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## The Trade-off Between Breastfeeding and Returning to Work: The Role of Workplace Constraints

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# The Trade-off Between Breastfeeding and Returning to Work: The Role of Workplace Constraints\*

## Abstract

Decisions about whether and for how long to breastfeed are shaped by mothers' ability to combine care with paid work under institutional and workplace constraints. While breastfeeding provides well-documented benefits for mothers and children, continuation after return to work may be difficult. We develop a formal economic model of breastfeeding and work decisions, accounting for physical, social and workplace constraints and document the role of mother's return to work in determining breastfeeding behaviour using data from the UK Household longitudinal study (UKHLS). We employ an event study methodology to study breastfeeding behaviour around the time a mother returns to work. Accounting for differential timing of return to work by child age, we find that return to work leads to a 9.6 percentage point reduction in the probability of continuing to breastfeed. Such effects are partly driven by mothers whose jobs do not allow flexible working or working from home, and those who face longer commuting times. We also document industry differences with the strongest effects in retail, education and health, which we show are driven more by workplace constraints than workplace attitudes. We discuss implications for workplace policies.

## JEL classification

J13, J22

## Keywords

breastfeeding, work, identity

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# 1 Introduction

Breastfeeding decisions are personal and emotive decisions and evidence indicates that supporting mothers to breastfeed for as long as they and/or their child want (and in the way that they want) provides benefits for maternal and child health/wellbeing and child’s cognitive development (Belfield and Kelly, 2012; Borra et al., 2012; Fitzsimons and Vera-Hernández, 2022; Pérez-Escamilla et al., 2023; Victora et al., 2016) as well as wider societal benefits (Rollins et al., 2016). Supporting working mothers with their infant feeding goals, not only benefits children, mothers and their mental health (Hauck et al., 2020), but also benefits employers via increased labour supply (Del Bono and Pronzato, 2024; Hatamyar, 2022; Heckl and Wurm, 2024) and reduced work absence due to child sickness (Cohen et al., 1995; Del Bono and Pronzato, 2024). The World Health Organisation (WHO), along with UNICEF and the NHS, recommends mothers exclusively breastfeed infants up to the age of 6 months and to continue until age 2 alongside solid food options (WHO, 2023). Breastfeeding rates in the UK are lower than other Western countries, with rates at 12 months one of the lowest in the world (Victora et al., 2016). The latest figures (December 2025) by the Office for Health Improvement and Disparities<sup>1</sup> show that by 6-8 weeks postpartum, only 55.6% of mothers are breastfeeding (34% exclusively). Evidence suggests that whilst the intention to breastfeed in the UK is high, many mothers stop breastfeeding before they want to (Brown, 2017) with detrimental effects for maternal mental health (Borra et al., 2015; Brown, 2019) .

Breastfeeding decisions concerning both initiation and duration are complex and are affected by demographic factors such as education, age, ethnicity; previous breastfeeding experience; support from family and health care workers (Chabrol et al., 2004; Belfield and Kelly, 2012; Simpson et al., 2019); and cultural and societal attitudes (Hannan et al., 2005; Acker, 2009; Scott et al., 2015) Research in the UK tends to focus on determinants of breastfeeding initiation and breastfeeding in the first six months (e.g. Simpson et al., 2019; Amiel Castro et al., 2025) with less research focusing on barriers to continuing breastfeeding beyond the early months. However, one potentially important barrier to mothers and/or their children to continuing to breastfeed as long as they wish to is return to work, which implies a significant reorganisation of time use for breastfeeding mothers (Skafida, 2012; Adams et al., 2016). This reorganisation includes not only feeding time, but also the practical work of expressing, storing and transporting milk and navigating workplace norms and stigma (Ayton et al., 2025).

Our paper aims are four fold. First, we introduce a formal economic framework to illustrate and understand the potentially competing relationship between breastfeeding and work to account for the physical work and cultural constraints affecting mothers’ choices. Second, we document breastfeeding and work behaviour in the UK, using a nationally representative individual panel dataset, following mothers from the birth of their child until return to work. Third, we explore the impact of returning to work on breastfeeding behaviour, particularly focusing on the period around return to work. Fourth, we seek to understand not just whether return to work impacts breastfeeding behaviour in the UK, but *why* and we consider the separate roles of workplace constraints, attitudes and norms. Our research provides a platform for better understanding the potential interdependence of breastfeeding and work decisions, and enables future research on the resulting impact on maternal outcomes in the UK.

In contrast to some other high-income countries there are limited legal obligations for employers in the UK

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<sup>1</sup>statistics available from <https://www.gov.uk/government/statistics/breastfeeding-at-6-to-8-weeks-data-for-2024-to-2025>

in relation to breastfeeding and the workplace.<sup>2</sup> The Health and Safety Executive states that employers must provide breastfeeding employees a suitable place to rest and must consider risks to breastfeeding employees in an individual risk assessment,<sup>3</sup>. Its recommendations regarding facilities (access to a private, hygienic space to express milk and appropriate storage) are not legally binding, nor is there any requirement to provide breaks for breastfeeding or expressing. At the same time, although women in the UK are entitled to up to 12 months of maternity leave, only the first six weeks are paid at earnings replacement rates, with substantially lower statutory pay available thereafter and the final 13 weeks unpaid. As a result, many mothers return to work well before 12 months, when breast milk is still recommended to be the main drink and a key source of nutrition for children.<sup>4</sup> Consistent with this institutional context, Del Bono and Pronzato (2024) show that when employers provide breastfeeding facilities mothers generally have longer breastfeeding duration, and highly educated mothers have shorter maternity leave spells. Ayton et al. (2025) show that where formal workplace provision is weak or inconsistently implemented, mothers often rely on informal accommodations and may face stigma around expressing at work.

Much of the research that has explicitly modeled the relationship between breastfeeding and work (Roe et al., 1999; Chatterji and Frick, 2005; Mandal et al., 2014) is based in the US, with limited evidence from the UK where breastfeeding continuation rates are much lower, at 35% (0.5%) at 6 (12) months in the UK vs 49% (27%) in the US (Victora et al., 2016), despite more generous maternity entitlement in the UK. In the UK return to work may not be a direct factor in the decision to breastfeed (initiation), but instead impact the duration of breastfeeding (continuation). Evidence from other countries support this distinction. Studies exploiting parental leave reforms consistently find that longer leave durations increase breastfeeding duration (Baker and Milligan, 2008; Kottwitz et al., 2016; Hamad et al., 2019; Pac et al., 2023), while observational policy comparisons similarly show higher breastfeeding prevalence in settings with paid leave Rosenberg et al. (2024). Related evidence from Israel investigating a formula safety scare finds that when formula is not an option, mothers postpone return to work, likely because of an inability to combine breastfeeding with working (Hatsor and Shurtz, 2024). However, most of this literature focuses on countries in which duration of parental leave is low, so that return to work happens at younger child ages, and does not look specifically at the link between return to work and cessation of breastfeeding. For this reason, we focus on modelling the tradeoffs that exist between continuing breastfeeding and return to work in a context of longer leave entitlements, with the aim of identifying the key workplace constraints associated with cessation of breastfeeding. This allows us to highlight where policy intervention could work to better support mothers in achieving their breastfeeding goals, potentially closing the gap between intention and realisation of breastfeeding and increase continuation rates.

Previous quantitative work in the UK is sparse and mostly based on older data (e.g Del Bono and Pronzato, 2024; Hawkins et al., 2007; Skafida, 2012): for instance, the UK Infant Feeding Survey - a survey of breastfeeding initiation, prevalence and duration - was last conducted in 2010 and only collected information up to 10 months postpartum when not all mothers have returned to work.<sup>5</sup> We thus use a UK nationally representative dataset, the UK Household Longitudinal Study (UKHLS), which enables us to follow mothers

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<sup>2</sup>See for example <https://www.ncsl.org/health/breastfeeding-state-laws> for information on breastfeeding laws in the US for employers with 50+ employees. Norway, Sweden, Denmark, Germany, Portugal, Spain, for example, have breastfeeding breaks requirements, and Italy have shorter days for breastfeeding employees.

<sup>3</sup>See <https://www.hse.gov.uk/mothers/employer/rest-breastfeeding-at-work.htm>

<sup>4</sup>In our sample 67% of mothers return to work by 9/10 months.

<sup>5</sup>We note that a new infant feeding survey was scheduled for 2023, but no data is yet publicly available.

beyond 10 months postpartum, and beyond 12 months (the maximum maternity leave excluding any annual leave). We find evidence that mothers stop breastfeeding upon return to work: our estimates suggest that return to work leads to a 9.6 percentage point reduction in the probability of continuation of breastfeeding. This effect is driven by those who do not have the option to work regularly from home, for whom the effect is 10.7 percentage points, and in particular, for those with longer commuting times, suggesting a significant role of time constraints. We also find important differences by industry, with the largest effects found for retail, health, and education. Taken together, we argue that these results suggest that time constraints as well as (lack of) workplace support and worker autonomy over working time (for example, a lack of flexibility at work and/or work environments in which it is particularly hard to express milk at regular set intervals) may impede mothers' ability to combine breastfeeding with work.

The rest of the paper is structured as follows. In section 2, we outline our conceptual framework of breastfeeding as work. In section 3 we outline the data used. Section 4 describes our empirical strategy, section 5 presents results, and section ?? discusses potential mechanisms. We present robustness checks in section 7. Finally, in section 8 we discuss implications and avenues for future research.

