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Home-based child-care subsidies

and the effect on women's employment

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Home-based child-care subsidies and women's employment

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Abstract

This study investigates the impact of home-based child care (HBCC) subsidies on employment among women in Denmark. Home-Based Child Care Subsidies (HBCCS) form a part of the Danish welfare system, providing financial support to parents who choose to care for their children at home rather than utilizing formal daycare services. These subsidies are administered at the municipal level, resulting in variation in their availability and magnitude across different municipalities. This paper utilizes micro-data from Danmarks Statistik, provided by the think tank DEA, to explore how these variations influence women's decisions to participate in the labor market.

Employing a fixed effects Difference-in-Differences (DiD) linear probability model, this study aims to isolate the effects of HBCCS on employment among Danish women whose first child is between 0 and 5 years old in 2019-2021. Our findings suggest that HBCCS has a significant albeit modest effect on the employment of women. The effect is highest the year the child turns 3 years old, where the subsidy reduces the likelihood of employment by 0.09 pct. points per 1,000 DKK a month of available subsidies. However, the effects are shown to be nonlinear wrt. the subsidy level, as the subsidy has no significant effect when below 100,000 DKK a year. When the subsidy is increased 1,000 DKK per month it decreases the probability of employment by a maximum of 0.4%-points when the subsidy is above 100,000 DKK per year. We also find that the subsidy has heterogenous effects across various social and economics factors and impacts the least educated mothers the most.

The analysis is contextualized within the broader framework of Danish family policy. This study contributes to understanding the role of local welfare provisions in shaping labor market dynamics and offers insights into the effectiveness of targeted subsidies in influencing economic behavior. By examining the causal relationship between HBCCS and women's employment status, this research provides valuable evidence for policymakers regarding the design and implementation of family support mechanisms within the welfare state.

Distribution of work:
Joint: 1, 10
Albert Lenz Bærentsen: 3, 5.1, 5.3, 5.5, 5.7, 6.2, 7.1, 8.1, 8.3, 9
Lærke Dyrby Kloch: 2, 4, 5.2, 5.4, 5.6, 6.1, 6.3, 7.2, 8.2

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1 Introduction

The provision of Home-Based Child Care Subsidies (HBCCS) in Denmark raises essential questions about their influence on labor market dynamics, particularly for women. As dissatisfaction with the quality of institutional daycare grows, more parents are considering home-based care as a viable alternative (BUPL 2023), supported by HBCCS . This shift is influenced by the increasing availability of these subsidies across various municipalities. A key concern is the consequences of encouraging parents to leave the workplace — but does this actually lead to decreased employment, and if so, how much?

This study directly addresses these concerns by quantitatively examining whether adjustments in HBCCS levels affect women's employment. Utilizing a Difference-in-Differences (DiD) approach with fixed effects, this paper explores the employment patterns of women for three years before becoming mothers and during 2019-2021 when their first child is of subsidy-eligible age. We analyze how employment differences emerge for women with access to subsidies compared to those without, applying a Linear Probability Model (LPM) adjusted for changes in educational status, marital status and economic cycles. This model also incorporates the opportunity cost of not having to pay for day care. The subsidy does not appear to have significant effects when below 100,000 DKK a year, but does decrease the probability of employment by 0.4 %-point in the year the child turns 2 per 1,000 DKK a month increase. Thus when we examine the heterogenous effects, we focus our analysis on the highly treated individuals.
A particular focus is placed on the heterogeneous effects across educational levels, anticipating the largest impact on individuals with low level of education, serving as a proxy for income potential. We find that unskilled mothers, who are facing the lowest opportunity costs, experience a more negative effect from the subsidy on employment in the years the child turns 1 and 2. We find that an increase of a 1,000 DKK a month results in a 0.35 and 0.18%-point decrease in employment in the year the child turns 1 for low and highly educated mothers, respectively. We also examine the possible heterogeneous effects of the secondary parent's income level. Here we find that while the subsidy has no significant effects on single mothers, having a secondary parent in the household makes women's employment sensitive to the subsidy. However the income level itself does not significantly impact the sensitivity.

The complexities of these results include potential issues with the normality of residuals and the limitations of the LPM, which might ideally be addressed through a non-linear probability model. However, such models complicate the inclusion of fixed effects and risk losing data on continuously employed individuals, skewing the results. We estimate a probit-model as a robustness check for our model, and find the same general qualitative results.

Our research contributes to the ongoing discussion about the role of child care subsidies in labor market participation, providing policymakers with quantitative evidence to guide subsidy adjustments. This is crucial for balancing family support with broader economic implications, ensuring that changes in HBCCS effectively achieve intended policy outcomes without unintended consequences.

2 Literature Review

The existing literature on Home-Based Child Care Subsidies (HBCCS) and their impact on maternal employment status presents a comprehensive view of the multifaceted effects of such policies. This review examines key studies that inform our understanding of how HBCCS influence labor market dynamics, focusing primarily on findings relevant to the Danish context and similar welfare states.

Österbacka et al. (2022): Home Care Allowance and Maternal Employment in Finland

(Österbacka and Räsänen 2022) provide a significant contribution to the literature by exploring the effects of child home care (cash-for-care) and private daycare allowances on mothers' return to employment post-childbirth. Using a Difference-in-Differences (DiD) approach with municipal-level variation in subsidies, the authors found that higher home care allowances (HCA) significantly prolong the period

mothers spend at home, delaying their return to the labor market. Specifically, a 100-euro increase in HCA extended home care by 2-3 months on average. This study highlights the complex interplay between family policies, labor market attachment, and the age of the child, demonstrating that higher HCA can disincentivize maternal employment, especially for those with weaker labor market attachment and lower pre-birth earnings potential. The methodology and findings of this paper have significantly influenced the present study, which also utilizes discrepancies at the municipal level to analyze the impact of HBCCS on labor market outcomes.

Child-Care Subsidies and Female Labor Supply

Several studies have examined how child-care subsidies, aimed at reducing the cost of external child-care, impact female labor supply. (Apps and Rees 2004) argue that public support for child care outside the family generally increases female labor force participation by alleviating some of the financial burdens associated with child-rearing. This is consistent with findings from (Kangas and Rostgaard 2007), who show that Nordic welfare policies supporting external childcare are instrumental in sustaining high levels of female employment. Similarly, (Ulker and Guven 2011) and (Olivetti and Petrongolo 2017) provide evidence that subsidies for external childcare services are crucial in promoting gender equality in the labor market by enabling women to balance work and family responsibilities more effectively.

Heterogeneous and Dynamic Effects

The literature also acknowledges the heterogeneous effects of childcare policies. For example, (Burgess et al. 2008) propose a theoretical framework suggesting that the impact of maternity leave rights and childcare subsidies varies significantly depending on the mother's income level and labor market attachment. Higher subsidies can lead to extended home care periods for mothers with lower earnings potential, while those with higher incomes may return to work sooner. This is echoed in the findings of (Kosonen 2014), who observed that higher home care subsidies reduce labor force participation among Finnish mothers, particularly those with less stable employment histories.

