*The economic history of caring labour: a case study of breastfeeding*

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**Abstract:** Caring labour, whether paid or unpaid, creates value, supports economic activity, and generates positive externalities, yet suffers neglect in conventional economic metrics. Breastfeeding exemplifies this: despite its critical role in infant health and social reproduction, its value is often unrecognised. Using historical data on weaning practices between 1850 and 1970, this paper traces how infant feeding interacted with broader economic and public health developments. As its economic costs fell and its benefits were better understood, prolonged breastfeeding protected infants from weak public health infrastructure. Yet as scientific discoveries on milk composition spurred commercial substitutes and public health investment reduced the harms of early weaning, breastfeeding prevalence declined. The economic history of breastfeeding offers a study in how social and economic interventions yield unintended consequences. Our findings highlight the need for public policy that acknowledges care labour's broader societal benefits, ensuring it is adequately supported rather than left to individual responsibility.

**Keywords:** care work, health externalities, breastfeeding, economic growth and measurement

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Caring labour whether paid or unpaid creates value, is productive, adds to wellbeing, substitutes for public infrastructure, shores up profits, supports economic activity, and so generates positive externalities (see special issue). Yet despite this palpable importance both economists and economic historians pay it little attention. Neglect is unjust, theoretically indefensible, and almost certainly leads to the misestimation of trends in productivity and output. As care is sometimes provided in the market and so remunerated, and sometimes provided 'privately' unpaid, it can move back and forth across the 'production frontier' defined by monetary exchange and delineating GDP. Consequently, care is sometimes counted in production and sometimes not. Pigou drew attention to this paradox when he observed that if a man married his housekeeper the national dividend would fall.

Since most unpaid care is done by women, neglect means injustice is gendered. Not surprisingly, feminist economists have long campaigned to recognise such work and include its value in GDP or at least in the broader 'satellite accounts' instituted by the SNA (see the contributions by Moos, Floro, Braunstein and Esquivel in the *Routledge Handbook of Feminist Economics*, edited by Berik and Kongar, 2021). The focus has been on domestic labour or 'indirect care', essential for the efficient functioning of the economy and for society to reproduce itself over time (Waring, 1988; Beneria, Berik and Floro, 2015; Folbre, 2018). Such work was also vital to social reproduction in the past. Recent research, using the historical costs of care when provided commercially to ascribe monetary values to similar services when provided unpaid has shown that even when focussing only on a subset of relevant tasks, total values amounted to around a fifth of aggregate income (Humphries, 2024a, 2024b).

This paper focusses on a specific task at the heart of social reproduction but relatively neglected even by feminists, despite playing a key role in Joan Huber's (2007) influential sociobiological theory of gender inequality: breastfeeding (for exceptions see Smith, Ingham and Dunstone, 1998; Smith, 1999; Smith and Ingham, 2005). Breastfeeding was (and is) a major charge within caring labour. It creates value, is productive, adds to wellbeing, substitutes for public infrastructure (see Himmelweit, this issue), such as the pasteurization of milk, produces fewer environmental costs (Joffe et al., 2019), and, as we shall see, generates positive externalities. Feeding an infant can also move across the 'production frontier'. In the past, mothers could employ wet nurses or feed babies on cow's milk; today, they can purchase commercial baby foods, though all substitutes are now known to be inferior. The rise in GDP that would follow a mother's decision to substitute superior breastmilk with inferior infant formula is surely even more paradoxical than Pigou's *reductio ad absurdum*.

In a companion paper, we use a conventional strategy (see Bridgman, this issue) to impute the value of unpaid breastfeeding from market substitutes over several

centuries in the English context (Henderson and Humphries, 2025). Its value varied with the prevalence of the practice and according to which substitute commodities and services were used as the basis for the imputation. For example, when measured by women's casual wages as an index of wetnurses' pay, its value ranged from as high as c. 10 per cent of GDP in late medieval times to c. 1-2 per cent around 1800.

A major factor in the prevalence of breastfeeding was weaning age, a key decision variable related to the economic, social, cultural and medical context. In general, we take weaning to mean the introduction of solid foods, but where our sources refer to weaning as the cessation of all breastfeeding, we make this clear in the text and refer to "non-exclusive breastfeeding". In any case, weaning in the past seems to have been relatively abrupt so that the difference between either definition of weaning should be relatively small. For example, Reid, (2002) demonstrates that the period of non-exclusive breastfeeding before complete weaning lasted approximately seven weeks in Derbyshire circa 1920.

Here, we use historical narrative (see Morgan, 2017) to examine changes in weaning age,1850-1970, a period which captures the development and marketing of commercial infant formula. We show that the form in which babies were fed, including its distribution around the production frontier, tracked social, economic and cultural developments. Indeed, changes to prevailing infant feeding practices in this period may be conceived as a process of care-economy "R & D" (see Harrison Brennan, et. al., this issue) as shifts in scientific understanding of breast milk affected technology, policy, and behaviour in turn, and continues to do so today.

We argue that in the absence of adequate investments in public health and in the context of rapid unplanned urbanization, hasty weaning raised the probability of infant mortality. In the first half of the nineteenth century, the costs of early weaning were high and evident. Households internalized these costs and responded to rising incomes with prolonged breastfeeding to improve infant health. Basic investments in public health, including sanitation and education, eventually broke the link between mortality and hand feeding. Costs became less clear, households failed to internalize them, and weaning decisions appeared less critical and grew more susceptible to advice in favour of artificial feeding.