## 2 Breastfeeding as work

Breastfeeding practices are varied in time and across space as they are also the product of cultural evolution, which is also reflected in the amounts, tones and emphasis of public health campaign devoted to this subject (Lawrence and Lawrence, 2021). The existence of alternative sources of milk and breastfeeding substitutes is well documented in the archaeological record with evidence of wet nursing as well as feeding flasks in Greek records. The main modern alternative to breast milk is infant formula milk which is typically made from cow's milk and provides the nutritional needs a child needs in the first 12 months of their life. The NHS and WHO recommend that milk (breast milk or infant formula milk) be the main contributor to the child's nutritional needs up until the child is 12 months; after this, a child can be introduced to alternatives such as cow's milk. Aside from infant formula milk, breast milk can still be fed to a child when the mother is not present. Mothers can express breast milk (removing milk from the breast either manually or via a breast pump) which can be given to the child by an alternative care giver in a bottle or feeding cup. This means that the mother upon return to work can still continue breastfeeding even though they are physically distant from the child. Expressing and storing breast milk comes with a time and set up cost (i.e. purchasing relevant equipment). In most cases it will not be possible for the mother to directly breastfeed their child (e.g. during breaks) whilst at work, so that many will express breast milk during work hours. Typically the need to express breast milk and frequency decreases as the child gets older, so that mothers of older children may simply adjust the frequency/timing of breastfeeds to occur outside of work hours.

The economic literature typically considers the trade-offs between breastfeeding and paid work in terms of the financial and non-financial costs/benefits (e.g. Chatterji and Frick, 2005; Roe et al., 1999). The opportunity cost of breastfeeding (either directly or through expressing milk) suggest decisions regarding breastfeeding and return to paid work may be competing, as both involve a time cost. Other direct costs relate to equipment for expressing breast milk, lactation support and consumption of additional calories.<sup>6</sup>

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<sup>6</sup>Breastfeeding is a calorie consuming activity requiring between 340 and 400 more kilocalories per day (Mahoney et al., 2023).

Benefits consist of both physical and psychological health returns to both child and mother. (e.g. see Pérez-Escamilla et al., 2023, for a review). Early work in the trade-offs literature (Fein and Roe, 1998; Gielen et al., 1991; Visness and Kennedy, 1997) assumed that the direction of the effect was from return to work to breastfeeding decisions, with later contributions treating them instead as joint decisions (Roe et al., 1999; Chatterji and Frick, 2005; Mandal et al., 2014). Generally these studies show the direction of the effect tends to be from work to breastfeeding duration but (Mandal et al., 2014) show for the US - where mothers typically return to work within 3 months of giving birth - that for those from higher socioeconomic backgrounds it may be a joint decision.

We go beyond the existing economic literature that has framed breastfeeding and work decisions in terms of costs and benefits and propose an economic approach to breastfeeding able to account for the physical, social, workplace and cultural constraints affecting mothers' choices. The concept of breastfeeding as a form of embodied, non-transferable work has been developed in sociology and public health, with the existing literature emphasising that breastfeeding entails ongoing physical effort and coordination that cannot be delegated, and that continuing to breastfeed after returning to work often requires mother to absorb substantial adjustment costs due to workplace norms and institutional rigidity (Gatrell, 2013; Lee, 2018; Burns et al., 2022; Gribble et al., 2023).

We model breastfeeding as a form of work that is performed alongside paid work and other unpaid work (e.g. child care and work in household) to provide utility to children and mothers. The choice between the two activities is constrained by physical and cultural factors pertaining to both the environment in which breastfeeding is initiated and occurs and that in which work takes place.

A mother's objective function can thus be described as

$$U(B, c, I^m, I^w) \tag{1}$$

where  $B$  is the utility of the child capturing both physical and emotional well-being, as does the mother's utility  $U$ ,  $c$  represents a composite good of services and consumption goods (including leisure),  $I^m$  is self image related to the extent to which the person conforms with existing social norms regarding mothering behaviors and  $I^w$ , the self image that is related to conforming to expectations regarding work behaviors (Akerlof and Kranton, 2000; Payne and Nicholls, 2010; Christopher, 2012). A mother's decision problem is framed in terms of the allocation of a given time endowment  $T$  amongst competing activities that include work.<sup>7</sup> Working time can be distinguished into three categories: time for paid work  $t_w$ , time for breastfeeding  $t_{bf}$  (including time expressing breast milk), and time for work in household  $t_h$ . so that the time available for work is:<sup>8</sup>

$$T_{work} = t_w + t_{bf} + t_h \tag{2}$$

The child's utility depends on all three types of mother work, though there are trade offs as more breastfeeding ( $t_{bf}$ ) and work in the household ( $t_h$ ) means less income but more time spent with the mother; as a result, reallocating maternal time across activities may involve non-trivial trade-offs.

Mothers care about the child's utility  $B$ ; and face some tradeoffs too: breastfeeding work ( $t_{bf}$ ) entails physical effort and consumption of calories, increasing the need to consume, while less breastfeeding increases

<sup>7</sup>The framework of reference is the model by Grossbard-Shechtman (1984)

<sup>8</sup>All time allocations are non-negative and non-greater than the time endowment.

the need to earn money to buy other food either via more paid work ( $t_w$ ), or more household work ( $t_h$ ) to secure partner transfers.

The budget constraint of mother  $i$  reads as

$$M^i + M^{ij} + w \cdot t_w^i = c^i \quad (3)$$

where  $M^i \geq 0$  is an exogenous source of income and  $w \cdot t_w$  is the income obtained in paid work at the wage rate  $w > 0$ . Overall income is used to buy the composite consumption good  $c$  at a unitary price. Term  $M^{ij}$  denotes a monetary transfer between  $i$  and  $j$ , in case an individual is engaged in a relationship (Grossbard-Shechtman, 1984). While all work activities contribute to the child’s utility  $B$ , they do not contribute symmetrically to the mother’s utility  $U$ . Consumption depends on income from paid work, and the self-image components of utility depend on the extent to which the mother’s behaviour conforms to social and workplace expectations.<sup>9</sup>

The optimal time allocation to the three types of work activities will thus depend on the extent to which this satisfies both the requirements of the child and those of the mother and will be constrained by the availability of other sources of income and the extent to which the activities engaged in are congruent with expectations from society and workplaces, which may be more or less ready to support breastfeeding employees. When paid work resumes, this framework implies a discrete tightening of time and effort constraints, generating a sharp increase in the likelihood of breastfeeding cessation around the return-to-work date, when the trade-off between breastfeeding and paid work first becomes binding. The model also therefore predicts that the return-to-work discontinuity in breastfeeding will be larger in workplaces where physical, organisational, or temporal constraints make breastfeeding less compatible with paid work. Finally, variation in workplace attitudes towards breastfeeding act through social and workplace expectations regarding mothering  $I^m$  and work  $I^w$  behaviours, implying larger declines in breastfeeding continuation at return to work in environments where breastfeeding is less socially or professionally supported.

Here we focus exclusively on the group of mothers who have established breastfeeding and are returning to work and investigate the effect of workplace constraints on their feeding decisions. Note that it is beyond the scope of this paper to model the microfoundations of identity concerns which underlie such decisions, but we include them so as to acknowledge the role of social and workplace norms, and descriptive analysis in section 6.2 investigates (some) such norms.<sup>10</sup>

Together, these predictions motivate an empirical strategy that focuses on discontinuities in breastfeeding behaviour at return to work and on heterogeneity across workplace environments.

### 3 Data

The UK Household Longitudinal Study (UKHLS, more commonly known as the Understanding Society survey) is a nationally representative household and individual level panel survey. The survey began in 2009 and follows approximately 40,000 households from across England, Scotland, Wales, and Northern Ireland

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<sup>9</sup>Our formulation captures the idea that household contributions may be compensated through shared resources, but we do not explicitly model bargaining power, preferences, or identity. What matters for our analysis is that time allocated to different forms of work affects available resources through distinct channels.

<sup>10</sup>We are also agnostic about the underlying household decision process and focus on how constraints on time allocation shape breastfeeding and return-to-work behaviour.

over time. Households are interviewed annually, with each round of interviews defined as a wave and each wave taking two years to complete.<sup>11</sup> The dataset has a large general population sample, an ethnic minority booster sample, and an additional immigrant-ethnic minority boost sample (included from wave six).

The UK Household Longitudinal Study collects information on social and economic variables at the individual and household level. Importantly for our study the survey collects information on new births including birth characteristics and breastfeeding behaviour, and information on economic activity and job characteristics, alongside demographic information. We obtained information on the month of birth (since only year of birth is available in the end user license) through the Special License version of the UKHLS<sup>12</sup>, so we could identify the age of the child upon return to work.

We draw together information from different data files: the individual response file, stable characteristics file, newborn file and child file. Our end data contains information on child characteristics - including breastfeeding - matched to mother personal characteristics and employment/job information around the time of each birth. We start with 6,163 births identified in the data. Due to a coder error in the UKHLS some information is missing on breastfeeding duration for births in wave 2, so we focus on births from wave 3 onwards, resulting in 891 births being dropped. We further dropped 84 multiple births, owing to the different issues relating to multiple births. Inclusion in our final sample is conditional on availability of information in the wave prior to the birth (to capture pre-birth characteristics), and full information on breastfeeding and employment status and characteristics after birth. Excluding observations for whom this information was unavailable leads to a final sample of 3,568 births from 2,838 mothers. Figure A.3 in the appendix shows that the most common point mothers stop breastfeeding is within the first month. In our main analysis we predominately focus on the group who ‘establish’ breastfeeding (breastfeed for at least 3 months). This is less than half (44.8%) of mothers in the sample, resulting in a sample of 1599 births from 1322 mothers (Table 1).

