



Universiteit
Leiden
The Netherlands

Additional Free Childcare Hours: Studying the Impact on Parental Extensive and Intensive Labour Supply Margins and Subjective Well-being

Sorour, Nour

Citation

Sorour, N. (2023). *Additional Free Childcare Hours: Studying the Impact on Parental Extensive and Intensive Labour Supply Margins and Subjective Well-being*.

Version: Not Applicable (or Unknown)

License: [License to inclusion and publication of a Bachelor or Master Thesis, 2023](#)

Downloaded from: <https://hdl.handle.net/1887/3655720>

Note: To cite this publication please use the final published version (if applicable).



**Universiteit
Leiden**

Additional Free Childcare Hours:

Studying the Impact on Parental Extensive and Intensive
Labour Supply Margins and Subjective Well-being

Master thesis, 9 June 2023

Author: Nour Sorour (s3605353)

Faculty: Public Administration, Economics and Governance track

Supervisor: Dr. Richard Karlsson Linnér

Second reader: Dr. Max van Lent

Word count: 17,095 words

Abstract

With the aim of enhancing parents' participation in the labour market, the provision of affordable childcare services has become a central policy issue in recent years. One of the main methods governments use to provide this support is subsidising childcare costs. As such, this study aims to assess how an increase in free childcare hours affects the extensive and intensive labour supply margins and the subjective well-being of parents. In order to do so, the effect of the United Kingdom's (UK) 2016 Childcare Act on parents is assessed. This policy increased the number of free childcare hours available for working parents of 3-to-4-year-olds from 15 hours/week to 30 hours/week for 38 weeks of the year. To conduct this study, data from the UK's Household Longitudinal Study (UKHLS) was used to conduct a Difference-in-difference methodology with fixed effects. The results show that increasing the number of free childcare hours available to parents increased the subjective well-being of mothers and led to the expansion of their intensive labour supply margins. As for fathers, more free childcare hours were found to have little to no effect on their intensive labour supply margins. However, the results do not find evidence in support of the expectation that the Policy would increase the extensive labour supply of mothers and have little to no effect on that of fathers. Nor do the results support the expectation that the Policy would boost fathers' well-being. Nonetheless, these results continue to be of value to governments since mothers are the group whose labour market activity and well-being are most affected by childcare, and this Policy was found to boost both.

Acknowledgements

I would like to express my gratitude to my supervisor, Dr. Richard Karlsson Linnér, for his patience, guidance, and support throughout the development of this thesis. I would also like to thank my parents for their undying belief in my ability to achieve anything I put my mind to. Finally, I would like to thank my better half. Without your support, I would not have made it through the past two years, let alone achieved anything. To you, I am eternally grateful.

Table of Contents

1. Introduction	5
1.1. Scientific and academic relevance	8
1.2. Thesis structure	9
2. Literature review	9
2.1. Parental labour market behaviour	9
2.2. Parental well-being.....	12
3. Institutional context	16
4. Theoretical framework	19
5. Data and methodology	23
5.1. Methodology: Difference-in-difference	23
5.2. Data	25
5.2.1. Research variables	27
5.3. Validity and reliability.....	29
6. Analysis	30
6.1. Descriptive analysis	30
6.2. Assumptions	33
6.3. Analysis and discussion	38
6.3.1. Effect of additional free childcare hours on mothers	38
6.3.2. Effect of additional free childcare hours on fathers.....	41
7. Conclusion	44
7.1. Limitations and future research	45
7.2. Practical implications.....	46
8. Bibliography	47
Appendix A: VIF results	51

List of Figures

Figure 1. Impact of change in childcare costs on parental budget lines	22
Figure 2. Parallel trends (mothers)	36
Figure 3. Parallel trends (fathers)	37

List of Tables

Table 1. UK Childcare Subsidy eligibility overview.....	18
Table 2. Number of free childcare hours received by 0-2 and 3-4-year-olds across time periods	26
Table 3. Descriptive statistics research sample treatment vs control (mothers).....	31
Table 4. Descriptive statistics research sample vs parallel trends sample (treatment mothers)	31
Table 5. Descriptive statistics research sample vs parallel trends sample (control mothers)	32
Table 6. Descriptive statistics research sample treatment vs control (fathers)	32
Table 7. Descriptive statistics research sample vs parallel trends sample (treatment fathers).....	33
Table 8. Descriptive statistics research sample vs parallel trends sample (control fathers)	33
Table 9. Time periods overview for parallel trends	34
Table 10. Effects of an increase in free childcare hours on mothers	41
Table 11. Effects of an increase in free childcare hours on fathers.....	43
Table 12. VIF test: maternal regressions.....	51
Table 13. VIF test: paternal regressions.....	51

1. Introduction

In 2022, the UK went into a cost-of-living crisis that continues to persist well into 2023 (Harari et al., 2023). This rise in costs was not just limited to the UK, but a phenomenon that swept through various countries worldwide (International Monetary Fund, 2022). Rising global commodity prices driven by the recovery of demand levels following the COVID-19 pandemic were compounded by the Russia-Ukraine war, which increased the price of energy and key raw food items. As parents grapple with the increasing burden of meeting basic needs, access to subsidised childcare became of critical importance. Not only does it ease parents' financial burdens through the provision of more affordable childcare, but it also presents parents with the opportunity to pursue additional employment opportunities to expand their household budgets. While many studies focus on the impact of childcare on children, this paper will study whether and how access to additional free childcare affects parents' extensive and intensive labour supply margins and subjective well-being. Extensive labour supply margins relate to parents' decision of whether or not to participate in the labour market, i.e. be employed or unemployed, and the intensive labour supply margin refers to parents' decision on how many hours they choose to work. When discussing both labour supply margins together, we will refer to them as labour market behaviour. This study also aligns with the growing trend of assessing policies using subjective measures of well-being, recognising that relying solely on objective economic indicators may not provide a complete understanding of a policy's impact (Dolan & White, 2007; Stiglitz et al., 2018).

There are several different policy options through which a government can facilitate parents' access to childcare. For instance, governments can increase the funding for childcare to make it more affordable and accessible for families by subsidising its cost and increasing its supply for eligible children (OECD, 2021). Governments can also invest in training and supporting childcare providers to enhance the quality of care and education they provide children (OECD, 2021). With a focus on the former, childcare subsidies can take several forms, such as providing vouchers to cover childcare costs, tax credits to offset childcare expenses, cash grants to parents, and free childcare hours (OECD, 2007). This study will focus on assessing the impact of providing childcare subsidies in the form of free childcare hours. As such, 'free childcare hours' and 'childcare subsidies' will be used interchangeably throughout this thesis.

The review of empirical literature assessing the impact of increasing subsidised childcare has shown various findings regarding its effects on parents' working hours and labour force participation (LFP). A study evaluating the Quebec Family policy, which reduced childcare costs in Quebec, Canada, found that the policy increased the labour force participation of married women and increased their probability of returning to full-

time employment (Baker et al., 2008). Connelly (1992) and Viitanen (2005) also found that reduced childcare costs increased the labour force participation of married women. However, all three of these studies may suffer from sample selection bias since they exclude single mothers who are more likely to engage in paid employment upon receiving childcare subsidies compared to other groups. Viitanen's (2005) study is also based on empirical choice models, which may over-simplify the dynamic nature of decision-making processes. In line with Baker et al.'s (2008) findings, Bettendorf et al. (2015) assessed a Dutch reform that significantly cut down formal childcare fees. They found that cheaper childcare increased maternal labour force participation and working hours but did not affect paternal labour force participation and decreased their hours worked. Similar findings were also uncovered by Brewer et al. (2022) and Schmitz (2020). Brewer et al. (2022) found that in the UK, the shift from no free childcare to part-time free childcare only marginally affects the labour market behaviour of parents. Meanwhile, an increase in free childcare hours resulting from the shift from part-time to full-time free childcare had a significant positive effect on the labour force participation and employment of mothers but had no effect on fathers. However, Bettendorf et al. (2015) and Brewer et al. (2022) fail to account for other policies that influence parental labour market behaviour enacted within the same time periods assessed. As such, the reliability of their results may be questionable since their findings may be confounded by the concurrent policies not accounted for in their analysis.

The literature surrounding the impact of increasing subsidised childcare hours on subjective well-being and overall life satisfaction presented contradictory findings. Studying the Quebec Family Policy, Brodeur and Connolly (2013) found that while the policy decreased paternal life satisfaction and increased paternal happiness, it had no effect on the life satisfaction of mothers and even reduced their happiness. Brodeur and Connolly (2013) attribute these contradictory results to changes related to the income effect and changing gender roles within the household. However, they do not elaborate on, nor account for, the effect of happiness on life satisfaction and vice versa. Studying the same policy, Baker et al.'s (2008) findings were more grim. Their research found that the policy negatively affected paternal health and maternal mental well-being but did not affect maternal health. These findings were further corroborated by Herbst and Tekin (2014). However, the findings of Herbst and Tekin (2014) should be extrapolated with caution since their study focuses on the United States, which often extends subsidies to individuals that are worse off compared to the average member of society. With contradictory findings, Schmitz (2020) found that greater access to free childcare had little to no effect on the life satisfaction of fathers but increased that of mothers. However, it is worth noting that Schmitz's (2020) positive findings may result from their sample being predominantly composed of parents of a higher socio-economic background.

These parents are more likely to experience greater life satisfaction than their less well-off counterparts. Turning to the fields of psychology and sociology, McLanahan and Adams (1987), Östberg and Hagekull (2000), Bandura (1986), and Ozer (1995) found that a lack of social support, caretaking hassles, economic strain, Role Overload¹, and low coping efficacy – all variables associated with direct parental care of children – adversely affected maternal stress levels and well-being.

This thesis aims to build on the literature highlighted above and explore whether and how an increase in free childcare hours affects parents' labour market behaviour and subjective well-being. To do so, this study focuses on a policy passed recently in the United Kingdom (UK). The 2016 Childcare Act, enacted in September 2017, increased the number of free childcare hours available to working parents of 3-to-4-year-olds from 15 to 30 hours per week for 38 weeks of the year (Jarrett, 2017). This act conditionally builds on the pre-existing universal entitlement to 15 hours of free childcare per week for 3-to-4-year-old children. To benefit from this expansion, both parents (or single parents) should expect to earn over the following three months a minimum income equivalent to 16 hours per week at the national minimum wage and a maximum income of 100,000 Great British Pounds (GBP) per year (UK Government, n.d.-a). Furthermore, the Act only extends this benefit to parents residing in England and holding British or Irish citizenship or non-nationals with a permit to access public funds. Throughout this study, we will use 'the Act' and 'the Policy' interchangeably to refer to the 2016 Childcare Act.

Based on the literature review, only one study was found to have assessed the impact of this policy on parental labour market behaviours and well-being. That study was commissioned by the UK's Department of Education to evaluate the first year of implementation of the 2016 Childcare Act. Using a custom survey, Paull and La Valle (2018) use descriptive analysis to assess the change in the quality of family life and parental working habits before and after utilising the additional free childcare hours. Their evaluation found that 30% of mothers and 18% of fathers increased their hours worked and that 43% of parents witnessed an improvement in their quality of family life. Given that Paull and La Valle (2018) do not utilise statistical methods to assess the Act's impact on parental labour market behaviours and do not assess individual well-being at all, the scientific relevance of this current thesis continues to hold.

To study the impact of this Act, this thesis will follow a number of other papers in adopting a Difference-in-difference methodology (Baker et al., 2008; Bettendorf et al., 2015; Brodeur & Connolly, 2013). Using the UK's

¹ The Role Overload theory outlines that individuals who undertake responsibilities that outweigh the time and resources they have available will experience negative effects on their well-being (Sieber, 1974).

Household Longitudinal Study (UKHLS), the effect of the 2016 Childcare Act on paternal and maternal extensive and intensive labour supply margins will be examined by observing changes in employment status and the number of hours worked per week (UK Data Service, n.d.). Additionally, the Act's effect on subjective well-being will be assessed by looking at changes in overall life satisfaction (UK Data Service, n.d.). The Difference-in-difference strategy compares changes to our outcome variables between the treatment and control groups before and after the enactment of the Policy to estimate its causal effect (Imbens & Wooldridge, 2009). The treatment group we study consists of parents of 3-to-4-year-old children, and the control group consists of parents of 0-to-2-year-olds. This group was chosen as our control since they generally do not qualify for free childcare hours and are otherwise quite similar to the treatment group. From the UKHLS dataset, we will use waves eight and nine since they include the observations right before and after the Policy's implementation. To assess the effect of the Act on parents, we divide our data into two time periods. The first spans from August 2016 to August 2017 and covers the period before the Policy's implementation. The second period spans from September 2017 to September 2018 and covers the period after the Policy's implementation. Each individual within our sample is observed once per time period. Finally, to identify the effect of an increase in free childcare hours on mothers and fathers, the analysis will be conducted separately for each group.

Applying the Difference-in-difference methodology, we will run three two-way fixed effects regressions assessing three different outcome variables; 1) number of hours worked per week, 2) labour force participation, and 3) overall life satisfaction. These regressions will be used to assess the following research question:

“How does an increase in free childcare hours affect paternal and maternal extensive and intensive labour supply margins and subjective well-being?”

1.1. Scientific and academic relevance

This study contributes to current public administration research by expanding the understanding of how and to what degree an increase in the duration of free childcare achieves policymakers' objectives of boosting parental employment and subjective well-being. While significant literature already exists assessing the impact of greater childcare subsidies on mothers' labour market behaviour and well-being, little work has been done to assess how it affects fathers. As such, this thesis aims to expand this body of knowledge by examining the impact of access to free additional childcare hours on paternal and maternal labour market behaviours and subjective well-being. Furthermore, findings from this thesis will also expand upon earlier research carried out by Paull and La Valle (2018) for the UK's Department of Education by utilising a Difference-in-difference methodology to assess the

impact of the UK's 2016 Childcare Act on the extensive and intensive labour supply margins and subjective well-being of mothers and fathers.