More generally, the state and its institutions played a role in how this important caring service was delivered but effects were not always foreseen, nor were the social externalities recognised. The lesson for policy makers provided by this historical case is that both social and economic interventions as well as exogenous social and technical changes can have unintended and unanticipated consequences, even running counter to those envisioned. As policy makers contemplate how to improve the global "care

economy", as in a recent UN resolution (United Nations, 2024), they should be alert to possibly complex interactions among public and private actors, inadvertent consequences, and the erosion of public goods.

Section 1 opens with the modern medical and scientific recognition of breast milk's value. We also review the literature on policy interventions found to improve breastfeeding rates, which informs our broader historical narrative. While economic constraints and incentives clearly matter, these studies underline the simultaneous importance of social, medical and cultural influences.

Section 2 locates the evolution of weaning ages in its shifting socio-cultural context identifying three long-run developments which likely impacted duration: changes in religious iconography, specifically the Reformation's banishment of images of the Virgin Mary breastfeeding the Christ child; trends in the extent and nature of women's paid work; and advances in scientific and medical knowledge. Standing against any shifting context was the lasting cheapness and convenience of breastfeeding; indeed, until the toll it takes on mothers' bodies was understood, it seemed free. Basic economics ensured that working-class mothers were almost always anxious to nurse if they were able (Johnson, 1902; Pember Reeves, 1919).

Section 3 focuses on 1850-1970, linking our historical perspective to more recent experience. During these decades breastfeeding's duration changed dramatically, illustrating our wider argument about the ways in which decisions, while reflecting relative costs such as women's opportunity costs, were also influenced by the broader concerns of the state and its investment in public health. These concerns were in turn informed by changes in scientific and medical knowledge, particularly about the composition of human milk suggesting its superiority in infant nutrition. But these scientific breakthroughs were not unambiguous in their implications, as the revelations about the make-up of breast milk prompted commercial initiatives to develop substitutes that imitated its composition. Inevitably, in a context where the value of breastfeeding remained underestimated and its externalities ignored, opportunities for profits encouraged the sale of commercial substitutes. Markets pushed back.

Commercial baby food could shelter behind improvements in sanitation, public health education, medical science, and maternal nutrition, in addition to improvements in artificial feeding technology, which united in breaking the link between high infant mortality and hand feeding. Its use was also often supported by a financially engaged medical establishment. The increasingly aggressive marketing of infant formula in the 1950s and 60s in the context of the post-war boom in married women's labour force participation rates was associated with a reduction in the duration of nursing, only recently reversed by the mounting evidence on the longer-term health benefits of

breastfeeding for both mother and baby and the implanting of this knowledge in maternity services. However, the importance and endurance of these health benefits suggest ongoing need for public support through maternal health practice, educational initiatives, and statutory maternity leave.

In concluding, we note how the historical investigation of weaning age informs the conventional estimation of breastfeeding's value from comparison with market alternatives and underline that these substitutes were and are markedly inferior. We emphasize the limitations of such an 'inclusivist approach' as the way to ensure the visibility and valuation of breastfeeding, which ignores vitally important social and health externalities and overlooks injustice in the distribution of care labour (Dowling, 2016; Dengler, 2021; this issue). Our historical perspective brings to the fore how public efforts to address these externalities interact with private care provision in unexpected ways, sometimes substituting for it and other times placing added burden on individual mothers to shoulder social costs. These dynamics are missed by taking market values as given, as in the conventional approach. While recognition of externalities makes an immediate case for public policy to support breastfeeding and to avoid premature weaning, our history provides an illustration of the value of understanding public- and private-order interactions within the broader care economy.

## I

Public health officials, associations of paediatric doctors, and WHO publications acknowledge that as well as providing the optimal nutrition for most babies, human milk protects against some short- and long-term illnesses (asthma, obesity, and type-1 diabetes, SIDS, ear infections and stomach bugs), while premature weaning is associated with significantly increased risk of a similarly lengthy list of acute and chronic diseases (American Academy of Paediatrics, 1998). Mothers share their antibodies with babies and help them to develop a strong immune system. Mothers themselves benefit from reduced incidence of some cancers, type-2 diabetes, and high blood pressure. More recently breastfeeding has been linked to cognitive development (Lucas et al, 1992; Drane and Longman, 2000; Quinn et al., 2001; Oddy et al., 2003; Kramer et al., 2008). In addition to these health benefits, breastfeeding today wins in the convenience stakes: mothers can nurse anytime, anywhere, provided no embarrassment is attached. Further, because breastmilk is anti-inflammatory, breastfed infants require fewer calories to grow (Walker, 2010; Butte et al., 2000). Finally, of course, it bonds mothers and babies and lowers mothers' risk of postpartum depression (Meek et al., 2022). In recognition of these benefits, the WHO currently

recommends exclusive breastfeeding to six months and continued breastfeeding for two years or more (WHO, 2024).

Thus, breastmilk makes a vital contribution to infant welfare and the reproduction of human capabilities, and this was equally true in the past. The health and nutritional advantages catalogued above would have been multiplied where food was scarce, sanitation absent, and medical techniques imperfect. In London c. 1900, exclusive breastfeeding reduced the hazard of infant death by as much as 270 per cent and protected against infant wasting (Arthi and Schneider, 2022), while in Derbyshire circa 1920, artificial feeding at one month increased the hazard of all-cause infant death by 56.5 per cent and of death from diarrheal diseases by as much as 212 per cent (Reid, 2002). Like today, parents in the past valued children's health (Pollock, 1983). But as Gallardo Albarràn (2021) notes, household expenditures suggest they value health proportionally more as incomes rise (see also Zelizer, 1995). For one thing, healthy children became more productive adults (Kelly, Ó Gráda and Mokyr, 2014; Horrell, Humphries and Weisdorf, 2020). If as many economic historians argue technological change rendered human capital acquired in childhood progressively more valuable, (Goldin and Katz, 2008; Hatton and Martin, 2010), the economic motive for investing in child health strengthened over time.