Full details of the key variables used in our analysis is outlined in table A.1 of Appendix A, and information on how we constructed our sample and variables of interest are provided in Appendix B. Key controls variables captured prior to birth include mother’s age (at birth), education, ethnicity, and marital status; the choice of such variables is driven by those used in other recent studies exploring breastfeeding and work (e.g. Del Bono and Pronzato, 2024; Heckl and Wurm, 2024) and studies in the UK exploring breastfeeding initiation (e.g. Simpson et al., 2019) Household income is not available for all (and for some is imputed) so we do not include household income in our main specifications but do include it as a robustness check.

### 3.1 Descriptive Statistics

Table 1 show the composition of the sample used in the analysis compared to all women. The majority of women in our sample who established breastfeeding belong to the age range 25-34 (62.5%), belong to white ethnicity (73.4%), and live with a spouse/partner (89.9%), with 55.8% having a University degree.

Amongst women who establish breastfeeding, 67.5% (1,080) were employed within 15 months of giving birth (Table 1, Column (II)).<sup>13</sup>, 76.1% breastfeed for at least 6 months (the recommendation for exclusive

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<sup>11</sup>There were 13 waves available at the time of data creation.

<sup>12</sup>University of Essex, Institute for Social and Economic Research. (2023). *Understanding Society: Waves 1-13, 2009-2022 and Harmonised BHPS: Waves 1-18, 1991-2009: Special License Access*. [data collection]. 17th Edition. UK Data Service. SN: 6931, DOI: <http://doi.org/10.5255/UKDA-SN-6931-16>

<sup>13</sup>This compares with 61.1% of all mothers (N=2,180), shown in Column (I) of Table 1.

Table 1: Descriptive statistics

	(I) Full Sample	(II) Established breastfeeding
A: Breastfeeding Behaviour		
Breastfed 3+ months	44.8	100.0
Breastfed 6+ months	34.1	76.1
Breastfed 9+ months	24.2	53.9
Breastfed 12+ months	18.8	42.0
B: Employment		
Remained not employed	28.9	22.6
Not employed: start a job	2.7	2.5
Employed, returned	58.4	65.0
Employed, did not return	10.0	9.9
Age of child at return to work	8.84	9.69
C: Demographic Characteristics		
Degree	39.6	55.8
Aged 16-24	14.7	7.1
Aged 25-34	59.9	62.5
Aged 35+	25.4	30.4
Live with spouse/partner	82.3	89.9
White	80.9	73.4
Asian	12.2	15.8
Black	3.9	6.8
Mixed/other	2.9	4.1
N Births	3,568	1,599
N mothers	2,838	1,322

breastfeeding by the NHS), 53.9% are still breastfeeding at 9 months, when women typically start returning to work, and 42% of these women are still breastfeeding at 12 months, by which time most women have returned to work (Table 1, Column (II)).<sup>14</sup>

Among those who are working within 15 months of giving birth the average age of the child upon return to work is 9.7 months. Figure A.1 shows common stopping points for breastfeeding and for return to work for those who breastfeed for at least 3 months; these are 3 months (13.3%), 6 months (14.9%), and 12 months (11.7%) and most return to work between 9 - 12 months, in line with the fact that 9 months is the point that statutory maternity pay ends and 12 months is the maximum maternity leave permitted in the UK (although some mothers may return later if they take annual leave).<sup>15</sup>

Descriptively, we see that the proportions of women stopping breastfeeding relative to return to work are fairly flat between 6 to 1 month prior to return to work, with a large discontinuity at the point of return to work, and a smaller one 2 months prior to return (Figure A.2).

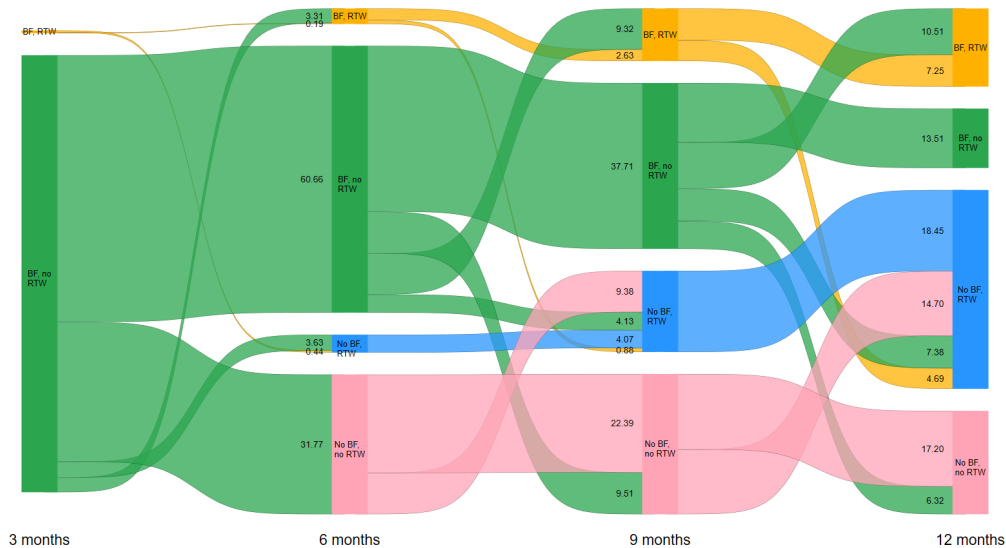
<sup>14</sup>This compares to rates of 34.1%, 24.2% and 18.8% when we consider all mothers, shown in Column (I) of Table 1.

<sup>15</sup>We find similar patterns when we instead consider all mothers regardless of whether they established breastfeeding or not, with the exception of a peak of stopping breastfeeding at 0 months (Figure A.3).

We document breastfeeding and return-to-work behaviour for mothers who establish breastfeeding, using a Sankey diagram. This provides a visual representation of the transitions between different states at postpartum months 3, 6, 9 and 12. Figure 1 illustrates the flow of individuals between four categories: (1) “Breastfeeding, not yet returned to work” (BF, No RTW), (2) “Not breastfeeding, not yet returned to work” (No BF, No RTW), (3) “Breastfeeding, returned to work” (BF, RTW), and (4) “Not breastfeeding, returned to work” (No BF, RTW). The width of the flows between these categories reflects the proportion of women transitioning from one state to another.

At 3 months, just 0.63% of mothers had returned to work; amongst these, by 6 months twice as many (0.44 vs 0.19%) had stopped breastfeeding. Considering flows from breastfeeding at 3 months to 6 months postpartum we observe 3.63% of the overall sample had returned to work and were no longer breastfeeding vs 3.31% of the sample who had returned to work and were still breastfeeding. At 9 months, a higher percentage had returned to work and were no longer breastfeeding vs. still breastfeeding (18.46% vs 11.95%) and at 12 months, 5.06% of the sample had returned to work were no longer breastfeeding and 3.65% had returned to work and were still breastfeeding. This suggests - descriptively at least - that constraints around combining breastfeeding and return to work depend on age of the child and that, for particularly early periods of return to to work, mothers may find it particularly hard to combine breastfeeding and return to work.

Figure 1: Breastfeeding and Return to Work Transitions



Notes: Figures shows transitions between four states. “BF” refers to breastfeeding, “RTW” refers to return to work.

## 4 Methodology

We estimate the impact of return to work on breastfeeding behaviour using an event-study framework in which we exploit variation in time to return to work across mothers:

$$Y_{ijt} = \alpha + \beta RTW_{ijt} + \sum_{k=-6}^{k=4} \gamma_k 1\{K_{ijt} = k\} \times RTW_{ijt} + \theta_i + \theta_t + \epsilon_{ijt}, \quad (4)$$

Treatment  $RTW_{ijt}$  is defined as an indicator equal to one if a mother  $i$  of child  $j$  had returned to work at time after birth  $t$ ; once treated, mothers retain treated status for all future periods. 32.5% of mothers in the sample who breastfed for at least 3 months do not return to work within the time period under study and constitute our never treated sample. We allow for heterogeneous treatment effects, implementing the staggered difference-in-difference estimator of (Callaway and Sant’Anna, 2021). Timing of return to work, and hence treatment, varies across individuals, so that a mother belongs to group  $G$  if she returned to work at time  $t = g$ . We estimate a group-time average treatment effect:

$$ATT(g, t) = E[Y_{ijt}(g) - Y_{it}(0)|G = 1]$$

where  $Y_{ijt}(g)$  represents the outcome  $Y$  (still breastfeeding) for mother  $i$  of child  $j$  returning to work at time  $g$  and observed at time  $t$ , and  $Y_{it}(0)$  denotes the potential outcome  $Y$  for mother  $i$  at time  $t$  who did not return to work. Thus,  $ATT(g, t)$  estimates the average treatment effect for mother  $i$  at time  $t$  for members of cohort  $G$  treated at time  $g$ . These group ATTs are then averaged across groups to conduct an event-study to consider the effect of return to work on breastfeeding behaviour in the periods after return to work.