International Comparisons and Policy Implications

The effects observed in Finland are mirrored in other Nordic countries and beyond. (Rønsen and Sundström 2002) and (Naz 2004) found that home care allowances in Norway similarly reduced maternal employment. (Kornstad and Thoresen 2007) support these findings, indicating that increased relative prices for day care (due to home care allowances) lead to reduced employment among mothers. In contrast, policies that subsidize external childcare (like private daycare allowances) tend to have less impact on employment if the out-of-pocket costs for private care are still higher than public alternatives.

Implications for Danish HBCCS The insights from these studies are particularly relevant for the Danish context, where HBCCS are increasingly offered as an alternative to institutional daycare. The potential for such subsidies to disincentivize labor force participation, especially among lower-income and less-educated mothers, is a critical concern. Our research aims to build on this body of knowledge by providing empirical evidence on the impact of HBCCS on labor market outcomes in Denmark, with a specific focus on the heterogeneous effects across different educational and income groups.

In conclusion, the literature underscores the importance of considering both the direct financial effects of childcare subsidies and the broader socio-economic factors that influence maternal employment decisions.

Contribution of Our Work

Our study contributes to the existing literature by providing a detailed quantitative analysis of the impact of HBCCS on women's employment in Denmark. By employing a Difference-in-Differences approach with fixed effects, we account for time-invariant unobserved heterogeneity and control for various demographic and economic factors. Our focus on the heterogeneous effects of HBCCS across educational levels adds depth to the understanding of how these subsidies affect different segments of the population. While our analysis utilizes a significant amount of data spanning more than a decade, it cannot fully

capture the long-term effects of HBCCS. Therefore, we recognize that our findings may not comprehensively address all policy concerns, and we hope they will be considered as part of a broader discussion on balancing family support with economic objectives.

3 Economic Theory

The analysis of Home-Based Child Care Subsidies (HBCCS) and their impact on women's employment is deeply rooted in classical labor supply theory and the theory of household production. According to labor supply theory, individuals make employment decisions by comparing the wage rate to the opportunity cost of not working, which includes the value of leisure and time dedicated to home production. Within the framework of HBCCS, these subsidies effectively lower the opportunity cost of home-based childcare, potentially shifting the labor-leisure balance towards increased non-participation in the labor force.

However, the assumption that increasing HBCCS rates will directly result in greater uptake of home-based child care and consequently reduced labor force participation might not be straightforward in the Danish context. The "business case" of a household choosing HBCC weighs on multiple factors, such as the pros of self-determination in terms of child-raising, less work-related stress, and potential financial subsidies from the state, versus the cons of a lower income. These negative economic factors may outweigh the possible benefits of HBCC, even when enhanced by subsidies, where the rates are at most, but rarely even half of, the unemployment insurance rate (dagpengesatsen) (Undervisningsministeriet 2024a).

3.1 Expected Results

Given the theoretical framework and the previous literature reviewed, the study anticipates several key results from the introduction or increase of HBCCS in Denmark:

- **Decrease in Employment:** Consistent with labor supply theory, women with access to HBCCS are expected to demonstrate a lower rate of employment, due to the lower opportunity costs of exiting the workforce.
- **Increased Sensitivity among Less Educated Women:** Less educated women are expected to have a lower potential income, and the subsidy will therefore be a larger share of their possible income. This means the opportunity cost of exiting the workforce is lower for the unskilled mothers. The possible more pronounced gender roles in lower educated households may also play a part and increase the likelihood of the unskilled mothers staying at home in general (OECD 2018).
- **Increased Sensitivity for High-Earning Secondary Parent:** In households with a high-earning secondary parent, the mother's income is (all else equal) a smaller proportion of the total household income. Consequently, there is reduced economic dependency on her earnings, making it more feasible for the family to rely on the subsidy and the secondary parent's income. This financial dynamic allows two-parent households to more easily accommodate a potential reduction in income while still meeting overall household expenses.

These heterogeneous effect hypotheses can also be understood through the lens of income and substitution effects. For single mothers with lower incomes, the income effect may dominate, leading them to continue working despite the availability of HBCCS because the subsidy does not sufficiently offset the loss of income. Conversely, for higher-income households, the substitution effect may dominate, where the value of time spent on home production becomes more attractive relative to the marginal income earned from working. For example, a higher-income household may find that the marginal utility of time spent caring for their children at home, supported by HBCCS, outweighs the marginal utility of additional income earned through employment. In such cases, the HBCCS could incentivize higher-income households to opt for home-based care.

4 Institutional Setting

To justify our econometric approach, it is essential to first understand the institutional framework within which our analysis operates. In Denmark, parents typically have three publicly subsidized day care options for their children: (1) the standard institutional day care, (2) a private provider of day care, or (3) caring for their children at home. The vast majority of children are enrolled in the publicly provided institutional day care (DST 2024a).

All municipalities guarantee day care from the time a child is 26 weeks old until they reach 5 years of age, ensuring that all parents may return to the workforce following the extensive Danish parental leave period (Undervisningsministeriet 2024e). For parents opting to care for their children at home, HBCCS are available in select municipalities.

Several formal requirements are imposed by the state on municipalities that choose to offer HBCCS (Undervisningsministeriet 2024d):

1. **Duration:** The subsidy must be provided for a minimum of 8 weeks and a maximum of 1 year.

2. **Child's Age:** The child receiving the subsidy cannot be older than 5 years.

3. **Monetary Cap:** The subsidy is capped at approximately 230,000 DKK, equivalent to the maximum unemployment benefit rate in a given year.

4. **Multiple Children:** Households can receive HBCCS for up to 3 children simultaneously.

5. **Age Differentiation:** The subsidy differentiates between children aged 0-2 years and 3-5 years.

6. **Residency Requirement:** The recipient (mother or father) must have resided in Denmark or the EU (if an EU citizen) for at least 7 out of the past 8 years.

7. **Income Restrictions:** The recipient cannot receive any other public transfers or work-related income while receiving HBCCS.

It is also important to note that municipalities offering the subsidy may impose additional requirements, such as demonstrating proficiency in Danish. Parents can also opt to receive the subsidy in smaller periods, allowing for intermittent benefits from HBCCS.

4.0.1 Fripladser

Another critical aspect of the institutional setting is the friplads system, which offers reduced rates for institutional daycare based on household income. The fripladser system allows for lower childcare costs, with greater reductions for families with lower incomes.

For instance, households with an income exceeding 600,000 DKK per year receive no reduction (0%), while those with an income below 180,000 DKK per year receive a full reduction (100%), resulting in a free spot at a daycare (a "friplads").

The income thresholds are adjusted by 7,000 DKK for each additional child living at home under the age of 18. If the parent is a single parent, the thresholds are further increased by approximately 60,000 DKK (Undervisningsministeriet 2024b). Given that daycare can represent a significant expense for parents, it is imperative to incorporate this into our econometric approach to ensure that we account for the financial dynamics faced by families.