1.2. Thesis structure

The remainder of the thesis is structured as follows. In section two, we will review and critique existing literature that studies the impact of a change in childcare subsidies on parental labour market behaviours and well-being. Section three will provide an overview of the institutional context in which the UK's 2016 Childcare Act was developed and provide further details regarding the Policy itself. Section four presents the theoretical framework outlining the hypotheses tested throughout this paper and the theories used to develop them. Section five, with the goal of answering our research questions, describes the data used and methodology deployed to test our hypotheses. Section six analyses the descriptive statistics, parallel trend plots, and regression outputs. Finally, the last section gives an overview of the findings and the conclusions that can be drawn from them.

2. Literature review

This section assesses the literature relevant to this study. Divided into two parts, the first part will examine the effect of an increase in free childcare hours on parental labour market behaviours, and the second will examine the increase's effect on parental subjective well-being.

2.1. Parental labour market behaviour

Past studies have had conflicting findings surrounding how increased state-funded childcare affects parents' extensive and intensive labour supply margins. A study by Baker et al. (2008) assessed the effect of reducing the price of childcare on the labour supply of married women and the well-being of mothers and fathers in Quebec, Canada. The authors focused their research on the Quebec Family Policy which reduced the cost of childcare to five Canadian Dollars per day for 0-to-4-year-olds. Through their research, Baker et al. (2008) found that the reform led to a rise in the labour force participation of married women with young children by 7.7%, as well as an increase in their likelihood of moving from no work to full-time work. However, this study excludes single mothers. The Quebec Family Policy was designed to target low-income families, which are more likely to be headed by single mothers. By excluding this group, the authors are alienating part of the target population.

Nevertheless, Baker et al.'s (2008) findings were corroborated by Connelly (1992) and Viitanen (2005) who found that lower childcare costs increased the probability of married women's participation in the labour market. Using an empirical choice model, Viitanen (2005) found that a 10% reduction in childcare costs only increased the labour force participation of married mothers by 1.5 percentage points. Viitanen's (2005) model

also showed that even with subsidies covering 50% of childcare costs, the effect on labour force participation remains modest, with a three-percentage point increase. However, it is worth noting that these findings are based on empirical choice models, not actual behaviours. In real life, individuals may be influenced by factors not accounted for in this model, like higher inflation or personal beliefs, actions, and attitudes (Boudon, 2003).

The analyses of Baker et al. (2008), Connelly (1992), and Viitanen (2005) may all suffer from sample selection bias due to the purposeful exclusion of single mothers. Studies have also shown that low-income single mothers receiving childcare subsidies are more likely to be employed upon receiving childcare subsidies compared to other groups (Ahn, 2012; Berger & Black, 1992; Brewer et al., 2022; Crawford, 2006). Thus, by excluding single mothers, the authors may be biasing their findings downwards.

Similar findings were found by Schmitz (2020) who assessed the effect of access to publicly funded childcare on the well-being of mothers and fathers in Germany. In January 1996, the German government put in place a policy that introduced a legal claim to publicly funded childcare for all children above the age of three. As part of this policy, the German government temporarily allowed municipalities to put cut-offs in place to circumvent childcare supply issues. Exploiting the exogenous variation in access to childcare imposed by these cut-offs, Schmitz (2020) found that with greater access to subsidised childcare, mothers shifted time away from non-market activities towards formal work, with a 22-percentage point increase in the probability to work. The majority of this increase stemmed from a greater up take of part-time work rather than marginal or full-time employment. Assessing time use, Schmitz (2020) found that increased access to publicly funded childcare increases the time mothers spend in paid employment or in training by approximately 1.4 hours/day. However, it is important to note that this study's sample was predominantly composed of parents from a higher socio-economic background since they were more likely to comply with the cut-off rules. This sample may skew the researcher's findings upwards since individuals of a higher socio-economic background may have better access to the job market through their higher level of education and personal connections.

Looking at the labour market behaviours of mothers and fathers, a study by Bettendorf et al. (2015) assessed the impact of a Dutch reform that led to a 50% cut in parental formal childcare fees. Bettendorf et al. (2015) found that this policy modestly increased the labour force participation of mothers with young children by 2.3 percentage points in the medium term. The policy was also found to have an even more significant impact on the number of hours worked by mothers with an increase of 1.1 hours/week (a 6.2% increase). Furthermore, the effect of the policy on hours worked by mothers was found to be larger for single mothers and mothers with children between the ages of 0 and 3. In contrast, the policy did not significantly affect fathers' labour force

participation and even decreased their hours worked. As highlighted by the authors, one issue here is that the different effects between the sub-groups may be confounded by heterogeneous effects resulting from the expansion of the earned income tax credit (EITC) that took place during the same time period. When comparing their findings to evaluations of similar policies conducted in Sweden and Norway, the authors found that the effect on parents' labour force participation in the Netherlands was larger. They attribute this difference to the working requirement attached to the Dutch policy (Bettendorf et al., 2015). This final point is essential for our study since there is also a work requirement to access an additional 15 hours of free childcare under the UK's 2016 Childcare Policy.

With similar findings to Bettendorf et al. (2015), Felfe et al. (2016) look at how establishing regulations in Swiss cantons mandating the provision of slots for after-school care affected the labour force participation of mothers and fathers. Felfe et al. (2016) found that the extension of after-school care in Switzerland had no effect on fathers' labour force participation but increased the full-time labour force participation of mothers. However, it is worth highlighting that Felfe et al.'s (2016) study focuses on assessing the effect of changes to the supply side of childcare – the expansion of childcare availability – rather than the demand side. Hence, the effect on parental labour force participation measured here is indirect.

With a focus on the UK, Brewer et al. (2022) assessed the impact of expanding free part-time childcare to free full-time care on the labour supply of mothers and fathers of pre-school-aged children. The authors found that moving from no free childcare to part-time free childcare had little impact on the labour force participation of mothers and fathers. However, shifting from part-time to full-time free childcare had a significant positive effect on mothers' labour force participation and employment but no effect on that of fathers. Investigating the heterogeneity between groups, Brewer et al. (2022) found that the effect of expanding from part-time to full-time free childcare was slightly larger for single mothers compared to married mothers. Acknowledging the relevance of these findings, it is worth noting that the author does not account for differences in labour market behaviours that may have resulted from the UK's 2016 Childcare Act that granted those eligible to expand from 15 hours of free childcare to 30 hours. While this policy is offered part-time for only 38 weeks of the 52-week year, it still affects the authors' calculation of extra childcare costs incurred by parents that want to expand their childcare usage from 15 to 30 hours. Based on the 5 GBP average hourly childcare rate in 2019, Brewer et al. (2022) calculate that parents have to pay around 55 GBP/week (2,860 GBP/year) to expand their 15-hour care to 30-hour care. Meanwhile, for those that qualify for the extra free childcare hours as per the 2016 Childcare Act, this cost would amount to 2,100 GBP/year (150 GBP/week for the 14 weeks not covered by the policy). The

lower cost of childcare may reduce the reservation price of parents and can thus expand their labour force participation and/or hours of work compared to those who only qualify for 15 hours of free childcare.

In summary, Baker et al. (2008), Bettendorf et al. (2015), Connelly (1992), Felfe et al. (2016), Schmitz (2020), and Viitanen (2005) found that access to greater childcare subsidies increased the labour force participation of mothers to various degrees. Regarding the number of hours worked, while Schmitz (2020) found that most women entering the labour force opted for part-time employment, Felfe et al. (2016) and Viitanen (2005) found that, in response to greater childcare subsidies, there was an increase in the full-time LFP of mothers. Both studies align with the findings of Bettendorf et al. (2015), who reported that access to more subsidised childcare had a more significant positive effect on the number of hours worked compared to its effect on LFP. As for fathers, Felfe et al. (2016) and Bettendorf et al. (2015) found that greater childcare subsidies had no significant effect on fathers' LFP and even decreased the number of hours they worked. Based on this overview, it could be seen that the majority of the literature assessed agrees that additional free childcare increases mothers' labour force participation and hours worked and has no effect on the LFP of fathers.

2.2. Parental well-being

Looking back at Baker et al. (2008), with a focus on the effect of the Quebec Family Policy on the well-being of parents, the authors had some interesting findings. While fathers saw a greater reduction in the likelihood of reporting themselves as being in excellent health around the time of the policy, mothers' self-reported health witnessed no statistically significant changes, but their depression scores increased by 10.2%. The authors only present depression scores for mothers since they were the primary household respondents. This may limit the analysis and subsequent findings surrounding the impact of subsidised childcare on the well-being of fathers. Baker et al. (2008) also found that the policy led to worsened childcare outcomes such as hyperactivity, motor/social skills, aggressiveness, and child health.

Herbst and Tekin (2014) corroborated Baker et al.'s (2008) findings on well-being. Looking at the United States's (US) Child Care and Development Fund (CCDF) programme, Herbst and Tekin (2014) found that mothers who benefited from childcare subsidies reported having poorer health and were more likely to show symptoms associated with parenting stress, anxiety, and depression, as well as a worsened parent-child relationships. To encourage entry into the labour force, the CCDF's policy included a work requirement and allowed parents to use childcare subsidies to pay for other legally operating childcare services such as in-home caregivers. Herbst and Tekin (2014) theorise that access to subsidised childcare through paid employment (the work requirement)

increases the opportunity cost of leisure, which may push mothers to return to work before they are ready. Furthermore, the stress and anxiety associated with searching for and commencing a new job may adversely affect the well-being of mothers (Herbst & Tekin, 2014). These findings are relevant to our study since the 2016 Childcare Act also involves a work requirement. However, it is important to note here that in the US, subsidies are often granted to the most disadvantaged groups who may already be experiencing lower levels of well-being compared to an average member of the population. Also focused on the US, Bertrand (2013) reported on the life satisfaction and emotional well-being of college-educated women in the US. The author found that having a family provided a higher life satisfaction premium than just having a career. However, combining work and establishing a family did not provide greater life satisfaction than having either or. Again, these findings may be particular to the US since their government provides less social support to parents in contrast to comparable states in Europe.

Also assessing the Quebec Family Policy, Brodeur and Connolly (2013) focused their study on how higher childcare subsidies affected parental well-being by looking at their reported life satisfaction and happiness. Brodeur and Connolly (2013) found that the policy decreased life satisfaction and increased happiness for fathers and had no effect on life satisfaction and reduced happiness for mothers. The authors attribute these contradictory findings to changes related to the income effect and changing gender roles within the household. However, they do not elaborate on, nor account for, the effect of happiness on life satisfaction and vice versa. Looking at the effect of the policy on parents with different levels of education, they found that well-being increased for mothers and fathers with a lower level of education and decreased for those with a higher level of education (Brodeur & Connolly, 2013). The authors state that these differences may be attributed to the program's indirect effect on well-being through the increased household income stemming from increased maternal employment and lower childcare fees, as well as the increased sense of economic empowerment that arises from taking on work (Brodeur & Connolly, 2013). Meanwhile, the negative effect on subjective well-being experienced by parents with a higher level of education could be due to negative child outcomes outweighing the positive effects of lower childcare costs and higher incomes (Baker et al., 2008; Brodeur & Connolly, 2013). Schmitz (2020), on the other hand, found that while fathers were less affected, mothers qualifying for childcare experienced a significant increase in their life satisfaction. In contrast to Brodeur and Connolly (2013), Schmitz (2020) also observed that the positive impact on life satisfaction was greater for mothers with a greater labour market attachment and highly educated mothers since they were more likely to move towards paid employment.

Looking across disciplines, the remainder of this section will shift focus to literature in the realm of psychology and sociology. Studying Sweden, Östberg and Hagekull (2000) perform a structural model analysis with the aim of understanding how sociodemographic background factors, social support (emotional and network support), caretaking hassles, life events, workload, and child temperament affect parental stress. Their research found that being an older mother, having more children, having fussy children, or having a higher perceived workload directly affects the parental stress of mothers. On the contrary, the greater the perception of the availability of social support, the lower the adverse effects on maternal stress. However, it is important to note that this study assesses maternal stress in the context of a Nordic welfare state model. Nordic welfare states are characterised by generous universal benefits, which differs significantly from the Anglo-Saxon/Liberal welfare state that operates in the US and UK, where benefits are largely means-tested and focus on labour market activation (Arts & Gelissen, 2002; Bonoli, 1997; Ferrera, 1996).

Through their literature review, McLanahan and Adams (1987) found that single parents reported being more worried and less happy than other groups. They also found that a higher perceived economic strain reduces the well-being of both parents and that working mothers do not accrue the same psychological benefits from employment compared to employed women without children. Their review also highlights the impact of Role Strain, through Role Overload, on parental well-being. The Overload hypothesis outlines that parents who work and care for their children may experience adverse effects on their well-being when the demands they face outweigh the resources – time and money – they have (Sieber, 1974). The Role Overload hypothesis can be used to corroborate the work of Ahn (2012), Berger & Black (1992), Brewer et al. (2022), Brodeur & Connolly (2013); Crawford (2006), and Östberg & Hagekull (2000), who found that parents with a larger number of children, single parents, and low-income parents have a lower level of well-being.

Drawing on social cognitive theory (Bandura, 1986), the well-being of parents is also associated with their sense of coping efficacy, which is their belief in their ability to mobilise various cognitive resources and actions to control events around them. Studies have shown that a lower coping efficacy can contribute to greater anxiety and depression (Cutrona & Troutman, 1986; Ozer & Bandura, 1990). Drawing on social cognitive theory and building on the findings of McLanahan & Adams (1987), it could be seen how the restrictions on time and money imposed by children can reduce working parents' sense of coping efficacy and their subsequent well-being. By taking on work and childcare, parents face demands from having more roles in their life. This can increase psychological distress through the mediating effect of lower perceived control imposed by limited resources (Rosenfield, 1989). A study by Ozer (1995) assessed these mechanisms by examining how childcare

responsibility and perceived self-efficacy affected the psychological health of working mothers. The author found that the perception of one's self-efficacy has a strong direct relationship with psychological health and that greater childcare responsibility can indirectly affect mothers' mental health through its impact on self-efficacy (Ozer, 1995). Acknowledging the relevance of this study, it is important to highlight that the sample size of 42 married mothers is limited and excludes single mothers. Furthermore, the study looks at mothers who plan to return to work once their child is three months old, which may exacerbate the negative effect on well-being, given that infants can be more demanding than older children.