Specifically, the Callaway and Sant’Anna (2021) event study aggregate ATT at a specific event time that is  $k$  periods away from treatment adoption is given by:

$$\theta_{es}(k) = \sum_{g \in G} 1\{g + k \leq T\} P(G = g | G + k \leq T) ATT(g, g + k)$$

The key identifying assumptions underlying the Callaway and Sant’Anna estimator are that of *no anticipation* and *conditional parallel trends*. The assumption of no anticipation assumes that mothers do not adjust their behaviour in anticipation of treatment; since mothers know their intended return to work, this may not be valid. However (Callaway and Sant’Anna, 2021) provide conditions under which this assumption can be relaxed; this is the *limited anticipation* assumption in which, assuming anticipation of  $\delta$  periods, treatment can be adjusted to be at  $g - \delta$  (Callaway and Sant’Anna, 2021). Though we cannot test for conditional parallel trends, we condition on pre-treatment individual covariates that might affect breastfeeding behaviour. These include whether the mother has a degree, her marital status, age and ethnicity, all of which have been shown to be associated with breastfeeding behaviour (Skafida, 2012; Simpson et al., 2019). We assume that conditional on such observable covariates, the evolution of breastfeeding behaviour would have been similar with and without return to work. We restrict the analysis to mothers who breastfed for at least 3 months to avoid conflating initiation barriers with continuation barriers.

We then investigate heterogeneity in the estimated effects by employment characteristics that in the context of the model, affect the ability of workers to allocate time to breastfeeding after return to work. In particular, workplace features that affect the feasibility of taking breaks, accessing private space, or working autonomy over how to spend time, operate as constraints on breastfeeding time  $t_{bf}$  once paid work time  $t_w$  becomes binding. These include industry, whether the mother has the option to work flexibly, and commuting time. respondents who were employed were asked, in every other wave (starting from wave 2)

if they needed them whether their employer offered any of the listed flexible work options. We created a dummy variable equal to 1 if the mother had any of the following flexible work options available to them: job sharing, flexi-time, compressed/annualised hours, working from home and other flexible working option, and 0 if their employer did not offer any of these. Full details of the flexible working question can be found in Appendix B.

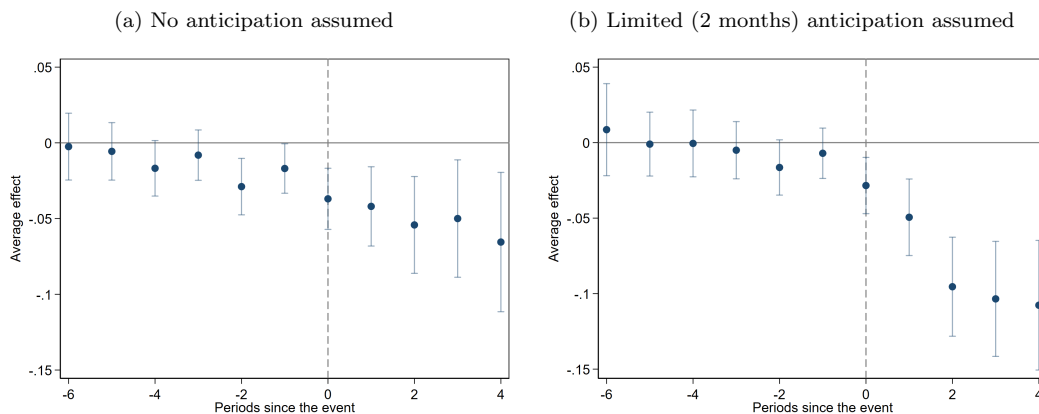
Employees whose usual place of work was not home were asked how long (in minutes) their commute took. We used our full sample who were asked this question (i.e. including those who did not breastfeed for 3+ months) to explore distribution of commutes. We defined a long commute dummy variable equal to 1 if the commute was equal to or greater than the 75th percentile of 35 minutes, 0 if less than 35 minutes (and they did not usually work from home). Table A.2 shows descriptives of these variables in our sample of mothers who established breastfeeding as well as for all mothers in the sample.

## 5 Results

### 5.1 Main analysis

Figure 2 shows event study estimation of the impact of returning to work on whether the mother still breastfeeds. Figure (a) shows estimated effects and shows clear evidence of anticipation effects emerging up to two months before return to work. Adjusting for this limited anticipatory behaviour, Figure (b) shows that the pre-trends are essentially flat and that the impact of return to work increases for three months after it's initial impact, after which it levels off. These results suggest that there is both a trade-off around the return to work, with mothers stopping both in anticipation of and in response to difficulties of combining breastfeeding and work. The average treatment effect on treated - after adjusting for anticipation effects - is 10.0 percentage points (Column (II), Table 2).

Figure 2: Event study for impact of return to work on the probability a mother continues breastfeeding



Figures show results from the Callaway and Sant'Anna doubly-robust estimator. Pre-treatment covariates of whether the mother has a degree, her marital status, age and ethnicity are used in the propensity score.

Table 2: Effect of RTW on breastfeeding

	(I) No Anticipation	(II) 2 Months Anticipation
RTW	-0.059*** (0.017)	-0.100*** (0.018)
N	23757	23580
X controls	Yes	Yes

Wild bootstrap standard errors in parenthesis. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Pre-treatment covariates  $X$  of whether the mother has a degree, her marital status, age and ethnicity are used in the propensity score.

## 5.2 Heterogeneity analysis

In this section we estimate estimated effects for sub-groups of various employment characteristics. Due to smaller sample sizes in sub-groups, we report aggregate ATT effects only.

First, we consider heterogeneity in estimated effects by industry of employment; with one study in the US finding differences in support by industry (Snyder et al., 2018).<sup>16</sup> We see large effects in Education, Health and Social work, Other services (including retail) and Other, with estimated aggregate effects of RTW of 10.3, 14.7, 13.5 and 14.6 percentage points, respectively (Table 3). We find little evidence of effects in the Business and Professional Services industry (Column (III), Table 3). This suggests the characteristics of jobs (for example, how likely a mother will have time or an office/other space to pump milk) matters for continuation of breastfeeding upon return to work, consistent with evidence from qualitative studies (Desmond and Meaney, 2016; Zhou et al., 2020; Hentges and Pilot, 2021; Jackson and Hallam, 2021). In a robustness check, we later consider whether alternative definitions such as occupational groups yield similar results.

To investigate the potential role of both time constraints and ability to pump milk during the working day, we consider sub-group analysis by whether a mothers’s job has the option to work flexibly or not. We also compare mothers who with different commuting times (above and below 75<sup>th</sup> percentile, or 35 minutes), amongst the subsample of mothers who cannot work from home (WFH). The effect of RTW on breastfeeding is driven by the group of mothers whose employers do not offer any flexible working, for whom RTW lowers the probability of still breastfeeding by 18.6 percentage points (Column (II), Table 4). Amongst mothers who cannot WFH, when we split by low vs. high commuting times, we see effects are driven by women with high commuting times (36.6 percentage points, column (IV)), with no effect found for those with shorter commuting times (column (III)).

<sup>16</sup>We focus on the largest industry groups and combine other industries which are too small for sub-group analysis.

Table 3: Heterogeneity by Industry

	(I)	(II)	(III)	(IV)	(V)
	Education	Health	Business	Services	Other
RTW	-0.103*** (0.037)	-0.147** (0.072)	0.011 (0.063)	-0.135*** (0.048)	-0.146*** (0.047)
N	5153	3355	2627	2591	3306
$X$ controls	Yes	Yes	Yes	Yes	Yes

Wild bootstrap standard errors in parenthesis. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Pre-treatment covariates  $X$  of whether the mother has a degree, her marital status, age and ethnicity are used in the propensity score. See A.13 for details on industry groupings

Table 4: Heterogeneity by availability of flexible working and by commuting time

	(I) Flexible working available Yes	(II) No	(III) Commuting Time < 75 <sup>th</sup> pct	(IV) > 75 <sup>th</sup> pct
RTW	-0.045 (0.047)	-0.186*** (0.051)	-0.032 (0.043)	-0.366*** (0.095)
N	5246	3131	4689	1685
X controls	Yes	Yes	Yes	Yes

Wild bootstrap standard errors in parenthesis. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Pre-treatment covariates  $X$  of whether the mother has a degree, her marital status, age and ethnicity are used in the propensity score. See Appendix B4 for information on flexible working and commuting variables

## 6 Mechanisms

Our proposed mechanism is that workplace-specific barriers increase the effective cost of maintaining breastfeeding after return to work, leading to the observed decline in breastfeeding continuation. In the context of the model outlined in section 2, these barriers operate as constraints on the feasibility of allocating time to breastfeeding  $t_{bf}$  once paid work time  $t_w$  becomes binding, by limiting opportunities for breaks, private space, or schedule flexibility. Here we provide descriptive evidence to support this and then investigate two alternative explanations which we argue are less consistent with the observed patterns.