However, while infant life has always been precious, the breastfeeding connection has not always been appreciated. The perceived cheapness of breast milk more likely caused working-class women to nurse their babies. As the poor mothers visited by Mrs. Johnson explained about their allegedly prolonged breastfeeding, 'expense is saved if children can be fed naturally' (1902, p. 33). Savings became even greater if substitute foods were in short supply or becoming more expensive. Oris et al., (2024) in a study of Madrid in 1917-21 found that when milk prices rose relative to trend, summer excess infant mortality declined, which they explained as the result of delayed weaning. Similarly, Ethiopian mothers in the late twentieth century responded to food shortage by lengthening the nursing period, thereby unintentionally giving infants greater protection against short-run food shocks than older children (Lindstrom and Berhanu, 2000). Even in the world's largest economy, breastfeeding is sensitive to the cost of substitutes, as illustrated by the 2022 Abbott Nutrition recall and subsequent formula shortage in the U.S., which raised exclusive breastfeeding rates of two-month-old infants by 35 per cent (Imboden et al., 2023). Basic economics ensures a deep undercurrent of nursing women.

The prices of substitutes are not the only costs; opportunity costs matter too. Here, employer policies supporting breastfeeding and maternity leave have received particular attention (Cunningham et al., 2024). Mothers who work part-time are more likely to breastfeed (Dunn et al., 2015), and more flexible labour markets may facilitate

this aspect of care (see Goldin, 2014). This may lead to a complicated relationship between income and breastfeeding, as lower household earnings may both push women into forms of employment with high opportunity costs and make market substitutes less affordable. Indeed, if price responses seem rational, income effects appear paradoxical. In developing countries, the income elasticity of breastmilk consumption is often negative, as higher incomes enable the purchase of market substitutes (Rogers et al., 1997). Something similar can be inferred from the socio-economic gradient observed in historical cross-sections of infant feeding practice. In Early Modern London, wealthy families regularly employed wetnurses, despite an associated though perhaps not fully recognised higher infant mortality (Davenport, 2019), illustrating Folbre's point that markets often fail to provide care due to imperfect knowledge (this issue). This continued until the turn of the nineteenth century when breastmilk's health benefits became increasingly recognised (Fildes, 1988a; Fildes, 1988b).

Economic incentives aside, contemporary research points also to the importance of strictly behavioural interventions. For instance, a recent meta-analysis found that changes to hospital policy were on average responsible for nearly tripling the odds (OR=2.77) of continued breastfeeding six months post-partum, while some individual policies were even more effective (Kim et al., 2018; see also Aksu et al., 2010 and Murray et al., 2007). In Cardiff, 38 per cent of mothers randomly assigned a lactation nurse continued to breast feed at six months compared to 28 per cent of the control group, and similar findings emerge in other contexts (Jones and West, 1985; Bonuck et al., 2005). "Rooming in" policies allowing mothers to sleep in the same room as their newborn children and breastmilk-first practices appear to carry through to affect longer breastfeeding out of hospital (Murray et al., 2007). On the other hand, one RCT found that supplemental formula feeds had no effect on later breastfeeding if administered in a limited and controlled manner. Hospital policy exists to balance patients' desires, accepted medical standards, and the distribution of scarce hospital resources, which often leads to difficult trade-offs, as oral histories of midwifery attest (Beier, 2004; Crowthner et al., 2009). Their chosen solution, in this case, will affect how likely mothers are to continue breastfeeding beyond the hospital.

The nature of hospitals' commercial partnerships may also be relevant. For example, baby formula manufacturers often provide free samples to hospitals to distribute to mothers at discharge. Receipt of such "gifts" predicts earlier weaning (Rosenberg et al., 2007; Peréz-Escamilla et al., 2022), and first-time mothers, those with less education, and those who had experienced post-partum illness are more strongly affected (Dougherty and Kramer, 1983). Other studies indicate that exposure to infant formula manufacturers' marketing causes earlier weaning (Howard et al., 2000; Greiner and Latham, 1982).

A final set of studies points to the effects of social influence and education in promoting breast-feeding duration (Aksu et al., 2010). Studies in low- and middle-income countries indicate participation in peer support networks substantially reduces the risk mothers will cease breastfeeding (Sudfeld et al., 2012). Further, support and education for fathers improves maternal breastfeeding rates (Maycock et al., 2013), as does the support of grandmothers (Negin et al., 2016), suggesting a role for familial influence.

Breastfeeding duration, therefore, is not biologically fixed but waxes and wanes according to changes in income, costs, medical practice and social influence. Importantly, the effects of behavioural interventions operating primarily through social influence and education are large. We believe this points to the 'relative autonomy' of this aspect of social reproduction (Humphries and Rubery, 1984) and argue that cultural norms and values cannot be ignored in favour of purely economic explanations of changes to breastfeeding duration.

II

In estimating the prevalence of breastfeeding in our companion paper, (Henderson and Humphries, 2025), we identified religion and its iconography as one long-run cultural driver. The nursing Madonna, the Madonna del Latte, provided a standard subject for Renaissance painters supplying decorative work for churches all over Europe (https://www.acp-palazzofranchetti.com/exhibitions/23-breasts/overview/). Images such as the last fragment of medieval stained glass in Newcastle Cathedral provided occasion for ordinary women to view breastfeeding represented as holy and honoured. Given the importance of social forces suggested by modern studies, we expect that such icons must have influenced the perceived meaning and status of nursing.