To summarize, Baker et al. (2008) and Brodeur and Connolly (2013) observed a negative effect on paternal health and life satisfaction as a result of the expansion of subsidised childcare. However, Schmitz (2020) reported little to no impact of increased subsidies on the life satisfaction of fathers. In contrast, Brodeur and Connolly (2013) found that more subsidised childcare hours increased paternal happiness. Shifting the focus to mothers, Baker et al. (2008), Herbst and Tekin (2014), and Brodeur and Connolly (2013) found adverse effects of childcare subsidies on maternal mental health and happiness. On the other hand, Schmitz (2020) identified a significant increase in life satisfaction among mothers qualifying for additional subsidised childcare. Additionally, Brodeur and Connolly (2013) discovered that childcare subsidies had no impact on the life satisfaction of mothers. Drawing on the fields of psychology and sociology, McLanahan & Adams (1987), Östberg & Hagekull (2000), and Bandura (1986) found that variables associated with parental childcare, such as a lack of social support, caretaking hassles, economic strain, and Role Overload all adversely affected maternal stress levels and well-being. Furthermore, Ozer (1995) found that mothers' mental health is indirectly affected by childcare responsibility through its impact on self-efficacy. As could be seen in this summary, the literature review showed that the expansion of subsidised childcare has mixed effects on paternal and maternal well-being. This highlights the complex and multifaceted nature of the relationship between childcare subsidies and the well-being of parents.

3. Institutional context

Before delving deeper into the UK's 2016 Childcare Act – this study's policy focus – we will examine the institutional context that produced this policy.

Childcare is considered an investment in children's future and a service that allows parents to work. Before the 1990s, affordable childcare was difficult to find in the UK, which led to mothers exiting the labour force once they had children (Rutter, 2016). Later, in 1994, the first tax reliefs for childcare were introduced, allowing some employees to benefit from means-tested childcare cost deductions. In 1996, the Nursery Education and Grant Maintained Schools Act was enacted. This Act aimed to increase the supply of childcare by providing grants for nursery education and allowing the grant-maintained schools to borrow funds from the state (Queen's Printer of Acts of Parliament, n.d.). In 1998, the National Childcare Strategy was introduced. This strategy represents the first time the UK government recognised the need for a national childcare policy and established the first childcare unit under the Department for Education and Employment (Male & Palaiologou, 2012). In 2004, a 10-year strategy, *Choice for Parents, the Best Start for Children*, was published. This strategy paved the way for the 2006 Childcare Act. The 2006 Act required English and Welsh authorities to secure childcare for working parents and ensure that enough childcare was available for those who needed it (Rutter, 2016). In September 2010, under the 2006 Childcare Act, the *Free Early Education Entitlement* program established a universal entitlement to 15 hours of free childcare for 3- and 4-year-olds for 38 weeks of the year (Jarrett, 2017). In 2014, this entitlement was then expanded to include 2-year-olds from less well-off families (National Audit Office, 2016).

Other forms of social support provided to parents during the timeframe covered by this study include the UK's *Universal Credit* scheme, where low-income working parents could claim up to 85% of their childcare costs² (Rutter, 2016). Under the *Tax Free Childcare* scheme, the government provides coverage of 20% of childcare costs for working parents. For instance, for every 8 GBP parents pay, the government pays 2 GBP, up to 2,000 GBP/year for working parents. Furthermore, since 2005, employers have been able to provide their employees with vouchers that can be used to obtain childcare from registered providers (Brewer et al., 2014). Under this scheme, parents forgo a part of their income in return for a voucher of an equal amount. These vouchers are not subject to income tax or National Insurance Contribution (NIC) fees. Under this policy, parents employed in organisations that provide this scheme can claim up to 55 GBP/week (Brewer et al., 2014). Other

² Upper limits were put in place to curb the childcare costs that parents can claim.

programs such as *Care to Learn*, *Further Education Discretionary Learner Fund*, and the *Higher Education Childcare Grant* cater directly to parents above and below the age of 20 who are pursuing an education (Rutter, 2016). Despite these other forms of support, the largest portion of funding in England continues to go to the provision of the “free entitlement” policy (Brewer et al., 2022), which will be studied throughout this paper by focusing on the 2016 Childcare Act.

The 2016 Childcare Act, which took effect in September 2017, provided an extra 15 hours of free childcare for eligible working parents of 3-to-4-year-olds. This builds on the pre-existing universal entitlement to 15 hours of free childcare, bringing the total number of free childcare hours available for eligible parents to 30 per week for 38 of the year’s 52 weeks³ (Jarrett, 2017). For both the universal and extended entitlement, parents can access the free childcare hours the term following their child’s third birthday. Parents may also access free childcare for the 52 weeks of the year if they use less than 30 hours per week. However, this option is dependent on the parent’s childcare provider (UK Government, n.d.-a). The benefits extended by the 2016 Childcare Act are not limited to public nurseries but can also be used with a range of approved childcare providers such as registered childminders, nannies, playschemes, nurseries or clubs, childminders/nannies with a registered agency, registered schools, or a home care worker with a registered home care agency (Department for Education, 2023).

The eligibility conditions to access additional free childcare centres around employment activation. To be eligible, the parent/s of the child should qualify for work and seek additional childcare to enable their access to work (Jarrett, 2017). The Policy is also means-tested, requiring that eligible parents should expect to earn over the following three months a minimum income equivalent to 16 hours of work per week at the National Minimum Wage (NMW) and a maximum adjusted net income per parent of 100,000 GBP/year (Rutter, 2016; UK Government, n.d.-a). It is also worth noting that this policy only applies to parents living in England with British or Irish citizenship or non-nationals permitted to access public funds (UK Government, n.d.-a).

Table 1 below provides an overview of the different childcare benefits per age group and eligibility rules that the UK government applies.

³ The 38 weeks cover the period during the school term.

Table 1. UK Childcare Subsidy eligibility overview

Child Age	Type of benefit	Eligibility
2 years-old	15 hours of free childcare for 38 weeks of the year	Recipient of any of the following: <ul style="list-style-type: none"> • Income support • Income-based jobseeker allowance • Income-based employment and support allowance • Universal credit and net household (HH) income < 15,400 GBP/year, excluding benefits⁴ • Child tax credit, working tax credit, and HH income is 16,190 GBP or less before tax⁵ • Payment after the period of qualifying for the Working Tax Credit
3-4 years-old	15 hours of free childcare for 38 weeks of the year	<ul style="list-style-type: none"> • Universal
	Additional 15 hours of free childcare for 38 weeks of the year	<ul style="list-style-type: none"> • Single/both parents are employed, self-employed, or both • Single/both parents should expect to earn a minimum of 16 hours/week at NMW over the next three months and a maximum adjusted net income of 100,000 GBP/year • Child resides with the parent applying for additional hours
>4 years-old	Child starts primary school	

Source: (Jarrett, 2017; UK Government Digital Service, 2015; UK Government, n.d.-a; UK Government, n.d.-c)

In September 2018, the Department of Education commissioned a study to evaluate the first year of the national rollout of the 2016 Childcare Act. The study found that of those eligible to receive the benefit, 91% used the extended hours. However, some reported that accessing the additional hours was not entirely free, with around 23% of providers imposing new charges or increasing existing ones to cover additional costs, compared to 74% who did not. 85% of the Act's beneficiaries were dual-parent households, and 44% had a father working full-time and a mother working part-time (Paull & La Valle, 2018). While the majority of low- and middle-income beneficiaries reported that they expanded the number of childcare hours they used to facilitate their access to work, the majority of those with high incomes just wanted to reduce the amount of paid childcare they use (Paull & La Valle, 2018). Looking at the combined effect of childcare use on work, the study found that 30% of mothers and 18% of fathers reported increasing their childcare hours used and hours worked. The study also found that 43% of those surveyed reported an improvement in their perceived quality of family life due to the use of

⁴ Values based on 2023 figures.

⁵ Values based on 2023 figures.

additional free childcare hours, which permitted parents to work more and improve their family finances (Paull & La Valle, 2018).

With the study of Paull and La Valle (2018) in mind, it is important to note that the scientific relevance of this study continues to hold. The evaluation of the 2016 Act commissioned by the UK's Department of Education does not utilise statistical methods to assess the Policy's impact on parents' labour force participation. Instead, they use descriptive analysis of a survey where parents were directly asked about their working habits before and after utilising the additional subsidised childcare hours or how they would change their working habits if they did use the additional free hours. Our methodology, on the other hand, is based on revealed preferences from data extracted from the UKHLS rather than on preferences stated in a survey tailored for the purpose of this study. Furthermore, Paull and La Valle (2018) only use regressions to assess differences in the working behaviour of mothers and fathers in response to the Policy across different types of families. Statistical methods were also not employed to assess the relationship between childcare use and the quality of family life. Additionally, this study will focus on the individual-level self-reported perception of quality of life rather than the family-level quality of life used in Paull and La Valle's (2018) evaluation.

4. Theoretical framework

By drawing on the review of past literature and tools from the fields of labour economics, psychology, and sociology, the following section outlines the mechanisms and subsequent hypotheses this study aims to test.

The UK's 2016 Childcare Act represents a subsidy that reduces childcare costs through the expansion of the number of free childcare hours for eligible parents from 15 hours/week to 30 hours/week for 38 weeks of the year. To qualify for this benefit, parents must be engaged in some form of paid employment. As such, we will divide our theoretical framework into two parts. The first part will focus on how the Policy affects parents' intensive labour supply margins by looking at changes to the hours worked by parents already engaged in paid employment when their child becomes eligible for the benefit. The second part will focus on how the Policy affects parents' extensive labour supply margins by looking at changes to the employment status of parents who were not engaged in paid employment before the Policy's enactment. The labour supply model helps us predict whether individuals will join the labour force and/or how many hours they intend to work (Borjas, 2016, p.21). For this purpose, we will elucidate the labour supply model in order to understand how individuals may potentially behave in response to a reduction in childcare costs.

At the onset of the Policy, parents already engaged in paid employment are faced with the choice of either expanding, contracting, or not changing their intensive labour supply margin. The Policy's expansion of the number of free childcare hours available to parents increases their effective wage since the cost of childcare within each parent's budget decreases. According to the labour supply model, parents' choices are contingent on the relative strength of two mechanisms: the income effect and the substitution effect (Borjas, 2016, p.39). Considering that leisure is a normal good whose demand increases as income increases, the income effect predicts that an increase in income, due to the increase in effective wages, would lead to a reduction in the intensive labour supply margin and an increase in the consumption of leisure (Borjas, 2016, p.36). On the other hand, the increase in effective wages caused by the additional free childcare hours also increases the cost of leisure. As such, the substitution effect suggests that because of this rise in the cost of leisure, parents would choose to expand their intensive labour supply margin (Borjas, 2016, pp.37-39). These mechanisms also inform the choice of hours worked by parents who decide to expand their extensive labour supply margin to benefit from this policy.

Whether or not parents expand their extensive margins at the onset of the Policy is also contingent on wages. Generally, individuals will not engage in work if the market wage falls below their reservation wage, which is the lowest wage at which individuals would accept to undertake a certain job (Borjas, 2016, p.41). Prior to the Policy, parents with children aged 3-to-4 only benefitted from 15 hours/week of free childcare for 38 weeks of the year. Any additional childcare hours they needed constituted an additional variable cost and were paid for out of pocket. As such, for parents to work, they must enrol their children in childcare, increasing their variable costs and, subsequently, their reservation wages. Should market wages not meet this higher reservation wage, the parents will not re-join the labour force. The 2016 Childcare Act can mitigate this issue by reducing the cost of childcare, which in turn reduces parents' variable costs and subsequently their reservation wages. Furthermore, since access to additional free childcare hours is tied to a work requirement, not working means that parents will face a higher opportunity cost by forgoing both salaried work and the additional free hours of childcare.

Under rational choice theory assumptions that individuals are fundamentally rational and make calculated decisions to maximise their utility, we hypothesise that for both groups, parents would choose the option with the lowest opportunity cost (Stanford Encyclopaedia of Philosophy, 2020). This means that the substitution effect would dominate the income effect for parents already engaged in paid employment, expanding their intensive labour supply margins. As for unemployed parents, they would expand their extensive

margins to avoid the higher opportunity costs imposed by unemployment. As seen in subsections 6.1 and 6.2 of this thesis, the employment levels of fathers are, on average, higher than that of mothers. As such, in line with the mechanisms outlined by Brodeur and Connolly (2013), given that labour supply elasticity is inversely related to the level of employment, we hypothesise that the positive effect of childcare subsidies on employment would be smaller for fathers compared to mothers due to their lower labour supply elasticity and higher labour market attachment.

It is also worth noting here that a parent's labour supply decisions also rely on non-monetary aspects such as the availability and quantity of childcare available, as well as their personal preferences with regard to time spent with children (Connelly, 1992; Paull & La Valle, 2018). However, this thesis only focuses on the monetary aspect of parents' labour supply decisions. As such, based on the mechanisms outlined above, we formulate four hypotheses to be tested:

H1: an increase in the number of free childcare hours will lead to an increase in the intensive labour supply margin of mothers.

H2: an increase in the number of free childcare hours will have little to no effect on the intensive labour supply margin of fathers.

H3: an increase in the number of free childcare hours will lead to an increase in the extensive labour supply margin of mothers.