### 6.1 Workplace specific barriers

To investigate how workplace specific barriers vary across industries we consider evidence from a second source: a HR survey undertaken by the authors. Few studies have considered employer perspectives regarding supporting breastfeeding employers and mainly limited to the US (Chow et al., 2011; MacMillan Uribe et al., 2019; Bai et al., 2012; Hojnacki et al., 2012; Ashby et al., 2024). Our HR Survey was conducted by YouGov Plc as part of their weekly HR Decision Maker panel survey and 508 adult HR decision makers from a range of industries completed it online. Fieldwork was undertaken between 21st-26th March 2024. Since YouGov’s Decision Maker panel does not cover the public sector, we supplemented the survey with one undertaken on the Prolific research platform,<sup>17</sup> collecting a further 144 responses from HR professionals from across public administration, education, and health and social work (including charity and not for profit/voluntary organisations). The HR Survey focused on workplace provisions, information and communication, views and barriers/ facilitators to supporting breastfeeding employees. We focus on perceived practicality of and perceived barriers to accommodating breastfeeding in the workplace. Table 5 shows variation by industry; we see that HR professionals in the health and education industries are most likely to disagree (36.4 and 26.2%, respectively) that is it easy/practical to accommodate breastfeeding employees in their business,

<sup>17</sup>Prolific is an online research platform that connects researchers with research participants, from among Prolific’s pool of potential participants. Researchers can select participants based on characteristics of interest or select a representative sample (based on sex, age and ethnicity). For more information about Prolific see, <https://www.prolific.com/researchers>

compared to an average across all industries of 18.1%. Perceived barriers are also highest amongst these sectors, with lack of space (41.4%, 47.1%), flexibility (47.1%, 47.7%) and difficulty of breaks (47.1, 52.3%) higher than the average. In contrast, HR professionals in Business and Professional services report the lowest level of disagreement that it is easy/practical to accommodate breastfeeding (10.1%), and the lowest (or amongst the lowest) percentages of perceived barriers of lack of space (29.3%), flexibility (23.2%) and difficulty of breaks (27.3%). These patterns are in line with our main results as presented in Table 3, in that there is a correlation with perceptions about ease of facilitation of breastfeeding in the workplace and our estimated effects of return to work on breastfeeding behaviour. For other services, (which includes retail, hospitality and other services), the story is less clear: HR professionals report lower than average disagreement with perception of practicality of accommodating breastfeeding employees (11.3%), but higher than average perceived barriers of flexibility (35.2%) and breaks (38.9%).

Table 5: HR Professionals Survey: Perceived Barriers to accomodating breastfeeding employees

	Practical		Lack Space	Barriers		N
	Agree	Disagree		Lack Flexibility	Breaks - difficult	
<b>All</b>	58.4	18.1	29.1	30.4	33.9	652
<b>Industry</b>						
Primary and Secondary industries	52.8	17.3	18.3	20.8	24.4	197
Transport and Communication	71.7	20.4	18.9	23.6	29.2	106
Business and Professional Services	66.7	10.1	29.3	23.2	27.3	99
Other Services	61.1	11.3	22.2	35.2	38.9	54
Health and social work	54	36.4	41.4	47.1	47.1	87
Education	53.8	26.2	47.7	47.7	52.3	65
Public Administration	45.5	20.7	59.1	40.9	43.2	44

Source: HR Survey (652 respondents)  
Practical: It is easy/practical to accommodate breastfeeding employees in my business/organisation  
Barriers-  
Lack space: Lack of facilities/space for employees to breastfeed/express breastmilk  
Lack flexibility: The nature of the job makes it difficult to allow (some or all) breastfeeding employees to work from home/adjust shift patterns  
Breaks – difficult: The nature of the job makes it difficult to allow (some or all) breastfeeding employees to take more frequent/longer breaks and / or lack cover: cover to allow breastfeeding employees to take longer/more frequent breaks and/or adjust start/finish times

## 6.2 Alternative explanations

### Occupational Sorting

One argument might be that our results may be driven by occupational sorting on the basis of personal characteristics that are also correlated with breastfeeding preferences or resources, rather than the causal effect of returning to work. If mothers who are more likely to breastfeed select into occupations with longer parental leave or greater flexibility, our estimates could conflate the effect of returning to work with pre-existing differences in preferences or resources. In the context of our framework developed in section 2, this would correspond to systematic correlation between preference parameters in the utility function e.g. the weights placed on  $I^m$  and  $I^w$  and workplace-specific constraints that shift the cost of breastfeeding after return to work. If occupational sorting on preferences were driving the results, the model predicts

heterogeneity in the return-to-work effect across observable maternal characteristics that proxy preferences or resources.

To address this, we investigate whether heterogeneity exists across socioeconomic characteristics such as educational attainment (degree vs. no degree), ethnicity (white vs. BAME), age (age 25-34 vs. 34+). Table A.6 shows that there are no statistically significant differences in the effect of RTW on breastfeeding behaviour between these different socioeconomic groups, suggesting that occupational sorting is not driving our results.

### **Workplace attitudes towards breastfeeding**

We have argued that workplace specific barriers may drive the effects of RTW on breastfeeding behaviour. Here, we consider whether instead (or in addition), breastfeeding norms and workplace culture across different occupations and sectors drives our results. Evidence suggests that the attitudes of others, employers and colleagues can influence breastfeeding decisions (Hannan et al., 2005; Acker, 2009; Desmond and Meaney, 2016; Hentges and Pilot, 2021). In the theoretical framework, workplace culture and norms enter utility through the reduced-form self-image components  $I^m$  and  $I^w$ , which capture the extent to which a mother’s behaviour conforms to prevailing expectations regarding mothering and work, respectively. Less supportive attitudes towards breastfeeding at work may therefore increase the psychological or social cost of continuing to breastfeed after return to work, even when formal workplace accommodations are available. It is possible that mothers in certain industries or occupations face more (or less) supportive attitudes towards breastfeeding in the workplace, independent of workplace constraints.

Whilst we cannot directly identify the effects of  $I^w$  and  $I^m$ , we use information from two surveys to examine whether variation in breastfeeding outcomes across occupations and industries may reflect differences in such workplace norms associated with breastfeeding. The first source we utilise is the British Social Attitudes 2022 survey, in which the authors funded a module on attitudes to breastfeeding. This included support for breastfeeding in the workplace, such as beliefs about what employers could do to support breastfeeding. We construct an index of attitudes towards workplace support (IndexWrk) for breastfeeding using principal components analysis (PCA); Table A.7 shows the questions asked of individuals and the coding in the index; all but one of the variables are coded so that more positive values indicate more support for employer support for breastfeeding at work. Table A.8 shows the factor loadings of these variables, which are in the expected direction, suggesting that more positive value of the index are associated with more positive attitudes towards employer support for breastfeeding at work; we interpret these as environments in which any breastfeeding associated costs captured by  $I^w$  and  $I^m$  are lower. Next, we utilise our HR survey (discussed in Section 6.1), which asked HR professions three questions covering attitudes to supporting breastfeeding in the workplace, and employers and employees responsibilities (see Table A.10). Table A.11 shows factor loadings, which are in the expected direction, with more positive values of the index associated with more positive attitudes towards breastfeeding support.

We investigate variation in this index by occupation (BSA) and industry (HR Survey). Whilst the occupational groupings in the BSA do not map onto those in our sample, we organise these individuals into the following groups: Modern professionals (including, for e.g. nurse, teacher), Traditional professionals (e.g. medical practitioner), Managers (including junior and middle managers), Manual workers and Services, Clerical (including intermediate occupations), and Other (technical/craft occupations). Table A.9 gives

further details on these groups.

When considering support for breastfeeding at work, the distribution in the index amongst BSA respondents are clearly bimodal- suggesting that people tend to agree with all or none of the statements on employer support for breastfeeding. We see the highest support for employer support for breastfeeding in the modern professional group, followed by traditional professions, clerical and managerial occupations (Figure A.5a). The least support is given by those in manual and service occupations and technical/craft occupations.<sup>18</sup> This provides some suggestive evidence that individuals in Education and Health, who are most likely to lie within the professional occupation category, are less likely to be in occupations in which prevailing norms around employer support for breastfeeding are negative. This is reinforced by our HR survey, which clearly shows that highest levels of support are in the Education and Health industries (as well as public administration). This is despite these HR professionals being more likely to cite potential workplace constraints that make breastfeeding in the workplace challenging (as discussed in section 6.1 above).

In contrast, attitudes towards employer support for breastfeeding may contribute to some of the observed effects for those individuals working in services or retail, for whom Tables 3 and A.5 suggest a negative effect of RTW on breastfeeding continuation. Both the BSA (Figure A.5a) and HR Survey (Figure A.5c) suggest less positive views towards employer support for breastfeeding in the workplace amongst Services. We note that, in our main analysis, we cannot disentangle the potential role of attitudes towards combining breastfeeding and work (which operate through  $I^w$  and  $I^m$ ) versus workplace specific constraints in driving our observed effects for those in Service industries.

Overall, these results lend support to the interpretation that workplace constraints, rather than occupational sorting or social norms, is the primary mechanism through which return to work affects breastfeeding duration.

## 7 Robustness checks

### 7.1 Additional Controls

We first investigate whether our results are robust to additional controls. We investigate region of residence, due to regional variations in breastfeeding rates in the UK (Merritt et al., 2023; Oakley et al., 2013) and an indicator for above median household income.<sup>19</sup> Our results are robust to inclusion of region and/or income; in a specification including both as pre-treatment covariates the estimated effect of RTW on the probability of breastfeeding is 9.0 percentage points (Column (III), Table A.3).

### 7.2 Dropping the Covid-19 period

Since both breastfeeding and work behaviour may have been different in the Covid-19 period, due to changes to breastfeeding support and/or working patterns, in an additional robustness check we drop observations after 2020 from our analysis (6.6% of observations). Our results are unaffected by their removal (Column (II), Table A.4).

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<sup>18</sup>Grouping individuals into professional occupations and managers vs. other occupations, we confirm the distributions across these two groups differ and are statistically significant (Figure A.5b).

<sup>19</sup>Table A.1 in Appendix A shows and section B.3 in Appendix B provides information on how these variables were constructed.