In the ideological struggle of Reformation and Counter-Reformation, however, this motif fell out of fashion. In the Council of Trent's ruling on acceptable Catholic iconography, the intimacy of Mary feeding her child, and the rapture in which these images were held, had become too prurient and embodied for the church. The holy and heroic identity of the nursing mother disappeared along with most of these beautiful images. A possibly important encouragement to medieval women to breastfeed was swept away.

Another long-term factor was women's involvement in economic activity and particularly work with which suckling was competitive. The higher opportunity cost of breastfeeding suggested by the labour shortage that followed the Black Death stands out as a particular turning point. Perhaps the disappearance of evocative religious iconography was as nothing compared with the new opportunities and higher wages on

offer in the post-plague ‘Golden Age’. Whether married women’s gains were sustained remains debated (Humphries and Weisdorf, 2015), but by the eighteenth century the industrial revolution was creating new demand for female workers with regional differences in married women’s employment growing ever starker (You, 2020).

However, linking long-run trends in breastfeeding to the history of women’s work is complicated. For one thing, not all women’s employment was a deterrent. By boosting family income, and potentially women’s bargaining power, it could result in a better diet for mothers and so greater milk production (Horrell and Oxley, 2013). Moreover, many forms of historical employment were compatible with domestic and family responsibilities, including suckling. Hand spinning, the most important manufacturing job available to medieval and early modern women, took place in a domestic setting and could be interrupted (Muldrew, 2012; Humphries and Schneider, 2019). Similarly, agricultural employment was seasonal, often undertaken for short hours, and performed in ways that could accommodate child-care (Burnette, 2008). Even if women’s involvement in traditional forms of work in the home or on the farm did pose dangers to their babies in terms of premature weaning, infant death rates were merely part and parcel of a general high mortality regime and disguised in the eighteenth century by high fertility.

For another thing, breastfeeding was itself regarded as work, a subjective assessment supported by its requiring time and calories (Shepard, 2023; Henderson and Humphries, 2025; on mothering more generally as work, see the essays in Knott and Griffin, eds., 2020). Moreover, through wet nursing, breastfeeding *created* employment for women. Wet nursing, the breastfeeding of other people’s babies in return for payment, was common in the ancient world and well documented throughout Europe in the seventeenth and eighteenth centuries (Fildes, 1982a,1988a; Shepard, 2023). While impossible to quantify the extent of commercial wet nursing, it takes breastfeeding across the ‘production boundary’ into the market economy and so enables its value to be captured by the measuring rod of money in terms of wet nurses’ wages. By the standards of the female labour market, they were relatively well-paid, particularly if employed ‘privately’ by better-off clients, who might also provide room and board (Fildes, 1988a). Wet nurses also worked for the large institutions that appeared across Europe to cope with rising numbers of abandoned babies. Foundling hospitals established networks of women able and willing to breastfeed, reaching out from cities into the surrounding countryside and providing regular albeit part-time employment on a scale analogous to a cottage industry (Fildes, 1988b, 1982b; Kazmierczak, 2013; Viazzo, et al, 2000; Sarasua, 2021; Sarasua, et al, 2023; Freschi and Virgillito, 2024). Probably equally common, though less readily documented, were occasional placements and adoptions often intermediated and subsidised if not paid for by the poor law or local charities (Levene, 2012).

In addition to the market-mediated provision of breastfeeding, mothering was also dispersed through significant but hard to uncover informal exchange (Shepard, 2023). Women would feed the infants of family, friends and neighbours in exchange for reciprocation in kind, goods or money. Breastmilk was swapped and bartered as women 'made shift' to exploit occasional opportunities to earn or acquire. Thus, historically, breastfeeding, like care generally, moved back and forth across the production frontier, sometimes provided commercially or through informal exchange and sometimes provided unpaid. It also straddled the 'care diamond' through which feminist economists have conceptualized the four sources of provision, family, market, voluntary sector, and state provision, as both the local authorities and charities were involved in the placement of abandoned infants with paid nurses (on the care diamond see, Razavi, 2011; Esquivel, 2014).

However, in England, wet nursing was declining in popularity by the nineteenth century, as the medical establishment began to advocate maternal nursing (Fildes, 1982a; Shepard, 2017). But for many poor mothers breastfeeding was incompatible with the changing nature of women's jobs, which increasingly involved fixed and long hours of attendance at centralised workplaces. Babies could be fed morning and night and carers hand feed in the interim, while some employers made provision for babies to be brought to workplaces for feeds (McCarthy, 2020). But neither strategy was without problems. Hand feeding, even when accompanied by nursing, could pose dangers of contamination or interrupted milk flow, while breastfeeding at work exposed infants to the dangers of the workplace (Henderson and Humphries, 2025). If early modern women's employment deterred breastfeeding, this was minor compared with the obstacles raised by the industrial and manufacturing jobs requiring long hours away from home in the first half of the nineteenth century. Such jobs appeared incompatible with women's performance of their domestic duties so that when in the late nineteenth century Britain's relatively high and regionally varied infant mortality became a source of public angst, blame fell on working mothers, though domestic incompetence rather than discontinued nursing was claimed as the link. Ironically, mounting disquiet coincides with the period when gender historians think married women's participation in regular paid work began to decline, making space for breastfeeding, although of course there were individual, regional and even district level exceptions (You, 2020; Erickson, 2024).

Scientific knowledge about appropriate infant feeding and its slow penetration of medical advice was another factor driving changes. Before the mid-eighteenth century, the chemical properties of breast milk were unknown (Stevens, Patrick, and Pickler, 2009). The most common substitute for mother's milk was cow's milk, although those who could afford it might have hired a wet nurse (Fildes 1982a). Published in 1760, Jean Charles Des-Essartz's *Treatise of Physical Upbringing of Children* provided a technical

comparison of the composition of human milk to that of the cow, sheep, ass, mare and goat. Based on chemical characteristics, Des-Essartz identified human milk as the best source of infant nutrition, but it took time for these findings and their implications to penetrate the medical establishment and advice books.