5 Methodology

To examine the impact of Home-Based Child Care Subsidies (HBCCS) on the employment of Danish women, we utilize a continuous Difference-in-Differences Linear Probability Model (LPM) with fixed effects. This model estimates the probability of a woman being employed in a given year, dependent on the availability of HBCCS and a variety of background variables. The analysis tracks the employment status of women from three years before the birth of their first child and during the period 2019-2021, when their first child are between 0 and 5 years old. Thus, in essence, we try to isolate the employment patterns of women at the time of having their first child.

5.1 Population

Our study includes women who conform to the following criteria:

- A consistent residency in Denmark for a minimum of 7 out of the past 8 years.
- Their first child being between 0 and 5 years old during the period from 2019 to 2021.
- Identified as ethnically Danish (IE_type 1 according to Statistics Denmark's terminology).

These criteria ensure that the population's eligibility for HBCCS is solely determined by whether their municipality offers the subsidy. While we primarily focus on state requirements, we include the criteria of being ethnically Danish because many municipalities require proficiency in Danish, which we cannot independently verify[1]. Therefore, we exclusively include ethnically Danish women in our sample.

5.2 Treatment and Control Groups

We dynamically define the treatment and control groups on an annual basis. In each year, residents of municipalities offering HBCCS are classified as the treatment group, while residents of municipalities not offering HBCCS are classified as the control group. Consequently, the composition of these groups varies each year due to changes in HBCCS offerings and resident relocations.

A significant concern may be that the presence of HBCCS affects when or why women have children. However, as the subsidy can change each year, only be received for one year per child and is capped at the unemployment insurance, it is unlikely that women will choose to get pregnant to receive the subsidy. Thus the choice of motherhood is likely uncorrelated with being in the treatment group or not. The birth of a child can therefore still be seen as exogenous relative to HBCCS-rates. Another major concern is the potential for self-selection bias, where individuals desiring HBCCS might move to municipalities offering these subsidies, thereby skewing our results. However, we argue that the subsidy rate is relatively low and unlikely to cover the expenses associated with moving. The alternative income without HBCCS, such as usual unemployment benefits (*dagpenge*), provides a counterbalance that discourages such movements solely for subsidy purposes.

Despite these arguments, it is important to examine whether self-selection disproportionately favors treatment municipalities. Our analysis indicates no significant trends suggesting disproportionate movement towards treatment municipalities. For the years 2019-2021, the percentage of people who moved from control (no subsidy) to treatment municipalities (subsidy) following the birth of their first child is 17%. The reverse movement, from treatment to control municipalities, is also 17%.

With these results, we feel confident in using non-constant treatment and control groups in our analysis. This approach acknowledges both the reality of population mobility and allows for a more accurate assessment of the impact of HBCCS. However, it does mean that the Difference-in-Differences (DiD) graph will not show two constant populations, adding a layer of complexity to the interpretation of the results.

[1] for example Albertslund (kommune 2024)

5.3 Theoretical Framework

The Continuous Treatment Difference-in-Differences (DiD) model extends the traditional DiD methodology by allowing for the analysis of varying treatment intensity levels across observations. Unlike standard DiD models that assume binary treatment states (treated vs. untreated), this model can handle a spectrum of treatment intensities, making it ideal for evaluating policies where the treatment dose or exposure is not uniform across the treated population. This flexibility is crucial for studying the nuanced effects of policies like HBCCS, where the amount of subsidy can vary significantly between municipalities and over time.

To utilize DiD, we must first elaborate on the differences considered in our somewhat complex framework:

- The first difference is the change in employment after having the first child, relative to the periods before having a child, for an individual. Since the treatment intensity is zero before childbirth, this difference captures the overall effect of having a child and some form of treatment (HBCCS, some or none).
- The second difference is the change in employment status across different levels of treatment intensities after having a child. This comparison isolates the differential effect of varying levels of HBCCS.

For parallel initial trends, we expect the women who give birth at $t = 0$ to have lower employment from $t = 1$ onwards for higher HBCCS. Thus, the total difference-in-difference coefficient will show not the consequence of being treated or not, but rather the linear effect of having higher HBCCS rates on women's employment, which is our primary interest.

5.4 Model Specification

Our model is specified as a linear probability model with fixed effects, modelling the individuals probability of being employed. This approach not only accounts for the non-binary nature of the treatment but also allows us to capture the dynamic response of employment to varying subsidy levels.

The model is formally specified as follows (with suppressed error term):

$$\begin{aligned} P(Y_{ijt} = 1) = \alpha + \boldsymbol{\beta}\text{Post}_{it} + \boldsymbol{\gamma}(\text{Treatment Intensity}_{ijt} \times \text{Post}_{it}) + \boldsymbol{\delta}(\text{Opportunity Cost}_{ijt} \times \text{Post}_{it}) \\ + \mathbf{X}_{it}\boldsymbol{\theta} + \mu_i + \tau_t \end{aligned} \tag{5.1}$$

where:

- Y_{ijt} represents the probability of employment for individual i at time t in municipality j.
- Treatment Intensity$_{ijt}$ quantifies the intensity of the subsidy available, reflecting variations in treatment exposure. It is 0 if either (a) the woman has no children aged 0 to 5 years or (b) the woman lives in a municipality with a subsidy rate of 0. Otherwise, this quantity will be positive and is defined as:

$$\begin{aligned} \text{Treatment Intensity}_{ijt} = (\text{no. of children})_{it}^{0-2} \times (\text{subsidy rate})_{jt}^{0-2} \\ + (\text{no. of children})_{it}^{3-5} \times (\text{subsidy rate})_{jt}^{3-5} \end{aligned}$$

  - (subsidy rate) represents the municipality-set subsidy rate for the given year.

  The treatment intensity is capped at the unemployment insurance rate for each year.

- Post_{it} is a variable marking how old the woman's first child is. The variable is -3, three years prior to the child being born, 0 the year he/she is born and a maximum of 5 the year, the child turns 5 years old. The variable only takes values between 0-5 in 2019-2021.

- Opportunity Cost_{ijt} represents the cost payable for institutional daycare if HBCC is not chosen. We control for this, as we expect daycare costs to heavily influence the financial choice of choosing HBCCS. It is defined as:

$$\begin{aligned}\text{Opportunity Cost}_{ijt} = (\text{no. of children})_{it}^{0-2} \times (\text{child care cost})_{jt}^{0-2} \times (1 - (\text{friplads \%})_{it}) \\ + (\text{no. of children})_{it}^{3-5} \times (\text{child care cost})_{jt}^{3-5} \times (1 - (\text{friplads \%})_{it})\end{aligned}$$

  - (child care costs) represents the institutional daycare costs in the municipality for the given year.
  - (friplads %) represents the percentage of child care costs that is publicly funded, dependent on household income. This variable measures the opportunity costs of the treatment, specifically the loss of friplads benefits. This composite proxy is derived from the woman's average income three years prior to having her first child, plus any income from a potential secondary parent in a given year. This is done to avoid possible endogeneity issues, and it is a conservative estimate of the amount paid by the parents, as the mother's income is likely to increase over time and thus reducing the (friplads %).

- $\mathbf{X}_{it}$ comprises control variables such as education level, marital status, and other socio-economic factors that may influence employment decisions.