### 7.3 Heterogeneity by Occupation

Results from the main analysis suggest that effects vary by industry. Here, we focus on an alternative classification of employment type: Standard Occupational Classification group; evidence from outside the UK context suggests differences in breastfeeding cessation by occupation with professional/managerial employees less likely to stop breastfeeding upon return to work (Dagher et al., 2016; Castetbon et al., 2020). We focus on the largest groups and/or combine groups to ensure enough sample size for estimation<sup>20</sup>. Results from our analysis of industry sub-group are mirrored when we consider occupation group (Table A.5) though in some cases effects are quite imprecisely estimated, reflecting the wide range of workplace settings included in each group. Nonetheless, we observe the largest falls in breastfeeding upon RTW in Education, Health, and Services, with estimated aggregate effects of 19.8, 23.3 and 20.5 pp, respectively (Columns (I), (II) and (VI), Table A.5).

## 8 Discussion and Conclusion

Decisions about infant feeding are fundamentally shaped by a mother’s autonomy over their time and work. Understanding barriers to breastfeeding is thus important to devise policies that remove constraints to what should be a mother’s choice. Within this context, breastfeeding is also associated with well-documented benefits for children and mothers and is widely promoted by international and national health organisations. We adopt an economic perspective by considering breastfeeding as a form of work performed by mothers alongside other productive work in the labour market and in the household. This allows us to describe trade offs that mothers encounter when making choices of their own time investments in ways that maximise both the child’s and their own wellbeing, which is affected by consumption and their sense of identity both as workers and mothers as well as the child’s wellbeing. In this paper we only focus on the constraints that derive from the workplace and assess the extent to which they affect the continuation of breastfeeding for mothers who return to work. Making use of a sample from the UKHLS we document a trade off between return to work and breastfeeding continuation with mothers anticipating difficulties they expect from the workplace and stopping breastfeeding prior to returning to work. Our paper complements and extends the results of previous studies, firstly, showing the increase in probability of stopping breastfeeding around return to work, secondly showing variations in this probability by industry and option to work flexibly/from home. We provide evidence that differences by industry are driven more by workplace constraints than workplace attitudes. This finding suggests a significant reason for the low breastfeeding continuation rates in the UK is related to the difficulty of reconciling work and breastfeeding. Strengthening legal protections to support breastfeeding employees in relation to breaks, flexible working and facilities would be a step in the right direction. Given variations in workplace constraints across industries, employers should consider how they can facilitate breastfeeding for those employees who wish to continue to breastfeed upon return to work. This paper provides a platform for future research to examine specific workplace barriers and to examine the impact on well-being on the trade-offs between breastfeeding and return to work.

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<sup>20</sup>See A.12 for details of the occupation groupings

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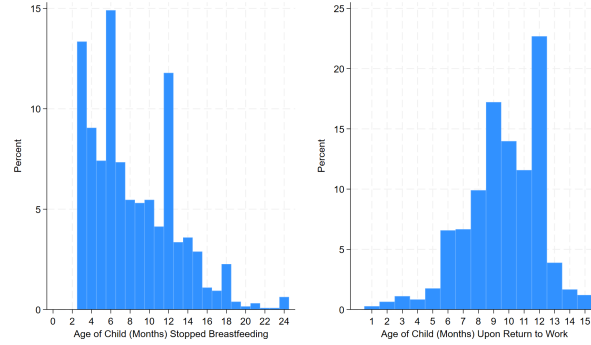
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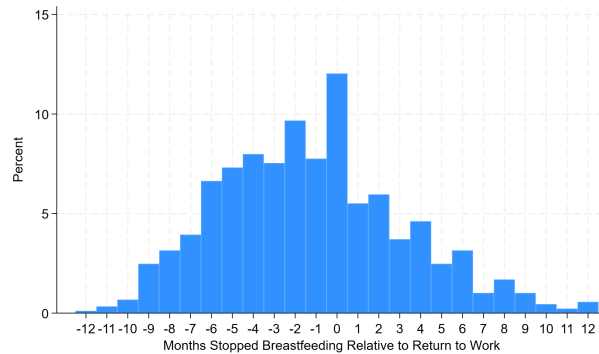
## Appendix A: Additional Figures and Tables

Figure A.1: Months Stopped Breastfeeding and Months Returned to Work: Mothers who established breastfeeding



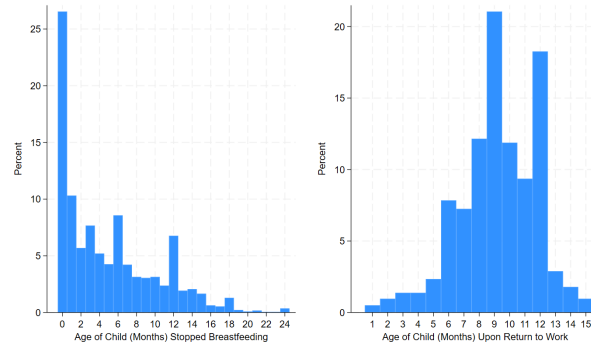
Notes: The figure showing the distribution of months stopped breastfeeding includes births where the mother was observed finishing breastfeeding and by 24 months which includes 1281 births from 1084 mothers. The figure showing distribution of return to work include the sample who returned to work within 15 months of giving birth and includes 1080 births from 899 mothers.

Figure A.2: Months Stopped Breastfeeding Relative to Return to Work: mothers who established breastfeeding



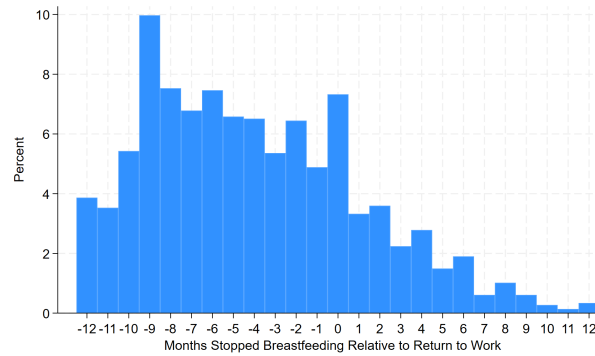
Notes: The figure showing the distance between stopping breastfeeding and return to work (month stopped breastfeeding - month returned to work) and includes mothers who had breastfed for at least 3 months and who were observed stopping 12 months before or after return to work which includes 889 births from 761 mothers.

Figure A.3: Months Stopped Breastfeeding and Months Returned to Work: All mothers



Notes: The figure showing the distribution of months stopped breastfeeding includes births where the mother was observed finishing breastfeeding and by 24 months which includes 2230 births from 1858 mothers. The figure showing distribution of return to work include the sample who returned to work within 15 months of giving birth and includes 2180 births from 1794 mothers .

Figure A.4: Months Stopped Breastfeeding Relative to Return to Work: all mothers



Notes: The figure showing the distance between stopping breastfeeding and return to work (month stopped breastfeeding - month returned to work) and includes mothers who had breastfed for at least 3 months and who were observed stopping 12 months before or after return to work which includes 1417 births from 1202 mothers.

Figure A.5: Attitudes towards employer support to facilitate breastfeeding



Notes: Data Source for figures (a) and (b) are the 2022 BSA. Data Source for figure (c) is the HR survey run by the authors via Prolific. Figures show the distribution of attitudes towards employer support for breastfeeding in the workplace. More positive values indicate more positive views towards employer support for breastfeeding/expressing breast milk in the workplace.

Table A.1: Description of Key Variables

Variable	Description
Age at birth (years)	Categorical variable: 1=Aged 16-24, 2=Aged 25-34, 3=Aged 35+
Ethnicity	Categorical variable: 1=white, 2=Asian/Asian British, 3=Black/Black British, 4=Mixed/Other
Pre-birth mother characteristics (collected wave before birth)	
Degree	Dummy variable =1 if respondent has a University degree, 0 otherwise
Marital status	Caegorical variable: 1=married/civil partnership, 2=cohabiting, 3=not living with a spouse/partner
Region of residence	Categorical variable: 1=North, 2=Midlands, 3=East of England, 4=London, 5=South, 7=Wales, 8=Scotland, 9=Northern Ireland
Equivalised monthly household income	Total monthly household gross income, equivalised by dividing by the provided OECD-modified equivalence scale
Breastfeeding variables	
Breastfed for at least x months	Dummy variable =1 if breastfed at least x months, 0 otherwise; x=3, 6, 9, 12
Employment variables	
Months returned	Age of child (months) when mother returned to work, missing if mother was not working within 15 months of birth
Employed pre-birth	Dummy variable =1 if employed pre-birth, 0 otherwise
Employed within 15 months after birth	Dummy variable =1 if returned to/started work within 15 months of birth, 0 otherwise
Returned to work within 15 months	Dummy variable =1 if returned to work within 15 months of birth, 0 otherwise
Continued breastfeeding upon return to work	=1 if mothers breastfeed duration (months) is greater than months returned, 0 otherwise
Event study variables	
Time relative to return to work	0=month returned to work, -1=one month before etc., 1=one month after etc.
Still breastfeeding	Dummy variable =1 if have not stopped breastfeeding by that month, 0 otherwise

Table A.2: Descriptive Statistics for variables used in heterogeneity analysis

	All	Breastfed 3+ Months
<b>A: Industry</b>		
Education	16.8	19.7
Health and Social Work	29.8	29.9
Public administration	7.0	7.0
Business and Professional Services	15.0	15.3
Other services	20.0	15.3
Other	11.5	12.8
N	2,376	1,167
<b>B: Occupation</b>		
Health	11.2	14.5
Teaching	12.7	15.8
Managers and Other professionals	16.2	18.3
Other associate professionals	15.3	18.2
Administration	13.5	12.4
Services	24.4	15.9
Other	6.7	4.9
N	2,402	1,179
<b>C: Availability of Flexible working (%)</b>		
Any	59.0	62.8
Working from home	14.8	18.6
N	1,243	540
<b>Commuting Time</b>		
Mean	27.0	29.2
Median	20	25
75th percentile	35	40
N	2,197	1,049

Table A.3: Callaway and Sant'Anna Estimates: Additional controls

	(I)	(II)	(III)
RTW	-0.094*** (0.019)	-0.096*** (0.018)	-0.090*** (0.019)
N	23387	23580	23387
X controls	Yes	Yes	Yes
Income	Yes	No	Yes
Region	No	Yes	Yes

Wild bootstrap standard errors in parenthesis.  
\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Pre-treatment covariates  $X$  of whether the mother has a degree, her marital status, age and ethnicity are used in the propensity score.