The identification of the composition of human milk had contradictory effects, for it also promoted the development, patenting, and marketing of infant food with similar make-up. The development of evaporated and then condensed milk also boosted the commercial supply of substitutes. Such foods were fattening but lacked valuable nutrients and were associated with summertime infant deaths because of spoilage of milk remaining in bottles. The 'long tube' feeding bottle, which enabled babies to be fed without being picked up, was a particular villain as it could not be cleaned, and while, by the late nineteenth century, doctors were recommending flattened bottles with shorter teats, these were mainly accessed by wealthier families (Fildes, 1998, p. 264). These connections were not understood until the public acceptance of germ theory, which not only elevated the status of domestic hygiene and so domestic labour, as Mokyr has argued (2000), but also promoted breastfeeding as providing sterile as well as nutritious milk.

Consistent with these long run forces, existing research has identified the mid-nineteenth century as a nadir following a three-centuries long decline in breastfeeding duration (Henderson and Humphries, 2025; Fildes 1982b). Changes to medical science and its effects on wider policy and practice, however, led to change in subsequent decades.

## III

For the remainder of the paper, we focus on 1850-1970, a period of particularly sweeping change in which women's labour force participation declined before beginning its post-WW2 rise, household real wages grew, and local governments made increasing investments in public health affecting infant welfare. As such, it illustrates starkly how maternal breastfeeding seems at times to be pushed by economic costs and at other times pulled by changing social values.

While of minority concern earlier, by the late nineteenth century, infant mortality had become a serious issue (Dyhouse, 1978). For one thing, it was no longer just one element in a high mortality regime. Between 1860 and 1900, the general death rate, and even the death rate of children, fell consistently, but the mortality of infants under one remained unaffected as the pale horse retreated---as high in the 1890s as it had been in the 1860s (Wrigley et al., p. 216). Furthermore, the birth rate was also in steady

decline, fuelling anxieties about a declining population that provided a strong impetus to the early infant welfare movement in Britain (Dyhouse, 1978).

There was also growing concern about the *quality* of the population. Alarm bells had been sounded by the miserable condition of volunteer recruits during the Boer War (1899-1902), particularly compared to the populations of rival European states which appeared to benefit from effective social policy. Contemplating a more active state, the Balfour government set up an interdepartmental Committee on Physical Deterioration. While the Committee's report recognised a variety of factors associated with widespread poor health---overcrowding, pollution, and parental neglect---working mothers' supposed failings and early weaning were a particular focus. While some historians hold that the Report did signal a shift towards improved public health policy (Zweiniger-Bargielowska, 2001; Pope, 1986), its emphasis on individual responsibility, particularly of young mothers, ensured that the state was not held accountable (Searle, 2004; Berridge and Gorsky, 2011; Boyer, 2019). Resultant, the report recommended training and paternalistic advice over substantive reform (Searle, 2004). Nonetheless, the connections between breastfeeding and infant health moved onto the public agenda.

The medical establishment took a growing interest in this new social problem. Medical opinion was swinging in favour of breastfeeding as the best form of infant nutrition, with cow's milk and commercial foods recommended only in those rare cases when mothers were unable for reasons of their own health to nurse. Indeed, spurred on by anxieties about alleged 'physical deterioration', breastfeeding became a mother's 'duty' (Serjeant, 1905; Hellier, 1904), and women who failed in this task should be 'pilloried' (Truby King, 1918). Advice-givers even declared that 'Mothers who cannot themselves suckle their children are not in the full sense of the word capable of procreation' (Kuhne, 1906, p. 5).

While the medical tide had turned, improved feeding equipment, cleaner cow's milk, the availability of commercial substitutes and the necessity for some poor mothers to work long hours away from home encouraged premature weaning. Some medical authorities understood the pressures on poorer women, and advocated policies to enable mothers to continue working such as the establishment of urban milk depots and access to trained nurses (Hall, cited in *The Present Conditions of Infant Life, and their Effect on the Nation*), supported in these aims by experts on women's employment. B.L. Hutchins, for example, suggested that an enlightened social policy 'should aim at better conditions and shorter hours, at maternity insurance and the establishment of well-ordered creches....' (quoted in Dyhouse, 1978, p. 260).

Other commentators saw married women's employment as the root cause of infant mortality. Thus, John Benjamin Hellier (1904, pp.6-7) claimed that the infant mortality

rate fell during both the siege of Paris and the Lancashire cotton famine because women's work outside the home was restricted. Differing opinions led to fierce debate among public health officials who drew on regional data linking infant mortality and married women's employment (for summaries see, Dyhouse, 1978; McCarthy, 2020). Within this turmoil there was spreading recognition that breast was best if possible and premature weaning was to be avoided, and there was also a dawning sense that infant life and wellbeing should be a social and political aim, informed by the scientific consensus, and embedded in an infant welfare movement. There was even some inkling of the externalities involved, with The Infant Health Society based on an account by E.W. Hope, Medical Officer of Health for Liverpool, of 1,082 families, calculating that poor care meant a financial cost to the state of over £8.5m in terms of missing or morbid adult workers (1905, p.8).

This swing in medical and public health advocacy underpinned an increase in maternal nursing in the late nineteenth and early twentieth centuries. To illustrate, we collected all cited surveys carried out in 1850-1970 of the proportions breastfed at each month of the first year of life. We split our data at 1946, when the first nationally representative and relatively high-quality breastfeeding survey was conducted. This survey serves as a benchmark against which to compare other surveys, which are sometimes partial or poor quality.