- μ_i and τ_t represent fixed effects at the individual and time levels, respectively, controlling for unobserved heterogeneity.

5.5 Heterogeneous Effects

One significant advancement in our analysis is the incorporation of heterogeneous effects to explore how the impact of HBCCS varies across different segments of the population. Our initial model did not account for the possibility that the effect of the subsidy might differ based on various factors, for example potential income level. Since actual income is closely linked to employment — potentially leading to reverse causality issues — we use educational level as a proxy for income potential.

5.5.1 Modeling and Estimation of Heterogeneous Effects

To quantify these effects, we may extend our model to include interactions between, for example, educational levels and subsidy intensity:

$$\begin{aligned}P(Y_{ijt} = 1) = \alpha + \boldsymbol{\beta}\text{Post}_{it} + \boldsymbol{\gamma_0}(\text{Treatment Intensity}_{ijt} \times \text{Post}_{it}) \\ + \boldsymbol{\gamma_1}(\text{Educational Level}_{it} \times \text{Treatment Intensity}_{ijt} \times \text{Post}_{it}) + \boldsymbol{\delta_0}(\text{Opportunity Cost}_{ijt} \times \text{Post}_{it}) \\ + \boldsymbol{\delta_1}(\text{Educational Level}_{it} \times \text{Opportunity Cost}_{ijt} \times \text{Post}_{it}) + \mathbf{X}_{it}\boldsymbol{\theta} + \mu_i + \tau_t \quad (5.2)\end{aligned}$$

where $\boldsymbol{\gamma_1}$ now measures the differential effect of the subsidy across different educational levels, providing insights into how educational attainment modifies the response to HBCCS.

5.6 Economic Interpretation of Coefficients

In our model, the coefficient $\boldsymbol{\gamma}$ is of central interest as it quantifies the marginal effect of an increase in treatment intensity—reflected by the varying levels of Home-Based Child Care Subsidies (HBCCS)—on the probability of women being employed at a given time relative to the birth of her first child. A negative

γ_z suggests that higher intensity of treatment, at year z relative to the birth, is associated with a decreased probability of employment, assuming all other factors remain constant. This interpretation directly aligns with economic theories suggesting that financial incentives can significantly influence individual labor market behaviors by altering opportunity costs.

However, several of the usual linear model assumptions for valid inference and unbiasedness are violated in this LPM model. We will delve into these problems in a misspecification section (8) following our main results section, and we discuss different omitted variable biases in the discussion (9).

Despite these issues, we proceed with the LPM due to its interpretability and the modifications we can make to mitigate these concerns. We continue to take these implications into account when analyzing our findings and discuss alternative approaches, such as the probit model, in subsequent sections of our analysis.

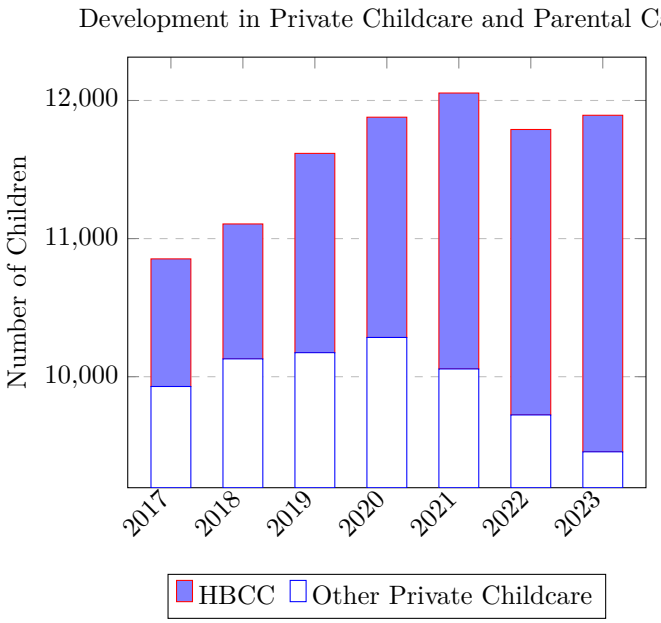
6 Data

The dataset for this analysis is an amalgamation of data from multiple authoritative sources. Individual-level data, encompassing demographic details and labor force activity, is procured from Danmarks Statistik, thanks to collaboration with the think tank DEA. This granular data forms the backbone of our analytical model. To complement this, subsidy rates are acquired from the Ministry of Children and Education (Undervisningsministeriet 2024a), which are pivotal for assessing the financial dimensions of HBCCS. Costs associated with public daycare are sourced from Noegletal.dk (Nøgletal.dk 2024), and friplads-percentage rates are sourced directly from (Undervisningsministeriet 2024c) .

During the 2019-2021 window, the dataset allows for a robust cross-linkage, albeit the timeframe is relatively short. A limiting factor is the RAS dataset's reach, which for us, extends only up to 2021. Notably, this period overlaps with the COVID-19 pandemic. We posit that the pandemic's influence is evenly distributed across municipalities and, therefore, its confounding effects are adequately captured by the time-fixed effects, denoted as τ_t in our model.

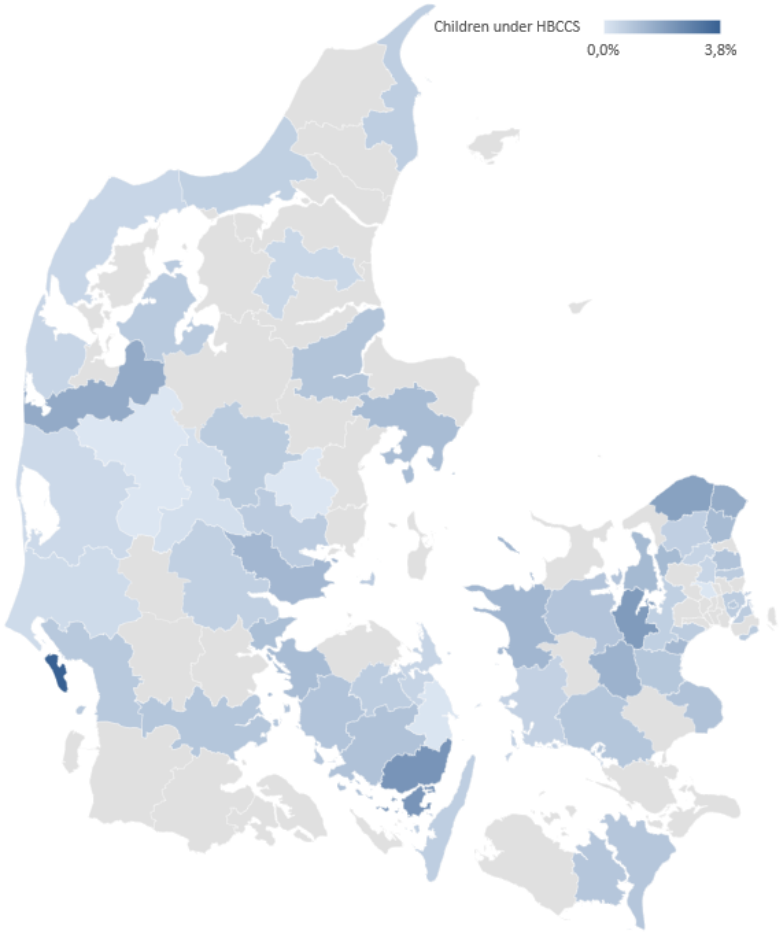
6.1 Descriptive Statistics

In the year 2021, 2,000 children were part of households benefiting from HBCCS. This should be seen in the trend from the previous years, where just 1000 children were part of households benefiting from HBCCS. Due to the rapid increase in HBCCS, but the small absolute counts of beneficiaries, it is worth noting that if we find a causal relationship, the effect of this is built on not too many "true positive" observations. Below we warrant that the usage of HBCCS is geographically distributed evenly enough to warrant an analysis. In Figure 6.2, the distribution of the rates are also given.