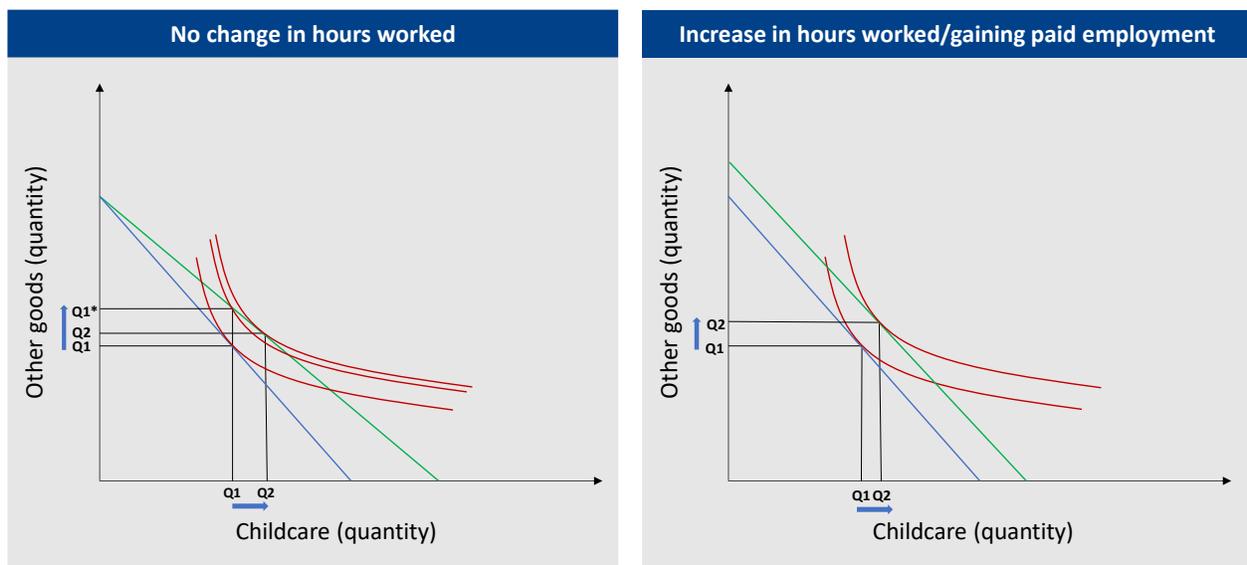
H4: an increase in the number of free childcare hours will have little to no effect on the extensive labour supply margin of fathers.

It is worth highlighting here that the father-focused hypotheses numbers two and four are null hypotheses. As such, should the methodology outlined in section 5 produce null results for fathers' labour market behaviour, this thesis will interpret it as providing support to hypotheses two and four since the null hypothesis could not be rejected in favour of the alternative hypothesis that an increase in the number of free childcare hours affects fathers' labour market behaviour.

Building on the mechanisms outlined above, we also hypothesise that the increase in income caused by the reduced cost of childcare and/or increased extensive/intensive labour supply margins would positively contribute to the well-being of parents. The lower cost of childcare allows working parents to consume the same level of childcare or expand their use of childcare at a lower cost, as well as increase their consumption of other

goods and services. In case there is no change in parents' intensive labour supply margins, it can be seen in Figure 1 how the reduced cost of childcare pivots parents' budget line outwards, which allows parents to move to a higher indifference curve and experience a higher overall utility regardless of whether they maintain or increase their level of childcare consumption (McConnell et al., 2018, p.155). Furthermore, should the Policy push parents to work more hours, the higher wage or jump from no wage to paid employment would shift their budget line outwards. This would allow them to increase the amount of goods and services they can afford and move them to a higher indifference curve and overall utility level (Figure 1).

Figure 1. Impact of change in childcare costs on parental budget lines



Furthermore, past studies have also shown how higher incomes positively contribute to well-being. Blanchflower and Oswald (2004), in a study looking at the United Kingdom and the United States, found that a higher income contributed to greater happiness and that higher relative incomes – as a ratio of individual income to state-level income per capita – led to greater well-being. Similar findings were also uncovered in McBride's (2001) work which found that higher incomes positively affected an individual's subjective well-being. The author also found that if an individual's income is low relative to their parents' standard of living and relative to the incomes of individuals in a similar age bracket, they experience a lower level of subjective well-being (McBride, 2001). The findings of Blanchflower and Oswald (2004) and McBride (2001) are corroborated by the work of Ferrer-i-Carbonell (2005), as well as the extensive literature review of Clark et al. (2008), who found that while higher incomes increase happiness through an increase in both consumption and status, happiness remains negatively related to other people's income and to the individuals' past income. This is because the consumption

benefits brought about by income increases approaches zero as incomes increase, but the benefit of status is tied to someone else or the individual's past self (Clark et al., 2008). Acknowledging the impact of relative incomes on subjective well-being, this research will limit its focus to the impact of greater incomes on subjective well-being.

Looking at the fields of psychology and sociology, McLanahan and Adams (1987) and Östberg and Hagekull (2000) identified a set of factors associated with having children that cause parents psychological strains. These factors include economic strain, Role Overload, and caretaking hassles. These psychological strains do not only have a direct adverse effect on parental well-being, but they also have an indirect negative effect on parents' perceived coping efficacy (Bandura, 1986; Ozer, 1995). As such, by providing additional childcare at a lower cost, the 2016 Childcare Act can alleviate the psychological pressures imposed by monetary constraints and grant parents more flexibility over their time and a greater sense of control over their lives.

Based on the mechanisms highlighted above, we formulate the well-being hypotheses as follows:

H5: an increase in the number of free childcare hours will increase maternal subjective well-being.

H5: an increase in the number of free childcare hours will increase paternal subjective well-being.

Similar to the case of labour supply decisions, parental well-being is also affected by the degree to which parents enjoy spending time with their children, as well as the well-being of the children themselves. However, we do not observe childcare preferences or child outcomes in our data. As such, similar to Brodeur and Connolly (2013), we only pick up the effects on children if parents account for them in their assessment of their own overall well-being.

5. Data and methodology

The research that we focus on throughout this thesis is deductive in nature. In terms of process, this means that we started with theory review, after which we developed hypotheses, which we subsequently seek to test using a quasi-experimental quantitative research design. Throughout this section, we will discuss the data and methodology used to conduct this research at greater length.

5.1. Methodology: Difference-in-difference

We will deploy a Difference-in-difference methodology to assess the effect of a higher number of state-funded free childcare hours on parental labour market activity and subjective well-being.

In its simplest form, the Difference-in-difference is a quasi-experimental methodology where we have two groups, the treatment and control, observed in two different time periods, before and after the enactment of a policy reform. In the time period preceding the Policy, neither the treatment nor control groups are exposed to the treatment. In the time period succeeding the Policy, only the treatment group is exposed to the treatment. To estimate the treatment effect, the Difference-in-difference compares the changes in outcomes of the treatment and control groups before and after the reform against each other (Imbens & Wooldridge, 2009).

This thesis will employ a Difference-in-difference regression with fixed effects. The fixed effects method accounts for unobserved individual time-invariant characteristics (time-fixed effects) that may be correlated with our independent variable of interest (Wooldridge, 2016, pp. 413, 435). This method allows us to control for heterogeneity bias and reduce the omitted variable bias caused by unobserved time-fixed effects. To implement the Difference-in-difference methodology we carry out the following two-way fixed effects regression:

$$Y_{it} = \alpha_i + \beta_1 Policy_{it} + \beta_2 NumberKids_{it} + \beta_3 Health_{it} + \beta_4 Treatment_{it} + \beta_5 Time_period_t + u_{it} \quad (1)$$

In the equation above, the subscript i identifies each individual in our sample, and the subscript t each time period. The dependent variable Y_{it} will take the form of our different outcome variables: 1) labour force participation, 2) working hours per week, and 3) overall life satisfaction. α_i represents the individual fixed effects. $Policy_{it}$ is our binary intervention variable, and our coefficient of interest is β_1 . $Policy_{it}$ measures the treatment effect and takes the value of one if the observation takes place in time period two and the parent has a child that is between the ages of 3 and 4. Otherwise, $Policy_{it}$ takes the value of zero if a parent is observed in either time periods and has a 0-to-2-year-old or if a parent has a 3-to-4-year-old in time period one. We also include three time-varying covariates that influence our outcome variables. Based on the findings of Ahn (2012) and Östberg and Hagekull (2000), the first time-varying covariate we include is $NumberKids_{it}$. As for the second covariate, we included the variable $Health_{it}$ which measures self-perceived general health. Our final time-varying covariate is $Treatment_{it}$ and it takes the value of one if the parent has children aged 3-to-4 and zero if they have children aged 0-to-2. In this model, we do not control for the level of education, age, and marital/cohabitation status since their values varied in less than 5% of our sample. Similar to Brodeur and Connolly (2013), we do not control for the income level since part of the effect of childcare on parents is an increase in household income. This model also includes $time_period_t$, which is a time dummy that captures the time trend in case there are any other time varying factors that are correlated with the Act's implementation

that can also explain our results. This variable takes the value of one in time period two and zero otherwise. Finally, u_{it} represents the idiosyncratic error, which includes the unobserved factors that change over time.

As outlined in subsection 5.2.1 below, the labour force participation outcome variable takes on binary values. As such, we will estimate the impact of $Policy_{it}$ on labour force participation using a linear probability model (LPM) that follows the specification outlined above. In a LPM, given that the LFP dependent variable is binary, β_1 measures the change in the probability of joining the labour force when the variable $Policy_{it}$ switches between zero and one, *ceteris paribus* (Wooldridge, 2020, p. 240). Despite the ease of estimating and using this model, the LPM has its drawbacks. First, the probabilities estimated are unbounded and may be greater than one or less than zero. This violates basic probability law, which outlines that the probability of an occurrence should fall in the interval [0,1]. However, as could be seen in subsection 6.3, this is not an issue we encountered in our model. Second, the LPM assumes constant marginal effects (Wooldridge, 2020, p.242). Providing an example to illustrate this issue, the LPM assumes that the effect on labour force participation of an increase from one child to two is the same as an increase from two to three children, which may not necessarily be the case. The second drawback is not of concern in our model since our main variable of interest is binary. Thirdly, the LPM violates the homoscedasticity assumption since its variance is not constant but dependent on the independent variables (Wooldridge, 2020, p.242). Our model accounts for this issue through the use of clustered standard errors.

Given that our model utilises panel data where each individual is observed twice, the error terms across observations may be correlated. This correlation would violate the regression's independence assumption. As such, to increase the efficiency of our estimates, we account for this correlation by clustering our standard errors based on each individual's unique identifier code (Wooldridge, 2020, pp.478). Furthermore, to ensure that our model does not suffer from multicollinearity, we conducted an uncentered variance inflation factor (VIF) test, the values for which were all below 10 (results can be found in Appendix A). This indicates that our models do not suffer from multicollinearity.

5.2. Data

The UK's Household Longitudinal Study (UKHLS) will be used to operationalise the Difference-in-difference methodology outlined below. The UKHLS is a longitudinal study of people residing in the UK. The study dataset builds on the British Household Panel Survey (BHPS), which started in 1991. In 2009, the BHPS survey ended, and the UKHLS commenced and continues to operate today (Understanding Society, n.d.). To date, there have been

13 waves of the UKHLS running from 2009 until May 2023. The dataset is a rich source of information covering various topics, including household and family structure, employment and income, health and well-being, social and civic participation, attitudes and values, lifestyle and leisure, and more.

To study the impact of the UK’s 2016 Childcare policy on parental extensive and intensive labour supply margins and subjective well-being, we utilise waves eight and nine of the UKHLS data since they include the observations right before and after the Policy’s implementation. For wave eight, the fieldwork took place between January 2016 and May 2018, and for wave nine, the fieldwork was conducted between January 2017 and May 2019. Individual and household questionnaire components were merged for each wave using the unique household identifier code to prepare the data for our analysis. Following suit, responses across the two waves were merged based on the individual unique individual identifier code.

To estimate our study's causal effect, we must first define our treatment and control groups. Based on the eligibility requirements of the 2016 Childcare Act, our treatment group will be composed of parents of children aged 3-to-4 that benefit from 15 hours of free state-funded childcare and are eligible to benefit from an additional 15 hours under this Act. Meanwhile, our control group are parents of children aged 0-to-2. This group was chosen as our control since they generally do not qualify for free childcare hours and are otherwise quite similar to the treatment group. A summary of the hours of free childcare received by the treatment and control groups across the different time periods can be found in Table 2 below.

Table 2. Number of free childcare hours received by 0-2 and 3-4-year-olds across time periods

Group	Time period 1 (August 2016 – August 2017)	Time period 2 (September 2017 – September 2018)
0-to-2-year-olds (control)	0 hours/week	0 hours/week
3-to-4-year-olds (treatment)	15 hours/week	30 hours/week

With a focus on the effect of the Act on parents, we narrowed down the observation window to two time periods; the first precedes the Policy’s enactment and spans from August 2016 to August 2017. In September 2017, the 2016 Act came into effect and commenced our second observation period, which spans from September 2017 to September 2018. Since this study aims to identify the effect of a higher number of free childcare hours on mothers and fathers separately, we split the data by gender before proceeding with the analysis. As such, the dataset for mothers includes 616 observations divided equally across the two time periods.

Time period one has 206 mothers of 0-to-2-year-olds (control) and 102 mothers of 3-to-4-year-olds (treatment). Meanwhile, time period two has 134 control observations and 174 treatment observations. As for fathers, the dataset includes 396 observations, also divided equally across the two time periods. Time period one has 139 control observations and 59 treatment observations, and time period two has 99 control observations and 99 treatment observations.

In our sample, we excluded parents that do not have children between the ages of 0-4 and those with children aged 0-to-2 and 3-to-4 since it may contaminate the treatment effect. For instance, if a parent has a 3-to-4-year-old and wants to return to work, they may be unable to do so due to childcare restrictions imposed by their 0-to-2-year-old child. As such, by omitting mothers with both children, we facilitate the process of isolating the treatment effect. At the time of the Policy's enactment, the national hourly minimum wage was 7.5 GBP/hour⁶ (UK Government, n.d.-b). According to the Policy's minimum requirements, this translates to a minimum income requirement of 1,562 GBP⁷ for single-income households and 3,124⁸ for dual-income households. As such, to ensure adherence to the Act's income requirement, married parents in paid employment observed in time period two with a net household income less than 3,124 GBP, as well as single parents with incomes less than 1,562 GBP were excluded from our data. We only excluded parents who do not meet the income requirement in time period two since that is the time period in which the Policy came into effect. Additionally, we excluded all observations whose economic status is not "paid employment (ft/pt)", "unemployed", and "family care or home". As such, all retired and long-term sick or disabled respondents have been omitted from the dataset since they have no prospects of contributing to the labour force. Respondents that were "self-employed", "temporarily laid off/short-term working", and "doing something else" were also omitted since the dataset does not assess the number of hours they work, one of our key outcome variables.⁹ Moreover, all responses recorded in other British Isles are excluded since the Policy only applies to England.