The mid-nineteenth century nadir is illustrated by relatively good clinical data collected by Drs Merei and Whitehead in Manchester in 1857 (figure 1). Here, mother-infant pairs exclusively breastfed for a mere 2.3 months on average, and fully 65 per cent of infants received supplemental foods from birth.[1] The data only allow the possibility of calculating exclusive breastfeeding rates, although qualitative remarks in the source suggest non-exclusive breastfeeding continued for several months in this setting (Routh 1879). At birth, only five per cent of these infants received no breast milk at all. Supplemental feeding must thus have been widespread, plausibly pointing to the effects highlighted above of maternal employment in this textile district.

[FIGURE 1 ABOUT HERE.]

We next aggregate data on exclusive breastfeeding rates by age (in months) collected by Medical Officers of Health (MOH) in 17 localities between 1905 and 1919 (Fildes, 1992; Fildes, 1998; Newsholme, 1906) and unpublished studies cited by Spence (1938)

[1] Mean weaning age is calculated by treating observed breastfeeding rates by month as a survival curve and summing across all months of life.

to piece together a broad picture. In Figure 1, these are represented by the various grey lines. None of these sources reported rates for the entire first year of life, leaving spans of missing data which we fill in by linear interpolation. In every locality surveyed, the resulting mean weaning age was later than our 1857 Manchester sample and our 1946 standard (figure 1).

The difference between our 1857 and circa 1910 statistics suggests an increase in maternal nursing, but there is good reason to expect that breastfeeding rates in Manchester fell below the national average in the nineteenth century. Unfortunately, because it was not surveyed in this later wave, a direct comparison across time is not possible. Nonetheless, in Manchester's immediate neighbour, Salford, the MOH found 78 per cent of women continued to exclusively breastfeed their six-month-old children compared to 14 per cent in Manchester in 1857 (Fildes, 1998; Routh, 1879). This dramatic difference suggests rapid change. Strikingly, exclusive breastfeeding in the first month of life was nearly universal circa 1910. Averaging across all localities at each month of life and taking the mean duration of breastfeeding of this constructed group gives a period of 7.2 months.

We conjecture that rising living standards at the end of the nineteenth century paradoxically supported prolonged breastfeeding. The state began to provide capital for investments in clean water and sewerage at the end of the nineteenth century. Chapman (2019) argues that these investments accounted for as much as 60 per cent of the decline in infant mortality, but Aidt, Davenport and Gray's (2023) follow-up study using panel data and two-way fixed effects suggests they can only account for between 13 and 40 per cent of the observed decline (see also Gallardo-Albarrán, 2024; Harris and Hinde, 2019). The difference may come down to the exclusion of spillovers from fixed-effects models, such as the broader programme of public health interventions motivating sanitation reform and described above. We therefore interpret public health investment inclusively, encompassing the introduction of health visitors and educational programmes intended to further encourage breastfeeding and improve sanitary practices, informed by a growing scientific and medical recognition of the value of breastmilk and concern for infant welfare (Fildes, 1998). Rising incomes must have encouraged private investment in health to account for the remainder. However, because labour markets (with some exceptions) were organized around male breadwinning and because these public health investments did not eliminate the hazard of early weaning, the burden of care fell to women, reflected in persistently declining female labour force participation (Horrell, 2007).

Breastfeeding rates did not remain at these high levels. The 1946 survey reports a mean breastfeeding duration of 4 months; however, because this refers to non-exclusive breastfeeding rates, the extent of the reversal compared to earlier in the century is

understated. Paradoxically, there had been no turnaround in the macroeconomic trends identified as culminating c.1905-19 and providing context for the growth in maternal nursing. Women's (particularly married women's) participation rates remained low, boosted temporarily by the demand for their labour and the accompanying hastily assembled supportive infrastructure in WWI, while the male breadwinner family remained the ideal type of social unit, resurrected after the war when women were no longer required to be 'temporary patriots' (McCarthy, 2020, p. 99). A similar upswing in female economic activity occurred during WW2, also followed by a reversal. A sustained increase in participation would only come later.

What is striking is that the decline in breastfeeding was not accompanied by a sharp rise in infant mortality. This reflects both continued investments in public health and the baby food industry's efforts to improve the safety of its product, notably by the introduction of powdered formula and the development and marketing of complementary feeding equipment, such as artificial nipples and boat-shaped bottles. Infants who were weaned early were no longer significantly more likely to die (Douglas, 1950), as they had been earlier in the twentieth century. The state had subsidised care up to this basic standard, and the costs of early weaning were no longer so starkly registered in statistics of infant death.

[FIGURE 2 ABOUT HERE.]

Breastfeeding duration continued its slide before reaching a new nadir in the 1970s, around which it hovered for the remainder of the twentieth century (Crowthner et al., 2009, p. 9). These trends are depicted in figure 2 which compares the 1946 standard to subsequent waves of the infant feeding survey and a series of local studies carried out in the later twentieth century, represented by the grey lines in the figure. Early weaning was clearly much more common in the second part of the twentieth century. This introduces a new paradox because relevant macroeconomic trends had, in fact, now gone into reverse. Beginning in the late 1960s, female labour force participation grew, reflecting structural change, cultural shifts, institutional reform, and declining fertility (Horrell, 2007). Some analysts have linked these changes to earlier weaning (see Van Esterik and Greiner, 1981), but our longer view makes it clear that the trend had begun much earlier. Moreover, the infant feeding surveys found no significant differences between working and non-working mothers in breastfeeding duration (Rogers, 1997 S51).