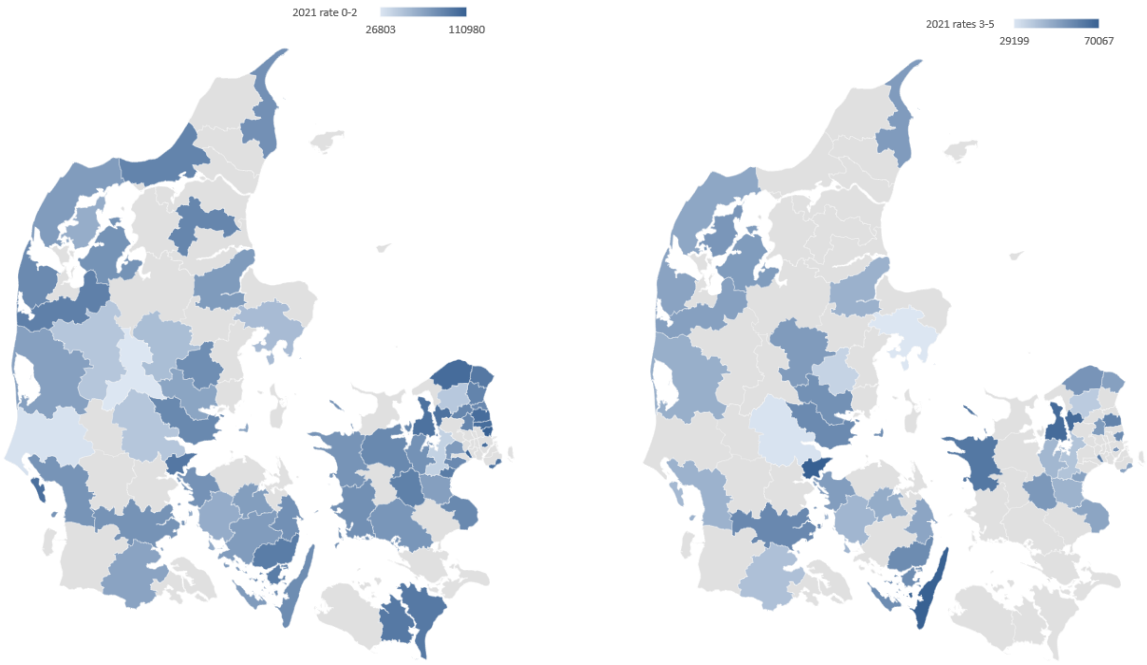
Notes: Annual development in the number of children in private childcare compared to parental care.

Figure 6.1: Distribution of HBCCS across Denmark, 2021



Notes: The proportion of 0-5 year olds under HBCCS in the Danish municipalities. 2021. Grey does not provide HBCCS. Note the vast distribution with no significant centers of high frequency utilization.

Figure 6.2: Distribution of HBCCS rates, yearly DKK, 2021



Notes: Left: The proportion of 0-2 year olds under HBCCS in the Danish municipalities. Right: The proportion of 3-5 year olds under HBCCS in the Danish municipalities. 2021. Grey does not provide HBCCS.

6.2 Comparability of Control and Treatment Groups

Before year $t = 0$, individuals in the population are by definition not treated. However, if an individual lives in a municipality that offers HBCCS at least 1 year while their first child is between 0-5, then they are considered part of the treatment group in the following comparisions from $t = -3$ to $t = -1$. Otherwise, we simply define it as we have already stated - if they live in a municipality with HBCCS in a given year, then they are treated.

The control and treatment groups, while distinct, maintain consistent differences throughout the observed period, allowing for a controlled comparison. The model aims to account for these variances, such as in civil status and educational levels, to eliminate any bias these factors might introduce.

6.2.1 Size of Groups

First and foremost, we want to make sure that none of our groups are too small, relative to the other. In table 6.1, the size of the control (K) and treatment (T) groups are given for our entire population. As is evident, the groups are size-wize roughly equivalent.

Table 6.1: Equivalent disposable income by group and percentile

	Age Group								
Group	-3	-2	-1	0	1	2	3	4	5
K	117159	116842	116733	34232	32282	31740	31474	30244	28946
T	96817	96558	96338	29271	30648	31550	29089	29388	27619

Notes: While we examine the all mothers before they had children, we only have data points from 2019-2021 for after they became mothers. Therefore, not all mothers are included at each reference point from 0-5 years. Additionally, from that point, mothers can switch T and K-group.

6.2.2 Household Income

While not explicitly included as a regressor in the model, equivalent disposable family income is compared across the two groups to ensure that the financial situation of each group is roughly equivalent. The

equivalent disposable family income value is calculated by Danmarks Statistik using a formula where the first adult over the age of 14 is weighted at 1, other adults a weighted at 0.5 and children below the age of 14 is weighted at 0.3 (DST 2024b).

The equivalent income of the households are highly similar between the control and treatment group, and is no cause for concern. Note that only the high-income households (75-percentile) have a decrease in income at the time of the birth of the first child, signifying the financial opportunity costs are higher to stay at home for these households.

Table 6.2: Equivalent disposable income by group and percentile

	Age Group								
Group	-3	-2	-1	0	1	2	3	4	5
K P25	153049	174420	200923	211534	216868	220380	217591	217547	220364
K P50	216833	240478	269813	277041	282605	285497	278993	278631	281567
K P75	280770	309188	343150	342943	351498	355909	345327	344404	349806
T P25	153109	174417	199742	210724	217917	218980	218968	220069	220748
T P50	215835	239217	267390	273527	280475	281788	276504	277089	280319
T P75	279925	307403	340121	337610	345646	349849	341858	342250	346275

Legend: Values are in DKK/Year.

Notes: While we examine the income level of all mothers before they had children, we only have data points from 2019-2021 for after they became mothers. Therefore, not all mothers are included at each reference point from 0-5 years. Additionally, from that point, mothers can switch T and K-group
The equivalent income is calculated by Danmarks Statistik.

6.2.3 Education

Educational attainment, a critical determinant of employment choices, is examined below for the control group and the treatment group. We see that the control and treatment groups are much alike, but we see some acceleration in educational achievement in the control group, which is not present in the treatment group. Roughly 30% of the control group has an educational level of Master's or higher (LVU/PHD) at the birth of their first child, while the same is only true for 21% of the control group. This is a somewhat significant result that can bias our results in the homogeneous model. Therefore, we will additionally employ a model which allows for heterogenous effects across educational levels.