5.2.1. Research variables

We will extract and use the dependent, independent, and control variables used in our analysis from the UKHLS. As highlighted previously, our research question aims to address three key points: the impact of increased free

⁶ This is the national minimum wage for individuals aged 25 and above.

⁷ 7.5 x 16 hours/week for three months

⁸ (7.5 x 16 hours/week for three months) x 2

⁹ Respondents with the following economic statuses were also excluded from the sample to facilitate the estimation of labour force participation: on maternity leave, full-time students, government training scheme, unpaid family business (not paid employment), on apprenticeship, on furlough.

childcare on 1) parental extensive labour supply margins, 2) parental intensive labour supply margins, and 3) parental subjective well-being. First, we construct the labour force participation variable to assess the effect on the extensive labour supply margin. According to the International Labour Organization (n.d.), labour force participation is defined as the proportion of the working age population that is active in the labour market by working or looking for work. Due to the difficulty associated with assessing whether an individual is searching for work, we limit the definition of LFP to those who are engaged in paid employment only. As such, we construct the LFP variable from survey respondents' self-reported economic status. If the respondent reports being in paid employment, then the variable takes the value of one. Meanwhile, if the respondent reports being either "unemployed" or "family care or home", the LFP variable takes the value of zero. Second, to assess the effect on the intensive labour supply margin, we will follow an approach similar to that of Bettendorf et al. (2015) and Brewer et al. (2022) and adopt each parent's normal number of hours worked per week.

As for the third and final part of our research question, similar to Brodeur and Connolly (2013), Herbst and Tekin (2014), and Schmitz (2020), we will be using overall life satisfaction as our well-being dependent variable. Life satisfaction was assessed by asking respondents to answer the following question: "pick the number which you feel describes how dissatisfied or satisfied you are with the following aspects of your current situation: your life overall". In response to this question, individuals surveyed chose a number on a seven-point scale spanning from 1 (completely dissatisfied) to 7 (completely satisfied). One fundamental limitation to highlight here is that the measure of well-being is subjective and self-reported; as such, the answers could have been influenced by the environment surrounding the respondent at the time of data collection.

Our main independent variable of interest is meant to measure the impact of the 2016 Childcare Act on the dependent variable. As outlined in greater detail in subsection 5.1., our variable of interest only takes the value of one when a parent observed in time period two has a 3-to-4-year-old child and zero otherwise. To construct this variable, we drew on four variables from the UKHLS dataset; 1) number of children aged 3-4 in household, 2) number of children aged 0-2 in household, 3) interview start month, 4) interview start year.

Finally, we also included three time varying covariates: number of kids, self-perceived general health, and treatment group assignment. The number of children is included as a covariate since it affects parents' childcare costs and their likelihood of employment. With a focus on the labour market activity component of our research, Ahn (2012) found that a greater number of children reduced the likelihood of single mothers' employment. Having more children was also found to increase the parental stress of mothers, which subsequently had a negative effect on their well-being (Östberg & Hagekull, 2000). While our reasoning for

including this variable in our model is based on academic studies that focus on mothers, we include it in our paternal regressions as well to study its relationship on their dependent variables. As for self-perceived general health, respondents were asked to rate their health from 1 (Excellent) to 5 (poor). This variable was included because an individual's health affects both their ability to work and their overall life satisfaction. The last covariate we included measures assignment to the treatment group and takes the value of one if a parent has children aged 3-to-4 and zero otherwise. This variable is constructed from two other variables in the UKHLS dataset; 1) number of children aged 0-2 in household and 2) number of children aged 3-4 in household. The group to which parents belongs to determines the number of free childcare hours they receive, which subsequently affects their labour market activity and overall life satisfaction.

5.3. Validity and reliability

Validity and reliability are two key attributes of high-quality research. While reliability relates to the replicability of the research, validity relates to how accurately a study measures what it sets out to measure. If a study fulfils either attribute but not the other, then the study's findings may be misleading.

Focusing on this thesis' reliability, we aimed to facilitate this study's replicability by providing clear and extensive citations and detailed descriptions in the methodology. This information can be used to replicate the results using the open-source UKHLS dataset. As such, we do not expect the results to differ significantly should the study be repeated.

As for the validity of our thesis, we set out to measure two concepts, 'labour market activity' and 'well-being' of parents. The objective of the UK government's 2016 Childcare Act is to push parents to either shift time away from caretaking towards paid employment (increasing their extensive labour supply margins) or to increase their working hours if they are already engaged in non-full-time paid employment (increasing their intensive labour supply margins) (Paull & La Valle, 2018). To operationalise the former, we constructed an indicator that measures the extensive labour supply margin of parents by assessing whether their economic status changes from "unemployed" or "family care or home" towards "paid employment". Meanwhile, to operationalise the intensive labour supply margin, we draw on an indicator that measures the number of hours normally worked per week by each parent. Operationalising the concept of well-being, we use self-reported overall life satisfaction. Past research has shown how overall life satisfaction is robust to potential biases and has a high face validity in relation to well-being (Diener et al., 1985; Schmitz, 2020). As such, the operationalisation of our two key concepts fulfils the validity requirement.

6. Analysis

The analysis section will be divided into three parts. The first will analyse the descriptive statistics of our sample, followed by an assessment of the Difference-in-difference parallel trends assumption, and the third and final section will analyse the results of our regression model.

6.1. Descriptive analysis

The descriptive statistics of all dependent, independent, and control variables are shown below. Since the analysis is conducted separately for men and women, the descriptive statistics are also presented separately for each group. To assess experimental group comparability, the number of observations and average values of each variable is showcased for the treatment and control groups for both mothers and fathers. The treatment group variable is not shown in the tables below since it is a binary variable that takes the value of one for the treatment group and zero for the control group. As such, presenting this information would not provide additional meaningful insights.

With a focus on mothers in our research sample, table 3 shows that most variables' treatment and control groups are quite similar. However, some minor differences prevail between the groups. As seen in table 3, mothers of 3-to-4-year-olds, on average, have more children and work fewer hours compared to mothers of 0-to-2-year-olds. This disparity could be attributed to the increased caretaking needs associated with having more children, which diverts time away from work. To test if these differences in means are significantly different from one another, we run a t-test and report the p-values in the final column of our table. Based on these results, it could be seen that, other than the number of children, the means of the different variables do not significantly differ from one another.

As for fathers in our research sample, table 6 also shows that for most variables the experimental groups are quite similar. However, fathers of 3-to-4-year-old children appear to have a higher number of children on average compared to fathers of 0-to-2-year-olds. These differences were further corroborated by the t-tests, which showed that the only variable whose mean is significantly different across the treatment and control groups is the number of children. Otherwise, the average values of the other variables do not vary substantially between the groups.

To check the representativity of our sample tables 4, 5, 7, and 8 compare our sample averages with the average values of the data used to showcase the parallel trends in section 6.2 below. Due to a lack of comparable third-party statistics, we chose to compare our averages with the parallel trends data since it is made up of a

larger sample size. This larger sample caters towards calculating a more accurate mean value that more closely resembles the population mean. In support of the representativity of the research sample, the majority of the variable means were not found to be statistically different from one another. Only the general health variable means were found to be statistically different for both the treatment and control groups of mothers and fathers.

Table 3. Descriptive statistics research sample treatment vs control (mothers)

Variable	Treatment (Mothers of 3-to-4-year-olds)		Control (Mothers of 0-to-2-year-olds)		T-test of mean differences
	Research sample		Research sample		
	N	Mean	N	Mean	P-value
Working hours/week	167	27.189 (25.668 – 28.709)	177	28.183 (26.663 – 29.703)	0.3623
Labour force participation	276	0.598 (0.540 - 0.656)	340	0.556 (0.503 - 0.609)	0.2958
Overall life satisfaction	253	5.225 (5.052 - 5.398)	301	5.349 (5.193 - 5.505)	0.2965
Number of children	276	2.072 (1.961 - 2.184)	340	1.915 (1.811 – 2.018)	0.0421
General health	253	2.506 (2.388 - 2.624)	305	2.492 (2.390 – 2.593)	0.8572

Note: values between brackets represent confidence intervals.

Table 4. Descriptive statistics research sample vs parallel trends sample (treatment mothers)

Variable	Treatment (Mothers of 3-to-4-year-olds)				T-test of mean differences
	Research sample		Parallel trends sample		
	N	Mean	N	Mean	P-value
Working hours/week	167	27.189 (25.668 – 28.709)	2,747	26.533 (26.140 - 26.926)	0.4327
Labour force participation	276	0.598 (0.540 - 0.656)	4,562	0.621 (0.607 - 0.636)	0.4327
Overall life satisfaction	253	5.225 (5.052 - 5.398)	4,014	5.107 (5.063 - 5.151)	0.1962
Number of children	276	2.072 (1.961 - 2.184)	4,562	2.068 (2.040 - 2.096)	0.9425
General health	253	2.506 (2.388 - 2.624)	4,562	1.562 (1.474 - 1.649)	0.0000

Note: values between brackets represent confidence intervals.

Table 5. Descriptive statistics research sample vs parallel trends sample (control mothers)

Variable	Control (Mothers of 0-to-2-year-olds)				
	Research sample		Parallel trends sample		T-test of mean differences
	N	Mean	N	Mean	P-value
Working hours/week	177	28.183 (26.663 – 29.703)	3,204	27.056 (26.707 - 27.405)	0.1483
Labour force participation	340	0.556 (0.503 - 0.609)	5,792	0.575 (0.562 - 0.587)	0.4940
Overall life satisfaction	301	5.349 (5.193 - 5.505)	5,041	5.194 (5.155 - 5.233)	0.0641
Number of children	340	1.915 (1.811 – 2.018)	5,792	1.868 (1.842 - 1.894)	0.4047
General health	305	2.492 (2.390 – 2.593)	5,792	1.500 (1.421 - 1.579)	0.000

Note: values between brackets represent confidence intervals.

Table 6. Descriptive statistics research sample treatment vs control (fathers)

Variable	Treatment (Fathers of 3-to-4-year-olds)		Control (Fathers of 0-to-2-year-olds)		T-test of mean differences
	Research sample		Research sample		
	N	Mean	N	Mean	P-value
Working hours/week	141	38.693 (37.570 - 39.816)	207	38.548 (37.662 - 39.434)	0.8406
Labour force participation	158	0.911 (0.867 - 0.956)	238	0.929 (0.896 - 0.962)	0.5343
Overall life satisfaction	144	5.146 (4.914 - 5.378)	219	5.242 (5.061 - 5.423)	0.5160
Number of children	158	1.975 (1.846 - 2.104)	238	1.765 (1.643 - 1.886)	0.0239
General health	144	2.493 (2.343 - 2.643)	221	2.362 (2.240 - 2.484)	0.1827

Note: values between brackets represent confidence intervals.

Table 7. Descriptive statistics research sample vs parallel trends sample (treatment fathers)

Variable	Treatment (Fathers of 3-to-4-year-olds)				
	Research sample		Parallel trends sample		T-test of mean differences
	N	Mean	N	Mean	P-value
Working hours/week	141	38.693 (37.570 - 39.816)	2,662	38.110 (37.794 - 38.426)	0.4127
Labour force participation	158	0.911 (0.867 - 0.956)	3,110	0.903 (0.892 - 0.913)	0.7245
Overall life satisfaction	144	5.146 (4.914 - 5.378)	2,593	5.090 (5.037 - 5.143)	0.6331
Number of children	158	1.975 (1.846 - 2.104)	3,110	2.030 (1.998 - 2.062)	0.4547
General health	144	2.493 (2.343 - 2.643)	3,110	0.969 (0.845 - 1.093)	0.0000

Note: values between brackets represent confidence intervals.

Table 8. Descriptive statistics research sample vs parallel trends sample (control fathers)

Variable	Control (Fathers of 0-to-2-year-olds)				
	Research sample		Parallel trends sample		T-test of mean differences
	N	Mean	N	Mean	P-value
Working hours/week	207	38.548 (37.662 - 39.434)	4,024	38.121 (37.874 - 38.367)	0.4481
Labour force participation	238	0.929 (0.896 - 0.962)	4,635	0.911 (0.903 - 0.919)	0.3485
Overall life satisfaction	219	5.242 (5.061 - 5.423)	3,891	5.213 (5.170 - 5.255)	0.7518
Number of children	238	1.765 (1.643 - 1.886)	4,635	1.761 (1.734 - 1.788)	0.9576
General health	221	2.362 (2.240 - 2.484)	4,635	1.046 (0.948 - 1.143)	0.0000

Note: values between brackets represent confidence intervals.

6.2. Assumptions

For the Difference-in-difference methodology to hold, both the treatment and control groups need to follow similar trends with respect to the different outcome variables in the period preceding the implementation of the 2016 Childcare Act. This requirement allows us to assume that the groups would continue to follow similar trends unless external factors, such as the 2016 Childcare Act, intervene to alter either group's path. The deviation of the treatment group from the trend/counterfactual is considered to be the treatment effect (Angrist J. D. & Pischke, J.-S., 2015, p.184).

In order to test this assumption, the panel data must be expanded to go beyond the two time periods outlined above. To do so, a merging mechanism similar to the one outlined in section 5.2 was used to combine data from waves four through eleven of the UKHLS. The fieldwork for the expanded dataset spanned from January 2012 until May 2021. The data collected across the different waves were then divided into seven time periods of equal length. Table 9 below outlines the start and end date of each time period.

Table 9. Time periods overview for parallel trends

Status in relation to the 2016 Childcare Act	Time period (#)	Period start date (Month year)	Period end date (Month year)
Pre-policy	1	September 2013	August 2014
	2	September 2014	August 2015
	3	September 2015	August 2016
	4	September 2016	August 2017
Post-policy	5	September 2017	August 2018
	6	September 2018	August 2019
	7	September 2019	August 2020

Since this paper seeks to understand how an increase in the number of free childcare hours affects both parents, the assumption of parallel trends will also be assessed separately for mothers and fathers.

