robust standard errors in parentheses.