Table A.4: Callaway and Sant'Anna Estimates: Excluding post-Covid period

	(I) Full Sample	(II) Excluding post-2020
RTW	-0.100*** (0.018)	-0.100*** (0.018)
N	23580	22065
X controls	Yes	Yes

Wild bootstrap standard errors in parenthesis. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Pre-treatment covariates  $X$  of whether the mother has a degree, her marital status, age and ethnicity are used in the propensity score.

Table A.5: Callaway and Sant'Anna Estimates: Heterogeneity by Occupation

	(I) Health	(II) Education	(III) Managers	(IV) AssocProf	(V) Admin	(VI) Services
RTW	-0.233*** (0.069)	-0.198*** (0.060)	-0.042 (0.055)	-0.062 (0.065)	-0.075 (0.074)	-0.205*** (0.048)
N	1916	2708	3208	3138	2141	2755
X controls	Yes	Yes	Yes	Yes	Yes	Yes

Wild bootstrap standard errors in parenthesis. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Pre-treatment covariates  $X$  of whether the mother has a degree, her marital status, age and ethnicity are used in the propensity score.

Table A.6: Callaway and Sant'Anna Estimates: Heterogeneity by Personal Characteristics

	(I) Degree	(II) No Degree	(III) Age 25-34	(IV) Age 35+	(V) White	(VI) BAME
RTW	-0.104*** (0.023)	-0.107*** (0.028)	-0.078*** (0.021)	-0.086*** (0.021)	-0.100*** (0.020)	-0.094** (0.045)
N	13148	10432	14789	16459	17313	6267
$X$ controls	Yes	Yes	Yes	Yes	Yes	Yes

Wild bootstrap standard errors in parenthesis. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Pre-treatment covariates  $X$  used in the propensity score are: in columns (I) and (II), the mother's marital status, age and ethnicity; in columns (III) and (IV), whether the mother has a degree, her marital status, and ethnicity; in columns (V) and (VI), whether the mother has a degree, her marital status, and age.

Table A.7: BSA Survey: Attitude Variables used in Index construction

Variable	Question	Coding of answers
FeedWrk	Please indicate how much you agree or disagree with the following statement: It should be the responsibility of employers to make it possible for mothers to breastfeed or express breastmilk while at work.	1= Strongly disagree, 2= Disagree, 3= Neither agree nor disagree, 4= Agree, 5= Strongly agree
FeedWrk2	Here are some measures people have suggested employers could take to support families with babies. Which of the following do you think would help support mothers who breastfeed their children?	
	(1) Extend paid paternity/partner leave from two weeks to four weeks	1=No, 2=Yes
	(2) Extend fully paid maternity leave from 6 weeks to 6 months	1=No, 2=Yes
	(3) Wherever possible, provide a private room where mothers can express and store milk	1=No, 2=Yes
	(4) Allow parents with babies to work flexible hours	1=No, 2=Yes
	(5) None of these [EXCLUSIVE]	1=No, 2=Yes

Table A.8: BSA Survey: Attitudes to Employer Support at Work: PCA loadings

	Loading
Employers responsible to make possible mothers to breastfeed (FeedWrk)	0.2430
Extended paternity leave would support BF (FeedWrk21)	0.5091
Extended fully paid maternity leave would support BF (FeedWrk22)	0.4855
Providing private room would support BF (FeedWrk23)	0.3867
Allow flexible hours would support BF (FeedWrk24)	0.3941
No employer measures would support BF (FeedWrk25)	-0.3758

Table A.9: BSA Occupational Groupings

Occupation Group	BSA Occupation Group	Examples
Modern Professional	Modern professional occupations	teacher/lecturer, nurse, physiotherapist, social worker, welfare officer, artist, musician, police officer (sergeant or above), software designer.
Traditional Professional	Traditional professional occupations	accountant, solicitor, medical practitioner, scientist, civil/mechanical engineer.
Managers	Senior managers and administrators usually responsible for planning, organising and co-ordinating work and for finance	finance manager, chief executive.
Managers	Middle or junior managers	office manager, retail manager, bank manager, restaurant manager, warehouse manager, publican.
Manual/Services	Semi-routine manual and service occupations	postal worker, machine operative, security guard, caretaker, farm worker, catering assistant, receptionist, sales assistant.
Manual/Services	Routine manual and service occupations	HGV driver, van driver, cleaner, porter, packer, sewing machinist, messenger, labourer, waiter / waitress, bar staff.
Clerical	Clerical and intermediate occupations	secretary, personal assistant, clerical worker, office clerk, call centre agent, nursing auxiliary, nursery nurse.
Other	Technical and craft occupations	motor mechanic, fitter, inspector, plumber, printer, tool maker, electrician, gardener, train driver

Table A.10: HR Survey: Attitude Variables used in Index construction

Variable	Question	Coding of answers
Q4.1	It is the responsibility of employers to make it possible for mothers to breastfeed or express breastmilk while at work	1= Strongly disagree, 2= Disagree, 3= Neither agree nor disagree, 4= Agree, 5= Strongly agree
Q4.2	It is the responsibility of employees to locate the business' policies regarding breastfeeding and/or discuss concerns and seek support when needed	1= Strongly disagree, 2= Disagree, 3= Neither agree nor disagree, 4= Agree, 5= Strongly agree
Q4.3	Employers have a duty of care to support breastfeeding employees in the workplace	1= Strongly disagree, 2= Disagree, 3= Neither agree nor disagree, 4= Agree, 5= Strongly agree

Table A.11: HR Survey: Attitudes to Employer Support at Work: PCA loadings

	Loading
Employers responsible to make possible mothers to breastfeed (Q4.1)	0.6861
Employees responsible to locate policies or discuss support needed (Q4.2)	0.2479
Employers have a duty of care to support breastfeeding employees (Q4.3)	0.6840

## Appendix B: Sample Creation

We draw together information from different data files in the UKHLS: the individual response file (indresp), stable characteristics file (xwavedat), newborn file (newborn) and child file (child). Except for the stable characteristics file, there is a version of each file for each wave (the newborn files start from wave 2). Successful pregnancies reported in a wave were identified from the individual response file and matched to information in the newborn file using the mother's unique identifier which then was matched to information in the child file (based on the child's unique identifier). The individual file contains information about the pregnancy (including type of delivery and whether a multiple birth), mother's personal characteristics, and information on employment, employment changes and maternity leave. The stable characteristics file contains information that is fixed and collected when first interviewed and includes information on ethnicity and year of the respondent's birth. The newborn file contains birth characteristics (birth weight, whether born early/late), and importantly information on breastfeeding (whether breastfed and for how long); if the mother was still breastfeeding (information on age stopped breastfeeding was collected in their next wave).

### B.1 Breastfeeding Information

We combined information from the newborn file and the child file to obtain information on breastfeeding initiation and duration. In the newborn file information is asked as to whether the child was breastfed and how long. Respondents could answer breastfeeding duration in days, weeks, months or years – we converted all information not collected in months to months breastfed (and rounded down when this led to partial months).

If an individual had not finished breastfeeding when information on breastfeeding was first collected (in the newborn file), information was collected on whether they were still breastfeeding (and if stopped the duration) in the next wave which is contained in the child file. We matched this information where available to obtain the duration for this group. However, they were not then followed up again if the breastfeed beyond the point of the second wave of being asked this breastfeeding information. Therefore, for some, particularly those with long breastfeeding duration, we do not observe their full breastfeeding duration but know how long they had been breastfeeding at the point this information was last collected. For those with right censored breastfeeding duration information, we included these in the sample who had breastfed at least 12 months (344 occurrences), as we did not want to introduce bias by excluding mothers who breastfed for longer durations (and hence if they had returned by that point would be observed as breastfeeding upon return to work). This is generally not a problem as we are not interested in the full duration more whether they were observed as breastfeeding around the time they returned to work. We excluded anyone who had been breastfeeding less than 12 months when the information was collected for a second time (24 observations).

Information in the newborn file is collected from wave 2 but the data contained in wave 2 was dropped due to an error by the data collectors in wave 2 relating to the follow up of breastfeeding mothers who had still been breastfeeding in wave 2.