Figures 2 and 3 showcase three figures, one for each outcome variable: hours worked/week, labour force participation, and overall life satisfaction. For each outcome variable, we assess the trends followed over time by the treatment (mothers/fathers of 3-to-4-year-olds) and control groups (mothers/fathers of 0-to-2-year-olds), as well as that of women/men with no children. The final group acts as a reference point for our treatment and control groups. The Policy is implemented in time period five. Across all figures, this time period is framed by a grey rectangle to improve the readability of the graph. To facilitate the comparison of values in each time period, we also included error bars showing the confidence intervals at a 95% level for both the treatment and control groups.

Looking at mothers' hours worked/week, it can be seen that the treatment and control groups have followed similar trends in the periods preceding the Policy. In time period five, following the incidence of the Policy, the parallel trends were disrupted, and the treatment group's hours worked/week witnessed a sharp

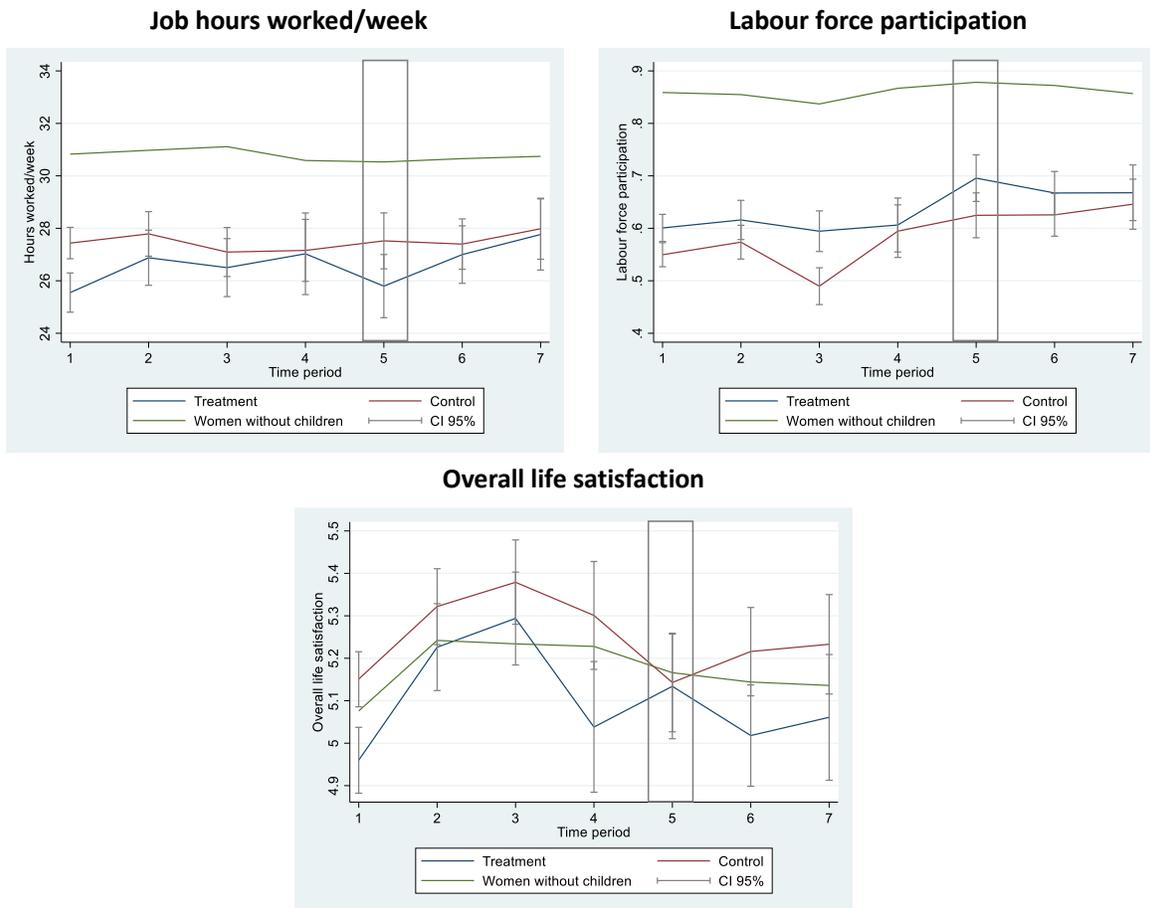
drop. In the post-policy time periods, the hours worked/week for the treatment group followed an upward trend. However, it is worth highlighting that despite the visible drop in hours worked/week, the treatment and control groups' confidence intervals slightly overlap in period five. Overall, across the different time periods assessed, the control group had a higher number of hours worked/week compared to the treatment group.

As for labour force participation, the treatment and control groups followed roughly similar trends in the pre-policy time periods. However, some trend deviations were observed in time period three, where the control group saw a more significant drop in labour force participation, followed by a sharp rebound in time period four. While the disruption caused by the incidence of the Policy is not large in magnitude, it could be seen how the treatment group experienced an increase in their labour force participation in time period five compared to the control group. Similar to hours worked/week, the confidence intervals for the treatment and control groups had a slight overlap in time period five. Furthermore, throughout the time periods assessed, the treatment group had a higher labour force participation compared to the control group. For both labour market activity variables, women without children worked more hours and had a higher labour force participation compared to mothers of 3-to-4-year-olds and 0-to-2-year-olds.

As for overall life satisfaction, the treatment and control groups also followed parallel trends before the incidence of the Policy. In time period five, these trends were disrupted, and the treatment group witnessed a significant increase in overall life satisfaction while the control group continued to follow its downward trend. Furthermore, the figure shows that while the treatment group had the lowest life satisfaction of all groups, the control group had the highest.

Based on these initial observations, it may be deduced that in response to the 2016 Childcare Act, mothers of 3-to-4-year-olds do expand their extensive labour supply margins, but they also shrink their intensive labour supply margins. This implies that although more mothers do (re-) join the labour force to benefit from the additional free childcare hours, the income effect continues to dominate, and the beneficiary group cuts back on its working hours in response to the increase in effective wages caused by the lower childcare costs. This change, which gives women more flexibility over their time and provides additional finances, appears to have contributed positively to this group's overall life satisfaction.

Figure 2. Parallel trends (mothers)



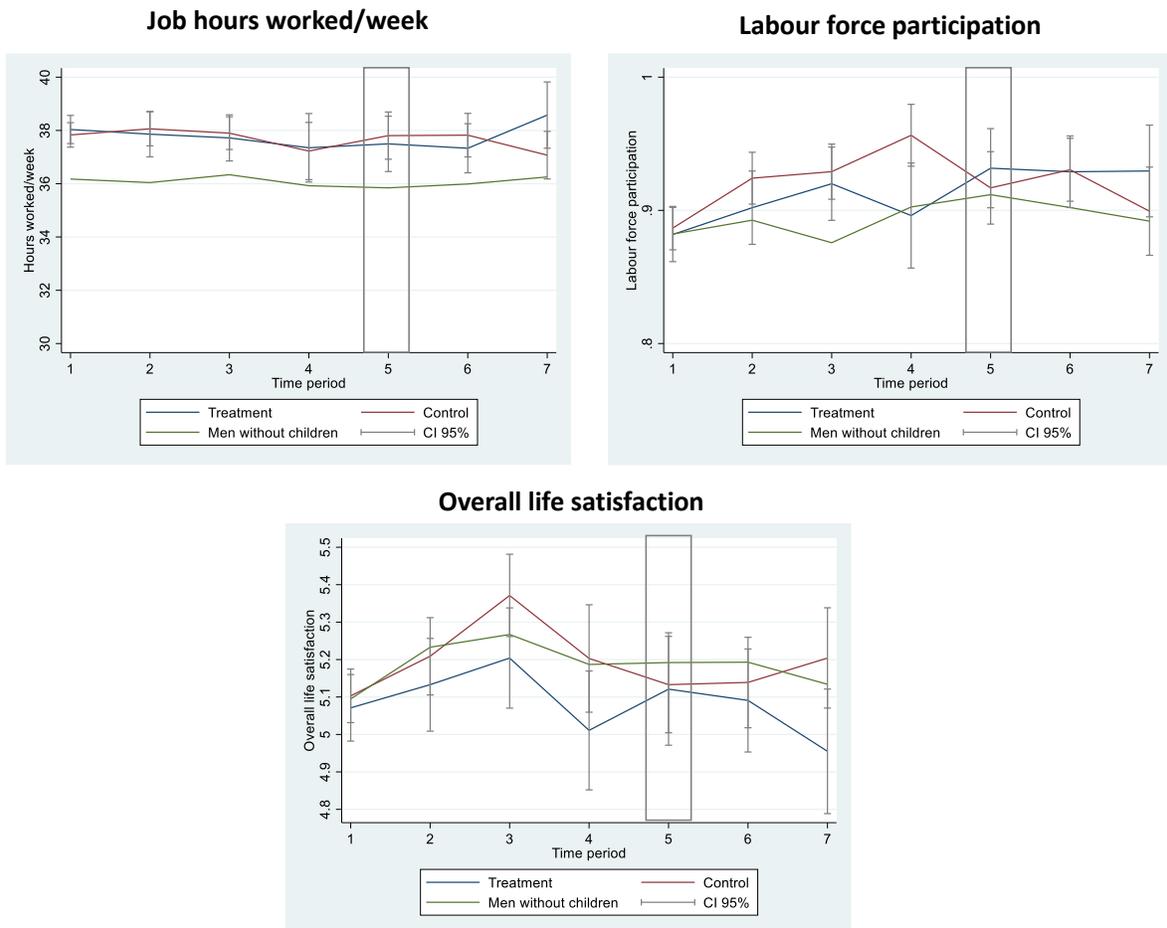
Looking at the number of hours worked per week for fathers, figure 3 shows that the treatment and control groups do not differ significantly over time. While the control group’s weekly working hours slightly fluctuate over time, those of the treatment group continuously decrease from time period one through to four and witness a negligible increase at the onset of the Policy. Both groups, however, work more hours per week compared to their childless counterparts. Based on this analysis, neither the parallel trends assumption holds, nor do we see a significant change in the treatment group’s hours worked per week at the Policy’s incidence. As for the labour force participation, the treatment and control groups can be seen to follow parallel trends until time period four, when their trends diverge and then converge again in time period five. Generally, the labour force participation for men with and without children is quite high, fluctuating around 90% of the sample.

Finally, for overall life satisfaction, both groups follow parallel trends in the time periods preceding the Policy. After the incidence of the Policy, while the control group continues to follow its downward trend, the

treatment group witnesses an increase in overall life satisfaction. Similar to mothers, the treatment group was also found to record the lowest levels of overall life satisfaction across all three groups assessed. Given the lack of policy-induced changes to labour market behaviours amongst fathers, the spike in overall life satisfaction in time period five may be attributed to higher household incomes stemming from the increase in maternal LFP and/or the increase in maternal overall life satisfaction.

Another assumption that needs to be considered for the Difference-in-difference methodology to hold is that parents in the treatment group do not act in anticipation of the reform. We can reasonably assume that this assumption holds since parents who rely on the additional childcare hours to return to or start work cannot do so before the Policy comes into effect.

Figure 3. Parallel trends (fathers)



6.3. Analysis and discussion

Throughout this section, we will present the results of the Difference-in-difference regressions for mothers and fathers separately.

Sections 6.3.1. and 6.3.2. below each, respectively, showcase the results of the regressions for mothers and fathers. For each outcome variable, we have one regression that excludes the treatment variable and another that includes the treatment variable. This was done because the treatment variable is a time varying group dummy determining whether an individual qualifies for the Policy. Given that this treatment variable is partly related to our independent variable of interest ($Policy_{it}$), we risk reaching a misleading conclusion should we have too much overlap between the two variables. As such, we run the regressions including this variable separately to compare how it affects our coefficient of interest.

6.3.1. Effect of additional free childcare hours on mothers

With a focus on mothers, we will start by analysing the Policy's effect on their intensive labour supply margins. As could be seen in table 10, in model one, the Policy was found to have a statistically insignificant positive effect, increasing the number of hours worked/week of those benefiting from the Policy by 1.966 hours on average. Adding the treatment variable in model two makes the Policy's effect statistically significant at a 5% significance level and increases the magnitude of the effect to a 2.974 hour/week increase on average. The direction of these results aligns with the findings of Bettendorf et al. (2015) and Schmitz (2020), who found that an increase in access to cheaper childcare increased the number of hours worked by mothers. However, the magnitude of our estimate is significantly higher, predicting an average increase of 2.974 hours/week, compared to Bettendorf et al.'s (2015) 1.1 hour/week increase and Schmitz's (2020) 1.4 hours/day increase¹⁰. The estimation results also contradict the parallel trends finding (Figure 2) that the Policy's onset led to a drop in the number of hours worked/week by mothers of 3-to-4-year-olds. Based on these results, it could be concluded that mothers of 3-to-4-year-olds benefiting from the 2016 Childcare Act work 2.974 more hours/week on average compared to mothers who do not benefit from this policy. Aside from the intercept, none of the other variables included in models one and two were found to be statistically significant. The R-squared of models one and two are 0.065 and 0.082, respectively. This means that the model only explains 6.5% and 8.2% of the variation in working hours/week, which is quite weak.

¹⁰ The figure estimated by Schmitz (2020) covers the time spent by mothers in paid employment or training.

Looking at the effect of the Policy on the extensive labour supply margin, model three, which excludes the treatment variable, shows that, on average, the Policy had a statistically insignificant positive effect, increasing beneficiary mothers' labour force participation by 1.63 percentage points on average. This value turns negative once the treatment effect is added in model four. In model four, the Policy was found to have a statistically insignificant negative effect, decreasing beneficiary mothers' LFP by 1.19 percentage points on average. Comparing these findings to our parallel trends, only model three adheres to the trends we observed in Figure 2. The explanatory power of models three and four were also found to be quite weak, with R-squared values of 1.3% and 1.8%, respectively.

The discrepancy between our regression estimates in models one, two, and four and the parallel trends may be driven by differences in the sample sizes used for the parallel trend plots and regressions. The smaller sample used to estimate our regression coefficients reduces the statistical power of our model, which may subsequently reduce its ability to detect effects of a smaller size. Furthermore, the parallel trends plot showcases the overall value of the outcome variables at a specific point in time. For instance, for Figure 2, the values shown in time period five are inclusive of the effect of the Policy, as well as the effect of other factors influencing our outcome variable of interest at that time. Meanwhile, the regression model aims to isolate the effect of the Policy on our outcome variable, controlling for other factors such as time trends and time-varying covariates. As such, the direction of the Policy's effect may differ in the parallel trends plot compared to the regression estimates depending on the direction and magnitude of the other factors influencing the outcome variable.