Table 6.3: Educational attainment distribution by group

	Age of Firstborn								
Group	-3	-2	-1	0	1	2	3	4	5
K Eud	19%	20%	21%	17%	18%	19%	20%	22%	23%
K KVU	5%	5%	5%	5%	5%	5%	5%	5%	6%
K LVU/PHD	18%	21%	23%	30%	29%	29%	29%	28%	27%
K MVU/BACH	28%	29%	30%	33%	32%	31%	31%	31%	31%
K Ufaglært	31%	25%	21%	16%	16%	15%	14%	14%	14%
T Eud	22%	23%	24%	22%	23%	24%	24%	25%	26%
T KVU	5%	5%	5%	5%	5%	5%	6%	6%	6%
T LVU/PHD	14%	16%	18%	21%	22%	22%	23%	23%	22%
T MVU/BACH	26%	28%	30%	32%	31%	31%	32%	32%	32%
T Ufaglært	34%	28%	23%	19%	19%	17%	16%	15%	15%

Notes: While we examine the education level of all mothers before they had children, we only have data points from 2019-2021 for after they became mothers. Therefore, not all mothers are included at each reference point from 0-5 years. Additionally, from that point, mothers can switch T and K-group.

6.2.4 Civil Status

Changes in civil status over the study period are considered in the analysis, particularly to address the assumption that leaving the workforce is potentially easier for married couples. However, it's noteworthy

that both the treatment group and control group demonstrate similar tendencies in this regard. The civil status of parents is of little concern in terms of ensuring representative sampling, as approximately one-third of women are married at the birth of their first child in both groups.

Table 6.4: Distribution of some category by group

	Age Group								
Group	-3	-2	-1	0	1	2	3	4	5
K F	2%	2%	3%	1%	1%	2%	3%	3%	5%
K G	15%	20%	26%	30%	37%	43%	48%	51%	53%
K U	83%	78%	71%	69%	62%	55%	49%	45%	42%
T F	2%	3%	3%	2%	2%	2%	3%	4%	5%
T G	16%	21%	28%	32%	40%	46%	51%	54%	56%
T U	82%	76%	69%	66%	59%	52%	46%	42%	39%

Notes: While we examine the civil status of all mothers before they had children, we only have data points from 2019-2021 for after they became mothers. Therefore, not all mothers are included at each reference point from 0-5 years. Additionally, from that point, mothers can switch T and K-group
The above results do not necessarily sum to 100%, as widows and other classifications have been excluded. All are included in the regressions, however, aggregated to unmarried (no partner) and married (has partner).

6.2.5 Employment Status

Employment patterns are observed to be comparable between the control and treatment groups.

It is notable that both the treatment and control groups exhibit similar employment statuses before the birth of their first child. However, following the birth of their first child, the treatment group demonstrates a higher propensity to exit the workforce and generally experiences lower levels of employment compared to the control group.

Table 6.5: Employment and non-employment mean percentages by group

	Age of Firstborn								
Group	-3	-2	-1	0	1	2	3	4	5
K besk	78.43%	81.04%	81.84%	74.15%	76.83%	78.71%	78.95%	80.39%	81.86%
K ik_abs	1.68%	1.60%	1.37%	1.62%	2.62%	1.88%	2.48%	2.49%	2.42%
T besk	77.70%	80.01%	80.87%	72.54%	75.41%	77.46%	77.76%	79.67%	80.84%
T ik_abs	1.66%	1.60%	1.41%	1.48%	3.48%	2.23%	3.09%	3.11%	3.06%

Notes: While we examine the civil status of all mothers before they had children, we only have data points from 2019-2021 for after they became mothers. Therefore, not all mothers are included at each reference point from 0-5 years. Additionally, from that point, mothers can switch T and K-group

Overall, the control and treatment groups exhibit remarkable similarities in terms of size, employment status, civil status, education, and income prior to the birth of their first child. However, following this event, we observe some short-term divergence, particularly in employment rates as expected, and to a lesser extent in educational attainment. The latter discrepancy is likely influenced by the absence of Copenhagen in the treatment group.

With a comprehensive understanding of these dynamics, we proceed confidently to estimate parameters and analyze results in the subsequent sections.

6.3 Parallel Initial Trends and DiD graph

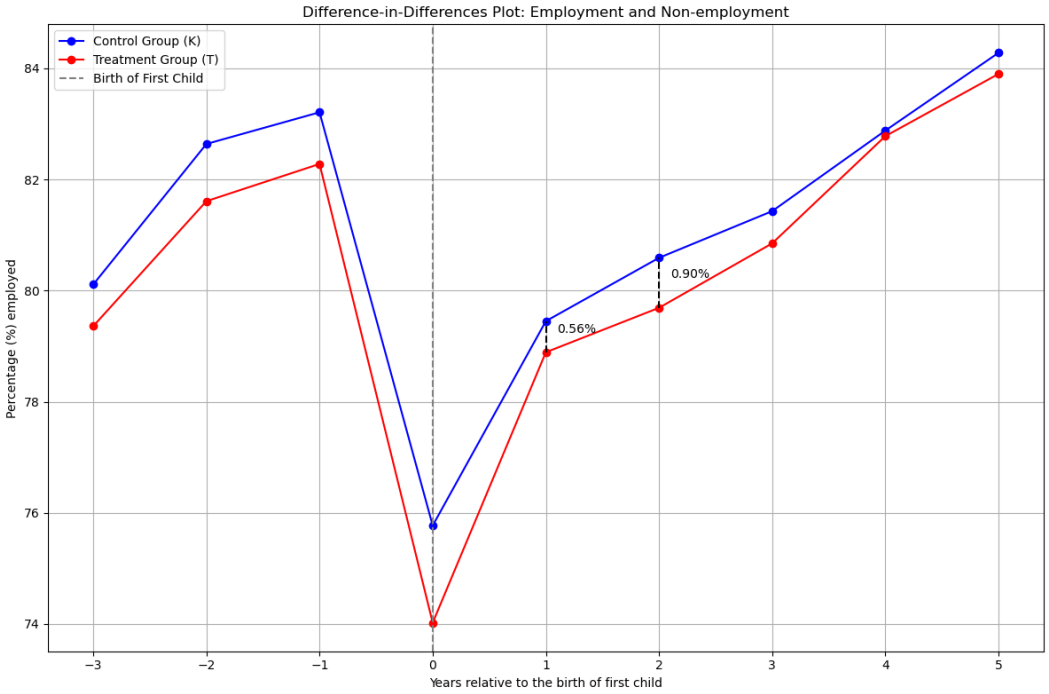
To ensure the validity of the Difference-in-Differences (DiD) approach, it is crucial to confirm that the pre-treatment trends between the treatment and control groups are parallel. This parallel trend assumption is essential to avoid overestimating or underestimating the effect of the treatment.