Cultural and social factors provide a common thread explaining the twentieth-century decline in breastfeeding duration. From their origins in the late nineteenth century, infant formula producers pursued a marketing strategy that relied on close cooperation with medical professionals, often distributing samples and promotional materials

through their networks (Apple,1983; Stevens, Patrick and Pickler, 2009; Fomen, 2001). As discussed, considerable research had been conducted on infant diets and health from the late nineteenth century. Standards for infant growth were developed, and more and more children were born to formally-trained midwives and doctors or visited at home by such (Beier, 2004). Medical professionals, perhaps with the best of intentions, now had a product, infant formula, to soothe the anxieties of mothers whose children grew more slowly than these newly developed standards (a necessarily large proportion of mothers given the statistical nature of such standards). Additionally, as artificial infant foods fell under closer scientific scrutiny, their quality improved. Indeed, some researchers came to believe that following a brief period of maternal nursing, artificial foods provided superior nutrition (Crowthner et al., 2009).

[Figure 3 about here.]

Such changes are tracked by the weaning age recommended in maternal advice books and nurse's textbooks, depicted in Figure 3. By around the middle of the twentieth century, corresponding with our 1947 survey, medical opinion began to recommend earlier weaning of around six months. From our post-1947 data, we calculate a mean breastfeeding duration of 2.7 months in the second half of the twentieth century, essentially the same duration as attained in Manchester in 1857.

We therefore end more or less where we began, with historically short breastfeeding periods. However, whereas early weaning in mid-nineteenth-century Manchester was explained by mothers working to keep family budgets balanced, by the late twentieth century, cultural and social change, particularly developments in the medical profession and the forceful marketing of artificial formula, seem more relevant.

## IV

Over the period of the twentieth century under study, breastfeeding duration declined by at least 4.5 months on average, a change largely attributable to the growth of demand for infant formula mediated through medical practice. Conventional economic logic would interpret this substitution as a reflection of revealed preference, as perfectly informed consumers (mothers) made welfare-improving choices. Moreover, because produced for sale in the market, substituting formula for (unvalued) breastmilk would be registered by conventional welfare metrics like GDP per capita as an unadulterated improvement. However, as we have argued, by overlooking significant health and human capital externalities, the market fails to value breastfeeding appropriately. Moreover, we demonstrate that historical actors' understanding of the nature of these externalities has not been a straightforward development. These considerations

illustrate wider truths about valuing breastfeeding, and maybe caring labour more generally.

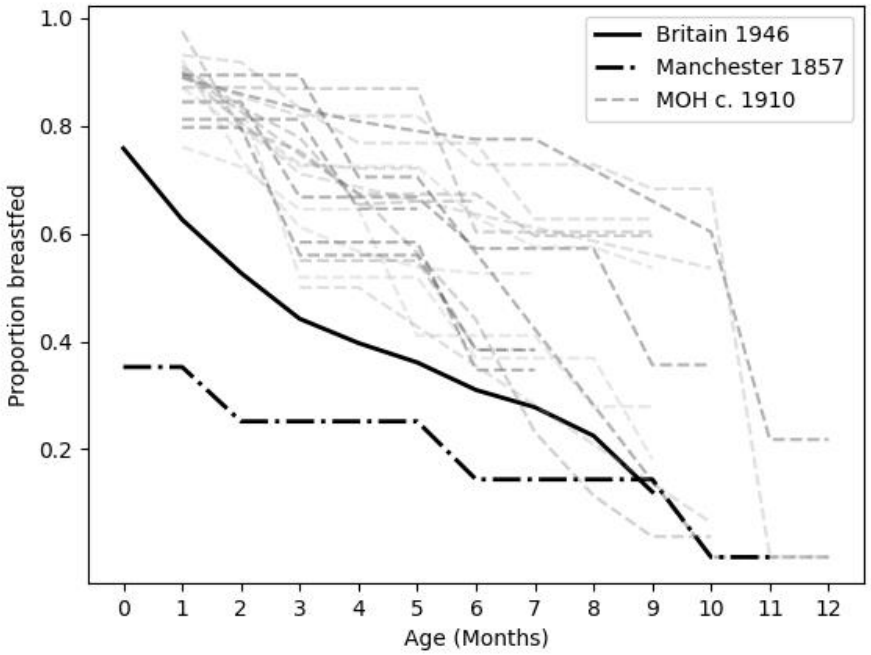
First, when standards of public health are very low, the value of care is obvious. Thus, when sanitation practices were poor and market substitutes for human milk very inferior, the connection between artificial feeding and infant mortality was strong. Mothers in mid-Victorian Manchester probably recognised that suckling would be better for their babies but were constrained by the need to contribute to the family economy. As incomes rose and the benefits of human milk were endorsed by science, but public health infrastructure remained weak, the value of breastfeeding for women's own babies became clearer still. So as the nineteenth century drew to a close, women breastfed, recognising the private benefits for their children, shouldering the individualized burden while unintentionally providing enhanced broader health benefits. Extended breastfeeding substituted for enhanced sanitary and water infrastructure. However, when by the mid-twentieth century, the public health infrastructure as well as commercial baby foods had both been greatly improved, the private benefits of nursing weighed less heavily. Mothers could shelter behind the state's investment in public health and the market's generation of an improved product and retreat from breastfeeding. But this ignored the longer term health benefits of nursing for both babies and their mothers; important health externalities were lost.

Second, our historical account underlines the complexities involved in assigning market equivalents to non-market goods and services like breastfeeding. Often, understanding their value, particularly the externalities they produce, involves historical processes of discovery, documentation, and debate. These processes are complex, as agents may respond to new information in a way that obfuscates it, such as the infant formula industry's response to the scientific decomposition of breastmilk by replicating its make up and accomodating poor sanitation by introducing powdered products.