As for our measure of well-being, in models five and six, the Policy was found to have a statistically significant positive effect on the overall life satisfaction of mothers. Excluding the treatment effect, model five shows that the 2016 Childcare Act increases the overall life satisfaction of mothers by 0.469 points on average at a 5% significance level. Adding in the treatment variable in model six increases the magnitude of this effect to 0.726 points and boosts its significance level up to 10%. The Policy's effect in both models aligns with the findings of Schmitz (2020) in terms of magnitude and direction. Schmitz (2020) found that access to childcare at a reduced cost increased maternal well-being by 0.518 points, which is in close proximity to our estimates in models five and six. The direction of the Policy's effect in both models also aligns with the parallel trends plot analysis (Figure 2). Based on these results, it could be concluded that mothers of 3-to-4-year-olds benefiting from the 2016 Childcare Act experience a higher overall life satisfaction compared to mothers who do not benefit from this policy. Furthermore, being in time period two, after the Policy's implementation, was found to have a statistically significant negative effect on overall life satisfaction in both models at a 1% significance level. As such, mothers

in time period two reported overall life satisfaction scores that were, on average, lower than that of the same mothers in time period one by 0.490 points in model five and 0.505 points in model six. This reduction may be driven by the overall life satisfaction scores of mothers who do not benefit from access to more free childcare hours in time period two. In line with expectations, a lower general health score also has a statistically significant negative effect on maternal well-being at a 5% significance level. On average, a one-unit increase in general health, which signals a deterioration in the self-perception of health, led to a 0.294- and 0.308-point reduction in mothers' overall life satisfaction in models five and six. The treatment variable also had a statistically significant negative effect at a 1% significance level. This means that mothers of 3-to-4-year-olds had an overall life satisfaction score lower than mothers of 0-to-2-year-olds by 0.564 points on average. This finding aligns with the parallel trends plot observations for the overall life satisfaction of mothers in figure 2. It is also worth noting that, similar to other models in table 10, the explanatory power of models five and six are quite weak, with R-squared values of 5.9% and 7.8%, respectively.

In conclusion, the Act's increase of free childcare hours from 15 hours/week to 30 hours/week had a statistically significant positive effect on the intensive labour supply margin and the subjective well-being of mothers of 3-to-4-year-olds. As theorised in the labour supply model with rational choice assumptions, the substitution effect dominates the income effect, and mothers expand their intensive labour supply margin once they have access to a greater number of cheaper childcare hours. As such, our results confirm hypothesis number one that *"an increase in the number of free childcare hours will lead to an increase in the intensive labour supply margin of mothers"*. However, our results do not provide support for hypothesis three that *"an increase in the number of free childcare hours will lead to an increase in the extensive labour supply margin of mothers"*. This may be due to a number of reasons. First, the Act may not have affected mothers' extensive labour supply margin. Secondly, other factors may have affected mothers' extensive margins that were not accounted for in the model. Finally, due to the limited sample size, the statistical power of our analysis may have been too weak to detect the effect of the Policy on mothers' labour force participation.

As for the well-being component of our study, the results also align with our theoretical framework and support our hypothesis that *"an increase in the number of free childcare hours will increase maternal subjective well-being"*. These results may be driven by the increase in income caused by the expansion of mothers' intensive labour supply margins and the alleviation of parental psychological strains stemming from financial stress, Role Overload, caretaking hassles, and reduced self-efficacy through the provision of more affordable childcare.

Table 10. Effects of an increase in free childcare hours on mothers

	Hours worked/week		Labour force participation		Overall life satisfaction	
	(1) Without treatment	(2) With treatment	(3) Without treatment	(4) With treatment	(5) Without treatment	(6) With treatment
Policy	1.966 (1.016) <i>0.054</i>	2.974* (1.187) <i>0.013</i>	0.0163 (0.0355) <i>0.646</i>	-0.0119 (0.0389) <i>0.761</i>	0.469* (0.205) <i>0.023</i>	0.726** (0.234) <i>0.002</i>
Number of children	6.270 (4.379) <i>0.154</i>	6.077 (4.384) <i>0.167</i>	-0.0576 (0.0537) <i>0.285</i>	-0.0524 (0.0544) <i>0.336</i>	0.103 (0.196) <i>0.600</i>	0.0561 (0.196) <i>0.775</i>
General health	-0.793 (0.673) <i>0.240</i>	-0.880 (0.668) <i>0.189</i>	-0.0249 (0.0282) <i>0.378</i>	-0.0233 (0.0285) <i>0.415</i>	-0.294* (0.123) <i>0.018</i>	-0.308* (0.123) <i>0.013</i>
Time period 2 (Sep 17 – Sep 18)	-0.402 (0.818) <i>0.623</i>	-0.419 (0.816) <i>0.608</i>	0.0148 (0.0242) <i>0.540</i>	0.0165 (0.0242) <i>0.496</i>	-0.490** (0.164) <i>0.003</i>	-0.505** (0.164) <i>0.002</i>
Treatment		-2.282 (1.204) <i>0.060</i>		0.0619 (0.0538) <i>0.251</i>		-0.564** (0.209) <i>0.007</i>
Constant	18.07* (8.296) <i>0.031</i>	19.42* (8.387) <i>0.022</i>	0.768*** (0.138) <i>0.000</i>	0.733*** (0.143) <i>0.000</i>	5.936*** (0.463) <i>0.000</i>	6.254*** (0.478) <i>0.000</i>
<i>N</i>	329	329	558	558	554	554
adj. <i>R</i> ²	0.065	0.082	0.013	0.018	0.059	0.078

Standard errors in parentheses and p-values in *italic*

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

6.3.2. Effect of additional free childcare hours on fathers

As for fathers, only the regressions assessing the effect of the 2016 Childcare Act on the intensive labour supply margins and subjective well-being were modelled. The regression examining the effect of the Policy on paternal extensive labour supply margins was not run because labour force participation did not vary sufficiently amongst fathers across the different time periods assessed. This limited our sample size to 14 observations, which is insufficient to make valid statistical inferences.

Looking at fathers' intensive labour supply margins, models one and two in table 11 show that the Policy had a statistically insignificant negative effect on fathers' hours worked/week. Assessing the magnitude of this

effect, model one, which excludes the treatment variable, estimates that fathers that benefit from the Act reduce their hours worked/week by 0.816 hours on average. Meanwhile, model two, which includes the treatment variable, estimates that fathers benefiting from the Act reduce their hours worked/week by 1.365 hours on average. These findings do not align with the parallel trend plots (Figure 3), which show that at the onset of the Policy, fathers of 3-to-4-year-olds saw a negligible increase in hours worked but continued to track the control group. Aside from the intercepts, none of the other variables included in either model were found to be statistically significant. Furthermore, the explanatory powers of models one and two were found to be quite weak, with R-squared values of 2.0% and 2.8%, respectively.

As for our measure of well-being, in models three and four, the Policy was found to have a statistically insignificant positive effect on the overall life satisfaction of fathers. Excluding the treatment variable led to the estimation of a policy effect with greater magnitude, increasing overall life satisfaction by 0.296 points on average. Meanwhile, including the treatment variable in model four reduced the magnitude of the Policy's effect to a 0.192 point increase on average, which more closely resembles the change in trends witnessed in time period five in figure 3. Similar to mothers, being in time period two, after the Policy's implementation, was found to have a statistically significant negative effect at a 5% significance level on the overall life satisfaction of fathers in both models. Fathers in time period two reported overall life satisfaction scores that were, on average, lower than that of the same fathers in time period one by 0.443 points in model five and 0.436 points in model six. The R-squared values of models three and four were 0.068 and 0.070, respectively. As such, model three only explained 6.8% and model four 7.0% of the variation in overall life satisfaction.

In conclusion, given that treatment and control fathers did not follow parallel trends in the time preceding the Policy for number of hours worked/week, nor were there sharp changes in the trend following the Policy's implementation, finding insignificant values for their intensive labour supply margins aligned with our expectations. As such, our results provide support for hypothesis two that *"an increase in the number of free childcare hours will have little to no effect on the intensive labour supply margin of fathers."* The lack of variation in paternal labour force participation across time within our dataset hindered our ability to conduct a valid regression analysis. As such, we were not able to put hypothesis four, which relates to the extensive labour supply margin of fathers, to the test. Meanwhile, for overall life satisfaction, despite fulfilling the parallel trends assumption and exhibiting diverging trends following the Policy's implementation, the regression did not provide evidence in support of hypothesis six that *"an increase in the number of free childcare hours will increase paternal*

subjective well-being". This result may be driven by factors similar to those outlined in section 6.3.1 to elaborate on the insignificance of hypothesis three.

Table 11. Effects of an increase in free childcare hours on fathers

	Hours worked/week		Overall life satisfaction	
	(1) Without treatment	(2) With treatment	(3) Without treatment	(4) With treatment
Policy	-0.816 (0.638) <i>0.203</i>	-1.365 (0.850) <i>0.110</i>	0.296 (0.242) <i>0.224</i>	0.192 (0.264) <i>0.468</i>
Number of children	0.661 (1.489) <i>0.658</i>	0.754 (1.485) <i>0.613</i>	0.106 (0.362) <i>0.769</i>	0.122 (0.367) <i>0.739</i>
General health	-0.982 (0.650) <i>0.133</i>	-1.000 (0.663) <i>0.133</i>	-0.307 (0.208) <i>0.142</i>	-0.308 (0.207) <i>0.139</i>
Time period 2 (Sep 17 – Sep 18)	0.397 (0.422) <i>0.348</i>	0.438 (0.410) <i>0.286</i>	-0.443* (0.191) <i>0.022</i>	-0.436* (0.192) <i>0.024</i>
Treatment		1.307 (1.235) <i>0.291</i>		0.244 (0.299) <i>0.416</i>
Constant	39.70*** (2.370) <i>0.000</i>	39.17*** (2.541) <i>0.000</i>	5.897*** (0.836) <i>0.000</i>	5.796*** (0.861) <i>0.000</i>
<i>N</i>	325	325	363	363
adj. <i>R</i> ²	0.020	0.028	0.068	0.070

Standard errors in parentheses and p-values in *italic*

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

7. Conclusion

In light of the recent rise in global living costs, providing subsidised childcare to parents has become paramount. Within this context, this study sets out to examine how the UK's 2016 Childcare Act, an act that expanded the number of free childcare hours available to parents of 3-to-4-year-olds from 15 hours/week to 30 hours/week for 38 weeks a year, affects the labour market behaviour and subjective well-being of parents. Drawing on the UK's Household Longitudinal Study, we apply a Difference-in-difference method with fixed effects. This method compares the outcomes of parents of 3-to-4-year-olds (the treatment group) with the outcomes of 0-to-2-year-olds (the control group) to estimate the causal effect of the Policy and answer the following research question **“How does an increase in free childcare hours affect paternal and maternal extensive and intensive labour supply margins and subjective well-being?”**.

Based on the literature review and theoretical framework, the expectation was that the Act's expansion of free childcare hours would increase mothers' extensive and intensive labour supply margins and have little to no effect on the labour supply margins of fathers. The labour supply model with rational choice assumptions provided the foundation for the labour market-related expectations. According to this model, parents who were already employed prior to the onset of the Policy were predicted to increase their intensive labour supply margins due to the dominance of the substitution effect over the income effect. Meanwhile, unemployed parents were expected to expand their extensive labour supply margins to avoid the higher opportunity costs associated with forgoing paid employment and free childcare. It was also anticipated that beneficiary parents would (re-)join the labour force since the Act reduces their reservation wages, which increases the likelihood of them being met by market wages. These effects were expected to be smaller for fathers compared to mothers due to their lower labour supply elasticity and higher labour market attachment. The regression results confirmed our expectations regarding the intensive labour supply margins of mothers and found that the Policy increased the number of hours worked per week by mothers of 3-to-4-year-olds by approximately three hours. The null results uncovered in the statistical analysis also provided support for the expectation that the Policy will have little to no effect on intensive labour supply of fathers. However, the results of our analysis did not provide evidence in support of the hypotheses related to the extensive labour supply margins of both mothers and fathers.

As for the well-being component of our study, our theoretical framework outlined that more free childcare hours would help alleviate financial stress and boost the overall level of utility experienced by parents. This is achieved by reducing parents' childcare costs and allowing them to (re-)join the labour force and/or increase their working hours, subsequently expanding their household budgets. Furthermore, additional free

childcare gives parents greater control over their time and boosts their sense of self-efficacy. As such, we expected that the UK's 2016 Childcare Act would improve the well-being of mothers and fathers. For mothers, these expectations were found to be correct. Mothers of 3-to-4-year-olds benefitting from the Act were found to have experienced an increase in their overall life satisfaction scores compared to mothers who did not benefit from the Policy. This finding, along with the finding that mothers benefitting from the Policy increase their intensive labour supply margins, corroborates the well-being mechanisms outlined above. However, no evidence was found in support of similar expectations for fathers.

Based on these results, to answer our research question, increasing free childcare hours available to parents increases mothers' intensive labour supply margins and subjective well-being, and has little to no effect on fathers' intensive labour supply margins. However, no evidence was found in support of policy-driven changes to the extensive labour supply margins of both parents and the subjective well-being of fathers.