Although we cannot guarantee parallel initial trends for every individual, we can ensure that these trends are parallel in aggregate across the treatment and control groups. This has been demonstrated

in our analysis related to civil status, educational level, and household income above. While there were some minor differences in levels, the overall trends were consistent.

To visually confirm the parallel trends, we construct a pseudo-DiD graph that compares the average employment trends in the treatment and control groups before and after the treatment period. As shown in Figure 6.3, the pre-treatment trends are indeed parallel, supporting the validity of our DiD approach.

Figure 6.3: Average Employment in Treatment and Control Groups



Notes: This graph illustrates the average employment trends in the treatment and control groups. While it is not intended for final conclusions, it provides an aggregated view supporting the parallel trends assumption. Actual results will utilize microdata to control for various variables.

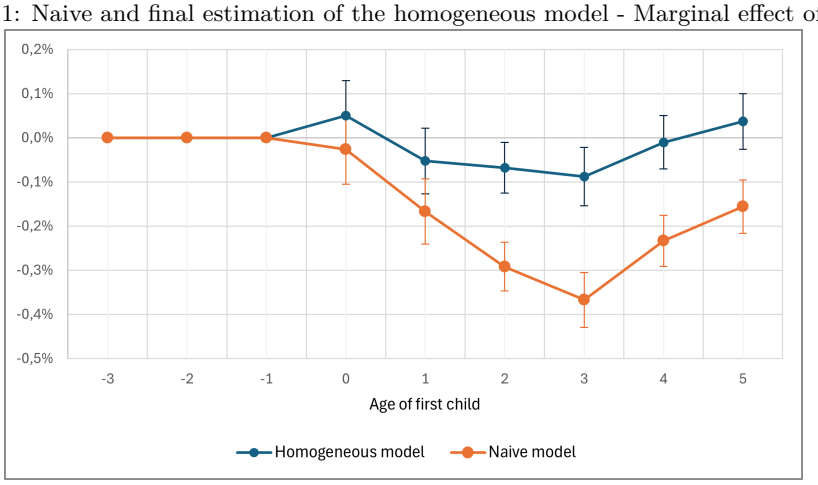
This preliminary data-analysis supports the robustness of our DiD framework, allowing us to proceed with a more detailed examination using microdata to account for individual-level variability and control for additional covariates.

7 Results

7.1 The Homogeneous model

We start our analysis by investigating the impact of the subsidy on maternal employment after the child's birth, without accounting for any additional factors. Our initial naïve findings, shown in figure 7.1[2], reveal that a 1,000 DKK increase per month in the potential subsidy results in a decrease of 0.37 percentage points in the probability of maternal employment at most, which is in the year the child turns 2 years old. Nonetheless, this outcome is likely skewed, as it neglects variables such as maternal education level, marital status, and the secondary parent's income, which may influence employment status. Over the course of our observation period, which spans a maximum of 8 years, these factors are prone to change, as evident in the data discussed earlier.

Figure 7.1: Naive and final estimation of the homogeneous model - Marginal effect of subsidy



Notes: the regression results have been multiplied by 12, to get the effect of a 1,000 DKK increase per month

To ensure a comprehensive analysis, we now run the full homogeneous model as given in 5.4, where we control for business cycle effects, individual effects, and background variables. Additionally, we integrate the potential savings associated with home-based care, stemming from the avoidance of costs related to institutionalized child care (corrected for *friplads*), thus reducing the opportunity cost of being unemployed.

This model shows a much weaker effect from the HBBC subsidy, and is only significant in periods 2 and 3, where it is a decrease in employment probability of 0.07 and 0.09 percentage points, respectively, as shown in figure 7.1. For reference (11.3), the cost of daycare increases the employment probability by 0.36 and 0.44 percentage points in the same periods.

Upon further examination, we find that women with multiple children exhibit lower employment rates, while individuals with higher levels of education tend to be more employed. The age of the woman is also relevant, and follows an inverted U-shape, with the chance of being employed being maximized at 30-35. We also find that married women are not less likely to be employed, contrary to our expected results. Lastly, we find mixed results for the partners income, which in period 2 significantly increases the probability of being employed.

As it is a requirement for the subsidy that you receive no benefits at the same time, women likely exit the workforce entirely when they receive the subsidy. When we run the regression on whether you are in the workforce or not rather than employment, the effect of the subsidy is larger (See 11.8 in appendix). This is due to the mechanical effect between the subsidy and workforce participation and indicates that

[2]All regression results can be found in the appendix.

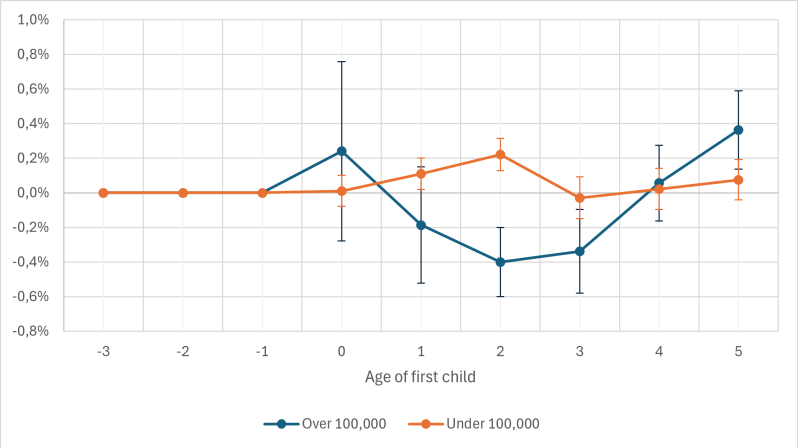
it is not solely employed women who choose to receive the subsidy.

7.2 Heterogeneous Effects

We now look at whether there are any heterogeneous effects from the subsidy as assumed in section 3.1. We first wish to check whether there are any nonlinear effects from the subsidy level. By interacting the effect from the treatment with the treatment level (below or above 100,000 DKK a year), we only find a negative contribution to employment from the subsidy for highly treated individuals, as seen in figure 7.2. The effect is significant from the year $t = 2$ and $t = 3$, where it decreases the employment with respectively 0,2 and 0,4%-point per 1,000 DKK per month increase. This is nearly triple the effect we saw, when not taking the nonlinear effects into account. We also find a significant positive effect on employment for the low treatment level in the year the child turns 1 and 2, however we assume this is an outlier or due to omitted variable bias.

The difference in effect depending on the treatment level indicates that there is a threshold the subsidy has to reach, before people are willing to exit the workforce. In economic theory this can be seen as the minimum income needed to achieve the same utility from staying home with their child as they get from additional income. Municipalities that offer the subsidy for a short amount of time or at a very low monthly payment, will therefore not see the same effect as the municipalities that offer a high payment for longer.

Figure 7.2: Marginal effects from the subsidy level



Notes: We define 100.000 as the cut-off for a high treatment at our own discretion. The population is slightly more concentrated in the low treatment at 127,000 observations versus 65.000 observations in the high treatment. This is reflected in the slimmer confidence intervals.