## **B.2 Employment Information**

We constructed a monthly employment and maternity leave history (with a row for each month and year combination, from the first year they were observed in the data until the last point observed) for each mother based on the information collected in the individual files (indresp). We combined information on current employment status/job information, employment status/job changes, maternity leave spells and expected return to work after birth. This information enabled us to determine the mother's employment status at the month of a birth and at what point they returned to work/started a job (if not previously employed at the time of the birth), if at all, after birth. For those returning to work/starting a job we could work out how old the child was in months at the point of return to work/starting a job. The individual file also contains information on job characteristics, such as sector (public vs private), occupation, industry, organisation size, contract type and job hours. We collected this information at the time of birth and upon return to work.

Based on the status and return to work information we created a variable indicating their employment status at the time of birth (whether employed/on maternity leave or not employed/on maternity leave) and whether they returned to work/started a job within 15 months of giving birth. We restricted our return to work variable to return within 15 months of the child's birth to reflect that the maximum maternity leave is 12 months in the UK and that some mothers may add a few months of annual leave. We constructed the following categories: remained not employed (the mother was not employed/on maternity leave before birth and did not start a job within 15 months of giving birth), started a job (the mother was not observed as employed/on maternity leave before birth but started a job within 15 months of giving birth), returned to work (the mother was employed/on maternity leave before birth and returned to work within 15 months of giving birth), not returned to work (the mother was employed/on maternity leave before birth and returned to work within 15 months of giving birth). The distinction between whether the mother was employed pre-birth is important when we consider job characteristics, since we use job characteristics prior to birth,

and hence only those employed prior to birth can be included.

We are interested in observing if there are any patterns in stopping breastfeeding around the time to return to work. To do this, we subtracted the age of child when mother return to work from the age of child when the mother stops breastfeeding. In the resultant variable the negative months indicated the number of months they stopped breastfeeding before returning to work and positive months indicated the number of months for which they continued breastfeeding after returning to work. Respondents with positive values were defined as continuing to breastfeed upon return to work.

### B.3 Control Variables

Personal information was obtained from the individual response files and the stable characteristics file. The age of the mother at the time of the birth was constructed on the basis of month and year of the mother’s birth and the child’s birth (this information was obtained from the `xwavedat` file, with the month of birth only available in the special licence version of the data that we used <sup>21</sup> i.e. the child’s birth date (in months) minus the mother’s birth date (in months) converted to years (age). We also obtained the mother’s ethnicity from the `xwavedat` file using the `racel_dv` variable which combines all the information collected on ethnicity for an individual. This variable uses 17 categories and we collapsed these to common groupings of White, Asian/Asian British, Black/Black British and Mixed/other owing to some groups having low frequencies, and hence avoiding low frequencies/small cell sizes for some ethnic groups. Anyone with missing ethnicity data was classed as having missing information.

From the `indresp` file we constructed pre-birth characteristics of the mother (based on information collected in the wave prior to them giving birth). We constructed an indicator of whether the mother had a University degree using the `hiqua_dv` variable. We defined a degree using the first category of `hiqua_dv` (degree) with all other qualifications classed as below degree level (including the other higher degree category which is classed as below undergraduate level). Anyone who did not have information on a degree was classed as having missing information. We utilised gross monthly household income (`fihhmngs_dv`) available from the household response file (`hhresp`) and equivalised this by dividing by the provided OECD-modified equivalence scale (`ieqmoecd_dv`) <sup>22</sup> which adjusts for household size. Marital status was constructed from the `mastat_dv` variable and categories were grouped into married/in a civil partnership, cohabiting and not living with a partner/spouse. We grouped region of residence (`gor_dv`) into fewer categories (to avoid having too many variables): North (North West, North East, Yorkshire and Humber), Midlands (West Midlands, East Midlands), East of England, London, South (South East and South West), Wales, Scotland and Northern Ireland.

### B.4 Job Characteristics

In our heterogeneity analysis we focus on several characteristics of the job. We focus on the characteristics of the job they were doing prior to birth rather than upon return, to avoid potential endogeneity from changes to job (between birth and return) to accommodate infant feeding decisions. Information on job is

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<sup>21</sup>University of Essex, Institute for Social and Economic Research. (2023). *Understanding Society: Waves 1-13, 2009-2022 and Harmonised BHPS: Waves 1-18, 1991-2009: Special License Access*. [data collection]. 17th Edition. UK Data Service. SN: 6931, DOI: <http://doi.org/10.5255/UKDA-SN-6931-16>

<sup>22</sup>For more details on this scale see the UKHLS documentation: <https://www.understandingsociety.ac.uk/documentation/mainstage/variables/ieqmoecd>

only available to the sample who were employed prior to birth, and provided full information, and some characteristics were only collected for employees (excluding self-employees).

## Occupation

3-digit standard occupation classification (SOC) codes were provided in the UKHLS and created based on the 2010 SOC classification as this was provided in most waves. In some cases where only 2000 or 2020 SOC classification codes were provided we matched these to the closest 2010 codes. We generally collapsed to the 2-digit SOC level so any minor discrepancies between the codes (due to re-classifications of occupations) made little difference. We occasionally use the 3-digit code to help with classification when identifying specific occupations such as health. We then created the following groups, as outlined in Table A.12.

Of those we observe both job characteristics before and after return to work, 229 of 1,903 observations had a different occupation group before to that they were in after return to work **Industry**

The UKHLS provided 3-digit standard industrial classification (SIC) codes using the 2007 classification, these were used to construct industry sectors (from industry section level) that were aligned with definitions used in our HR Survey, which we have outlined in Table A.13. We followed industry ‘sectors’ used in the Labour Force Survey but due to small cell size we combined primary and secondary sectors, and combined Food and Accommodation with Other services, and split out Public Administration, Education, and Health and Social Work, due to these being common sectors among our survey of mothers. In our final analysis using the UKHLS it was only possible to split out Business and Professional Services, Other services, Education and Health and Social Work, with all other groups place into an ‘Other’ category due to small cell sizes.

Of those we observe both job characteristics before and after return to work, only 124 of 1,885 observations had a different industry group before to that they were in after return to work.

## Flexible Working

From wave 2, the UKHLS asked employees in even waves “I would like to ask about working arrangements at the place where you work. If you personally needed any, which of the following arrangements are available at your workplace?”

Part time working

Working term time only

Job sharing

Flexi-time

Working compressed hours

To work annualised hours

To work from home on a regular basis

Other flexible working arrangements

Zero-hours contract

On-call working

None of these

Table A.12: Occupation Grouping

Short name	Full Name	Codes
Health	Health occupations	22 “Health professionals” 321 “Health associate professionals”
Teaching	Teaching and Educational occupations	23 “Teaching and educational professionals”
Managers and Other Professional	Managers, Directors and Other professional occupations	11 “Corporate managers and directors” 12 “Other managers and proprietors” 21 “Science, research, engineering and technology professionals” 24 “Business, media and public service professionals”
Other associate professional	Other associate professional occupations	31 “Science, engineering and technology associate professionals” 32 “Health and social care associate professionals” 33 “Protective service occupations” 34 “Culture, media and sports occupations” 35 “Business and public service associate professionals” Excludes “321 Health associate professionals”
Administration	Administrative and secretarial occupations	41 “Administrative occupations” 42 “Secretarial and related occupations”
Services	Caring, leisure and sales occupations	61 “Caring personal service occupations” 62 “Leisure, travel and related personal service occupations” 71 “Sales occupations” 72 “Customer service occupations”
Other	Other occupations	51 “Skilled agricultural and related trades” 52 “Skilled metal, electrical and electronic trades” 53 “Skilled construction and building trades” 54 “Textiles, printing and other skilled trades” 81 “Process, plant and machine operatives” 82 “Transport and mobile machine drivers and operatives” 91 “Elementary trades and related occupations” 92 “Elementary administration and service occupations”

Table A.13: Industry Sector Grouping

Short Name	Full Name	Industry Sections
Primary and Secondary industries	Manufacturing, construction and primary industries	A: Agriculture, forestry and fishing B: Mining and quarrying C: Manufacturing D: Electricity, gas, steam and air conditioning supply E: Water supply; sewerage, waste management and remediation activities F: Construction
Transport and Communication	Transport, information and communication	H: Transportation and storage J: Information and communication
Business and Professional Service	Finance, business and professional services	K: Financial and insurance activities L: Real estate activities M: Professional, scientific and technical activities N: Administrative and support service activities
Other services	Retail, accommodation and food; other services	G: Wholesale and retail trade; repair of motor vehicles and motorcycles I: Accommodation and food service activities R: Arts, entertainment and recreation S: Other service activities T: Activities of households as employers; undifferentiated goods-and services-producing activities of households for own use U: Activities of extraterritorial organisations and bodies
Public Administration	Public Administration and Defence	O: Public administration and defence, compulsory social security
Education	Education	P: Education
Health and Social Work	Health and Social Work Activities	Q: Human health and social work activities

The UKHLS also asked respondents which working arrangements they use but we focus on the availability rather than use, primarily to reduce potential endogeneity between use and infant feeding decisions, and also because this provides a general measure of flexibility at the workplace.

We classed job sharing, flexi-time, compressed/annualised hours, working from home and other as a flexible working arrangement. We excluded part-time working (as this may not indicate whether an individual can reduce their hours in their job, rather just whether part time jobs are available), term time only (as this is specific to certain jobs), zero-hours and on-call working (which may be more of a constraint).

## **Commuting Time**

The UKHLS asked respondents who were employees and worked at a location outside of their home, “About how much time does it usually take for you to get to work each day, door to door (in minutes).” We defined a long commute as having a commute greater or equal to the 75th percentile (using all in our final sample who were eligible and responded to this question) i.e. 35 minutes or more. A commute above the median was defined as 20 minutes or more.