7.1. Limitations and future research

This research contributed to the expansion of scientific literature regarding the effect of an increase in free childcare hours on the intensive labour supply margins and subjective well-being of mothers. Furthermore, this research also expanded upon Paull and La Valle's (2018) evaluation of the UK's 2016 Childcare Act by using statistical methods to assess the Act's impact on the labour market behaviours and well-being of parents. Nonetheless, this study still has some limitations that should be discussed. First, this research only assesses the Policy's effect in the timeframe that immediately follows its implementation. Therefore, based on these findings, it cannot be concluded that these short-term findings would continue to hold in the longer term. In the short-term, not all parents are aware of the Policy, how to apply for it, nor if they are eligible for it (Paull & La Valle, 2018). As such, in the long-term, as awareness of this benefit increases, its uptake may grow, and its effects on parental labour market behaviour and well-being may change. Second, the sample used to conduct this study was quite limited in size. This somewhat reduces the validity of our results since it weakens the statistical power of our regression models and leaves our results more susceptible to variability within our sample. This limited sample size also restricted our ability to test for heterogeneous effects amongst the different groups of parents. For instance, various studies in our literature have shown how, in response to reduced childcare costs, single and low-income parents are more likely to increase their labour market activity and report experiencing higher levels of well-being compared to other groups (Ahn, 2012; Berger & Black, 1992; Bettendorf et al., 2015; Brewer et al., 2022, 2022; Brodeur & Connolly, 2013). Finally, the generalisability of this study's findings may be limited since

the research question was addressed by examining the effects of a UK-specific policy, which may restrict the applicability of the results to countries with different socio-economic contexts and social welfare systems.

Based on these limitations, it is recommended that future research focuses on assessing how the effect of this policy changes in the long-term after 3-4 years of implementation. More importantly, future studies should be carried out with larger sample sizes to improve the estimates' efficiency and accuracy and allow for the examination of demographic heterogeneous effects. Furthermore, since this research excludes self-employed persons, exploring how an increase in free childcare hours would affect their labour market behaviour and well-being would be an interesting avenue to explore.

7.2. Practical implications

Based on the results of this research, it could be seen how a policy increasing the number of free childcare hours increases both the intensive labour supply margins and the well-being of mothers, and has little to no effect on the intensive labour supply margins of fathers. Although our results do not find evidence in support of the expected effect of free childcare on parents' extensive labour supply margins and paternal well-being, the relevance of our findings remains unaffected. This is because mothers are the group whose labour market activity and well-being are most affected by childcare and its costs (Musick et al., 2016; PwC, 2023), and this study finds evidence in support of this policy's positive effect on both factors. As such, it can be recommended that governments looking to boost the working hours and well-being of mothers adopt similar policies focusing on increasing this group's access to free childcare hours. However, given the issues of generalisability highlighted above, applying a similar policy to different country contexts should be done with caution.

8. Bibliography

- Ahn, H. (2012). Child care subsidy, child care costs, and employment of low-income single mothers. *Children and Youth Services Review, 34*(2), 379–387.
- Angrist J. D. & Pischke, J.-S.. (2015). Differences-in-differences. *Mastering metrics: the path from cause to effect* (pp.178-208). Princeton University Press.
- Arts, W. A., & Gelissen, J. P. T. M. (2002). Three worlds of welfare capitalism or more? A state-of-the-art report. *Journal of European Social Policy, 12*(2), 137–158.
- Baker, M., Gruber, J., & Milligan, K. (2008). Universal child care, maternal labor supply, and family well-being. *Journal of Political Economy, 116*(4), 709–745.
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Prentice-Hall.
- Berger, M. C., & Black, D. A. (1992). Child Care Subsidies, Quality of Care, and the Labor Supply of Low-Income, Single Mothers. *The Review of Economics and Statistics, 74*(4), 635–642. JSTOR. <https://doi.org/10.2307/2109377>
- Bertrand, M. (2013). Career, family, and the well-being of college-educated women. *The American Economic Review, 103*(3), 244–250.
- Bettendorf, L. J. H., Jongen, E. L. W., & Muller, P. (2015). Childcare subsidies and labour supply—Evidence from a large Dutch reform. *Labour Economics, 36*, 112–123. <https://doi.org/10.1016/j.labeco.2015.03.007>
- Blanchflower, D. G., & Oswald, A. J. (2004). Well-being over time in Britain and the USA. *Journal of Public Economics, 88*(7), 1359–1386. [https://doi.org/10.1016/S0047-2727\(02\)00168-8](https://doi.org/10.1016/S0047-2727(02)00168-8)
- Bonoli, G. (1997). Classifying Welfare States: A Two-dimension Approach. *Journal of Social Policy, 26*(3), 351–372.
- Borjas, G.J. (2016). Labour Supply. *Labor Economics*. (7th ed., pp.21-79). McGraw Hill Education
- Boudon, R. (2003). Beyond Rational Choice Theory. *Annual Review of Sociology, 29*(1), 1–21. <https://doi.org/10.1146/annurev.soc.29.010202.100213>
- Brewer, M., Cattan, S., & Crawford, C. (2014). State support for early childhood education and care in England. The Green Budget 2014. The Institute of Fiscal Statistics. https://ifs.org.uk/sites/default/files/output_url_files/gb2014_ch8.pdf
- Brewer, M., Cattan, S., Crawford, C., & Rabe, B. (2022). Does more free childcare help parents work more? *Labour Economics, 74*, 102100. <https://doi.org/10.1016/j.labeco.2021.102100>

- Brodeur, A., & Connolly, M. (2013). Do higher child care subsidies improve parental well-being? Evidence from Quebec's family policies. *Journal of Economic Behavior & Organization*, 93, 1–16. <https://doi.org/10.1016/j.jebo.2013.07.001>
- Clark, A. E., Frijters, P., & Shields, M. A. (2008). Relative Income, Happiness, and Utility: An Explanation for the Easterlin Paradox and Other Puzzles. *Journal of Economic Literature*, 46(1), 95–144.
- Connelly, R. (1992). The Effect of Child Care Costs on Married Women's Labor Force Participation. *The Review of Economics and Statistics*, 74(1), 83–90. JSTOR. <https://doi.org/10.2307/2109545>
- Crawford, A. (2006). The Impact of Child Care Subsidies on Single Mothers' Work Effort. *The Review of Policy Research*, 23(3), 699–711.
- Cutrona, C. E., & Troutman, B. R. (1986). Social Support, Infant Temperament, and Parenting Self-Efficacy: A Mediation Model of Postpartum Depression. *Child Development*, 57(6), 1507–1518.
- Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The Satisfaction with Life Scale. *Journal of Personality Assessment*, 49(1), 71–75. https://doi.org/10.1207/s15327752jpa4901_13
- Dolan, P., & White, M. P. (2007). How Can Measures of Subjective Well-Being Be Used to Inform Public Policy? *Perspectives on Psychological Science*, 2(1), 71–85.
- Felfe, C., Lechner, M., & Thiemann, P. (2016). After-school care and parents' labor supply. *Labour Economics*, 42(October), 64–75.
- Ferrera, M. (1996). The 'Southern Model' of Welfare in Social Europe. *Journal of European Social Policy*, 6(1), 17–37.
- Ferrer-i-Carbonell, A. (2005). Income and well-being: An empirical analysis of the comparison income effect. *Journal of Public Economics*, 89(5), 997–1019. <https://doi.org/10.1016/j.jpubeco.2004.06.003>
- Harari, D., Bolton, P., Francis-Devine, B., & Keep, M. (2023). *Rising Cost of Living in the UK*. <https://researchbriefings.files.parliament.uk/documents/CBP-9428/CBP-9428.pdf>
- Herbst, C. M., & Tekin, E. (2014). Childcare subsidies, maternal health, and child-parent interactions: evidence from three nationally representative datasets. *Health Economics*, 23(8), 894–916.
- Imbens, G. W., & Wooldridge, J. M. (2009). Recent Developments in the Econometrics of Program Evaluation. *Journal of Economic Literature*, 47(1), 5–86.
- International Labour Organization. N.d. *Labour Force Statistics (LFS, STLFS, RURBAN databases)*. <https://ilostat.ilo.org/resources/concepts-and-definitions/description-labour-force-statistics/>
- International Monetary Fund. (2022). *World Economic Outlook: Countering the Cost-of-Living Crisis*. <https://www.imf.org/en/Publications/WEO/Issues/2022/10/11/world-economic-outlook-october-2022>

- Jarrett, T. (2017). *Children: Introduction of 30 hours of free childcare in September 2017 (England)*. <https://dera.ioe.ac.uk/id/eprint/29990/1/CBP-7581-1.pdf>
- Male, T., & Palaiologou, I. (2012). *Historical Developments in Policy for Early Childhood Education and Care* (pp. 3–23).
- McBride, M. (2001). Relative-income effects on subjective well-being in the cross-section. *Journal of Economic Behavior & Organization*, 45(3), 251–278.
- McConnell, C. R., Brue, S. L., & Flynn, S.M. (2018). *Microeconomics: principles, problems, and policies* (21st ed., pp. 139-157). McGraw-Hill.
- McLanahan, S., & Adams, J. (1987). Parenthood and Psychological Well-Being. *Annual Review of Sociology*, 13(1), 237–257.
- Musick, K., Meier, A., & Flood, S. (2016). How Parents Fare: Mothers' and Fathers' Subjective Well-Being in Time with Children. *American Sociological Review*, 81(5), 1069–1095.
- National Audit Office. (2016). *Entitlement to free early education and childcare*. UK Department of Education. <https://www.nao.org.uk/wp-content/uploads/2016/03/Entitlement-to-free-early-education-and-childcare-Summary.pdf>
- OECD. (2021). *Starting Strong VI Supporting Meaningful Interactions in Early Childhood Education and Care*.
- OECD. (2007). *Babies and Bosses: Reconciling Work and Family Life – A Synthesis of Findings for OECD Countries*.
- Östberg, M., & Hagekull, B. (2000). A Structural Modelling Approach to the Understanding of Parenting Stress. *Journal of Clinical Child and Adolescent Psychology*, 29(4), 615–625.
- Ozer, E. M. (1995). The Impact of Childcare Responsibility and Self-Efficacy on the Psychological Health of Professional Working Mothers. *Psychology of Women Quarterly*, 19(3), 315–335. <https://doi.org/10.1111/j.1471-6402.1995.tb00078.x>
- Ozer, E. M., & Bandura, A. (1990). Mechanisms Governing Empowerment Effects: A Self-Efficacy Analysis. *Journal of Personality and Social Psychology*, 58(3), 472–486.
- Paull, G., & La Valle, I. (2018). *Evaluation of the first year of the national rollout of 30 hours free childcare*. Department for Education. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/740168/Evaluation_of_national_rollout_of_30_hours_free-childcare.pdf
- PwC. (2023). Section 4: the UK's affordability crisis. *Women in Work 2023*. <https://www.pwc.co.uk/economic-services/WIWI/pwc-women-in-work-index-2023.pdf>

- Queen's Printer of Acts of Parliament. (N.d.). *Nursery Education and Grant-Maintained Schools Act 1996*.
<https://www.legislation.gov.uk/ukpga/1996/50/enacted>
- Rosenfield, S. (1989). The Effects of Women's Employment: Personal Control and Sex Differences in Mental Health. *Journal of Health and Social Behavior*, 30(1), 77–91. JSTOR. <https://doi.org/10.2307/2136914>
- Rutter, J. (2016). 2016 Childcare Survey 2016. Family and Childcare Trust.
<https://core.ac.uk/download/pdf/46172863.pdf>
- Schmitz, S. (2020). The Impact of Publicly Funded Childcare on Parental Well-Being: Evidence from Cut-Off Rules. *European Journal of Population*, 36(2), 171–196.
- Sieber, S. D. (1974). Toward a Theory of Role Accumulation. *American Sociological Review*, 39(4), 567–578.
- Stanford Encyclopaedia of Philosophy. (2020). *Decision Theory*. <https://plato.stanford.edu/entries/decision-theory/>
- Stiglitz, J. E., Fitoussi, J.-P., & Durand, M. (2018). *Beyond GDP*. <https://doi.org/10.1787/9789264307292-en>
- UK Data Service. (N.d.) *Understanding Society: Waves 1-12, 2009-2021 and Harmonised BHPS: Waves 1-18, 1991-2009*. <https://beta.ukdataservice.ac.uk/datacatalogue/studies/study?id=6614>
- UK Government Digital Service. (2015). *Help paying for childcare*. <https://www.gov.uk/help-with-childcare-costs/free-childcare-2-year-olds>
- UK Government (n.d.-a). *30 hours free childcare*. <https://www.gov.uk/30-hours-free-childcare>
- UK Government. (n.d.-b). *National Minimum Wage and National Living Wage rates*.
<https://www.gov.uk/national-minimum-wage-rates>
- UK Government. (n.d.-c). *Help Paying for Your Childcare*. <https://www.childcarechoices.gov.uk/>
- Understanding Society. (n.d.). *Survey timeline*.
<https://www.understandingsociety.ac.uk/documentation/mainstage/survey-timeline>
- Viitanen, T. K. (2005). Cost of Childcare and Female Employment in the UK. *Labour (Rome, Italy)*, 19(s1), 149–170.
- Wooldridge, J. M. (2020). Advanced Panel Data Methods. *Introductory Econometrics. A Modern Approach*. (7th ed., pp. 462-482). Cengage Learning.
- Wooldridge, J. M. (2016). Pooled Cross Sections across Time: Simple Panel Data Methods. *Introductory Econometrics. A Modern Approach*. (6th ed., pp. 402-436). Cengage Learning.

Appendix A: VIF results

Table 12. VIF test: maternal regressions

	Hours worked/week		Labour force participation		Overall life satisfaction	
	(1) Without treatment	(2) With treatment	(3) Without treatment	(4) With treatment	(5) Without treatment	(6) With treatment
Policy	2.55	5.21	2.33	4.78	2.34	4.80
Number of children	3.84	4.16	3.75	3.99	3.76	4.00
General health	4.19	4.39	4.07	4.26	4.09	4.29
Time period 2 (Sep 17 – Sep 18)	3.52	3.97	3.22	3.59	3.24	3.61
Treatment		4.23		3.88		3.89
Mean VIF	3.52	4.39	3.34	4.10	3.36	4.12

Table 13. VIF test: paternal regressions

	Hours worked/week		Overall life satisfaction	
	(1) Without treatment	(2) With treatment	(5) Without treatment	(6) With treatment
Policy	2.01	4.18	1.99	4.17
Number of children	3.73	3.98	3.68	3.82
General health	3.94	4.16	4.06	4.37
Time period 2 (Sep 17 – Sep 18)	2.90	3.30	2.85	3.21
Treatment		3.70		3.65
Mean VIF	3.15	3.86	3.15	3.85