Finally, absent recognition of broader responsibilities for the production of public goods, 'breast is best' may pressurize women to nurse with no change in supporting infrastructure nor compensation for the hidden costs both economic and physical. The burden is placed on mothers alone. So at the turn of the twentieth century, as we have shown, when medical opinion began to trumpet the value of human milk, it was mothers who were tasked with its delivery with only slow and patchy support in terms of public health infrastructure, and little help for women struggling to combine work for wages with breastfeeding. Although we now increasingly recognize that breastfeeding provides broad benefits to society and economy, it remains viewed as individual 'body work' (Stearns, 2009). Some policies, such as making workplaces more breastfeeding-friendly are acceptable since they help maintain women's labour supply, but there is little recognition of the financial costs breastfeeding imposes on individuals in terms of

forgone wages, yet these are likely substantial as Rippeyoung and Noonan (2012) demonstrate. Compensation for the unpaid labour involved remains a utopian dream. Yet modern economics teaches that when market prices do not capture the benefits of an activity to society at large, there is a case for public subsidy, without which the good in question will be underproduced. This must be the case for breastfeeding, and probably for unpaid care more generally.

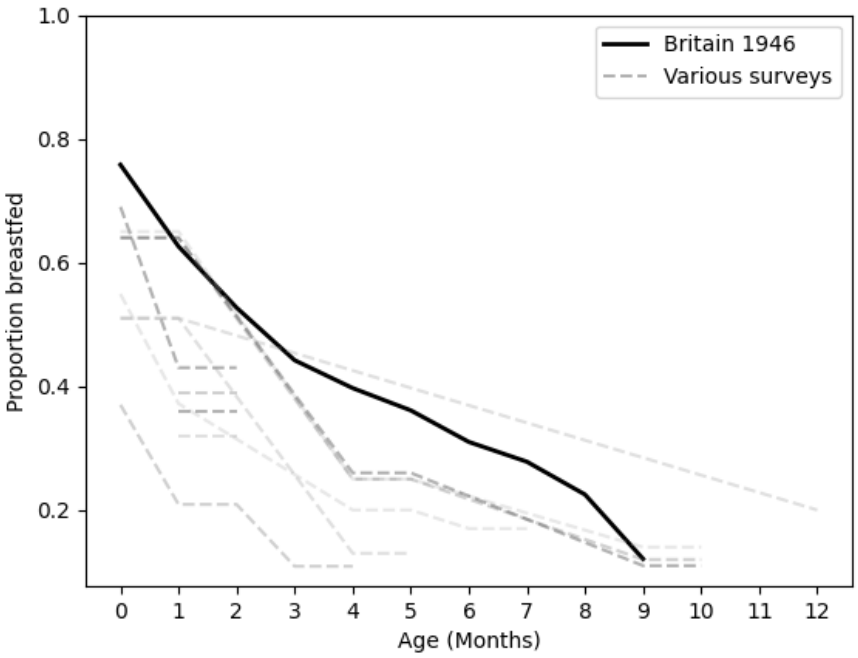
Figure 1: Duration of breastfeeding before 1946




NOTE: Grey dashed lines represent data from various Medical Officers of Health reports. Linear interpolation applied to figure. Proportion refers to exclusive breastfeeding rates.

SOURCE: Routh (1879); Fildes (1992 & 1998); Newsholme (1906); Spence (1938); Douglas (1950).

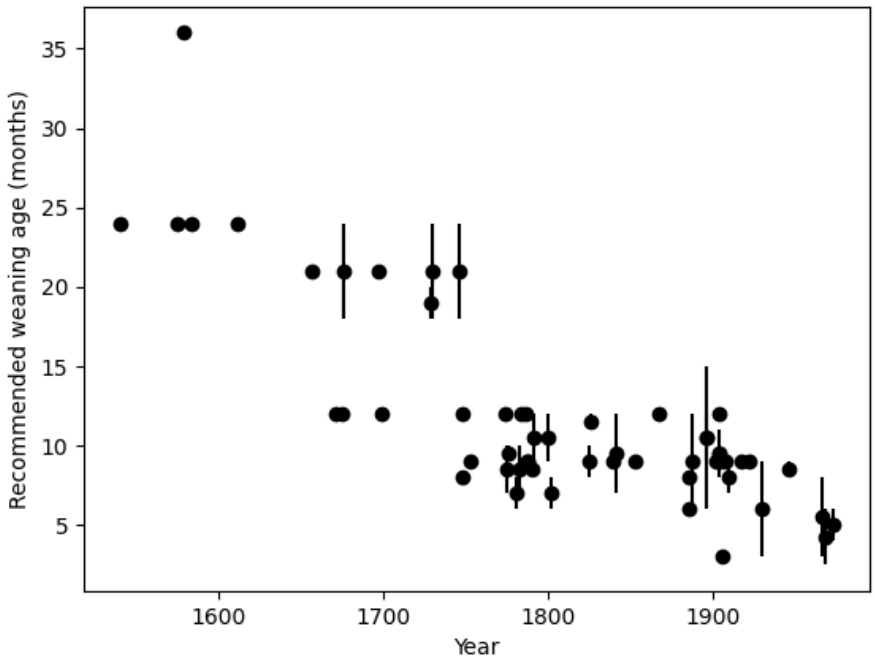
Figure 2: Duration of breast-feeding after 1946




NOTE: Dashed grey lines represent various surveys summarized in Rogers et al. (1997). Linear interpolation applied to figure. In contrast to earlier figure, the underlying data mostly refer to the end of non-exclusive breastfeeding.

SOURCE: Douglas (1950); Rogers et al. (1997).

Figure 3: Professionally recommended weaning age (months), 1500-1975




NOTE: Lines indicate range of recommended values, not confidence intervals.

SOURCE: See appendix.

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APPENDIX: Sources for figure 3

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