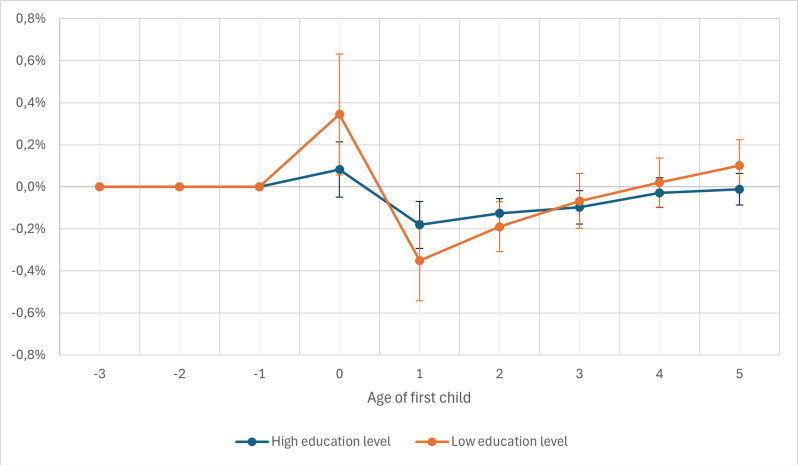
For the remaining exploration of heterogeneous effects of the subsidy, we will only analyze the effects for the population that had a treatment intensity of over 100.000 DKK/year. The next split we seek to investigate is whether these effects vary across different educational levels, the income of the partner, and the interaction between educational level and the income of the partner. Many other heterogeneous splits could have been investigated, but we find these splits the most relevant upon our examination of the regression results of the homogeneous model, and the previous literature on the subject.

7.2.1 Educational Level

Given the relatively low upper limit of the subsidy, its effects may vary across income groups. By using educational level as a proxy for potential income, we can effectively address issues related to reverse causality and examine the heterogeneous effects. Our analysis reveals that the subsidy tends to disproportionately reduce the employment level of mothers with low levels of education, with a decrease of a maximum of 0.35 percentage points per 1,000 DKK increase in HBCCS per month. This outcome suggests that as their potential income from work is lower, the impact of the subsidy on their employment

decisions is more pronounced, likely due to the reduced opportunity cost of exiting the labor force. The effect is only larger earlier on with the most negative effect being in the year the child turns 1. This could be an indicator that maternity leave rules play a significant role in how and when the subsidy is used as the higher skilled mothers tend to have better benefits[3].

Figure 7.3: Marginal effects from the educational level of the mother



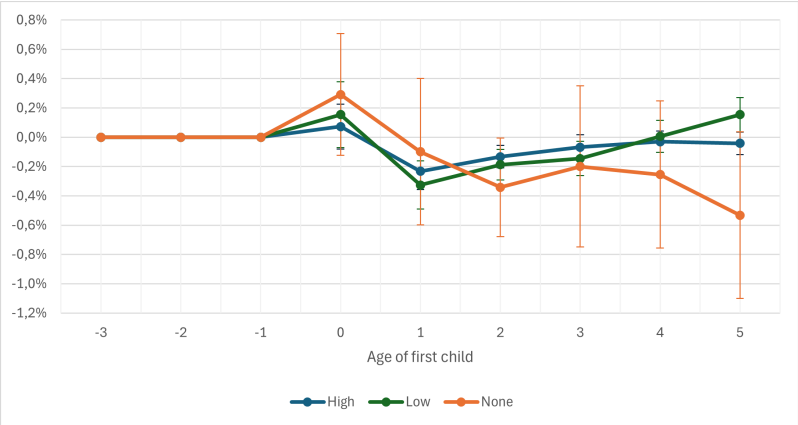
Notes: High educational level = {PHD/LVU, KVU, MVU/BACH} Low educational level = All others.

7.2.2 Secondary Parent's Income Level

The income of the secondary parent also introduces possible heterogeneity in the subsidy's effects. As explained in section 3.1, we assume that mothers, who have high-income secondary parents, will be more likely to be affected by the subsidy, as all things equal their wage is a smaller proportion of the household income. The marginal effect is largest in the year the child turns 1 where it decreases the employment of the mother by 0.23 and 0.33 per 1,000 DKK extra a month for mothers with high and low income secondary parents, respectively. However as shown in figure 7.4, we do not see a large difference in the subsidy's effect when the secondary parent's income is high or low. One interpretation could be that consumption follows the income levels, raising the bar for what is considered necessary household expenses. High income households may have larger fixed expenses such as a more expensive house, thus increasing the minimum level of income required to sustain their utility level. We do however find that the subsidy does not have a significant effect on the employment of mothers when there is no secondary parent. This is partly due to the large confidence intervals, as there are few children, where the secondary parent is unknown.

[3]See (industri 2024), less educated women tend to have lower maternity benefits.

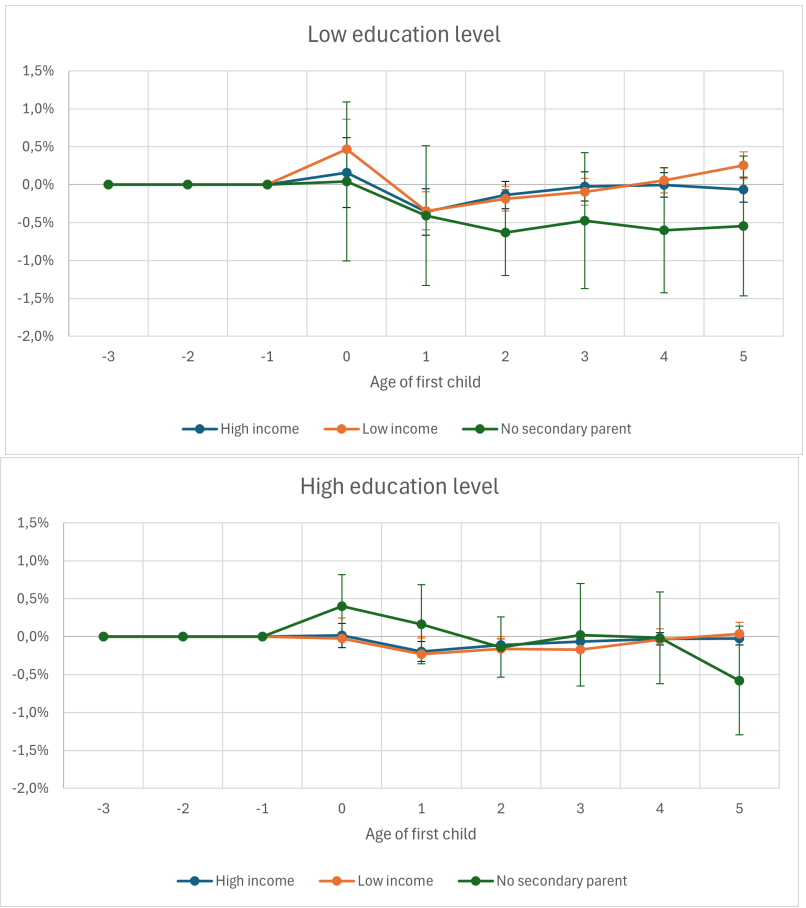
Figure 7.4: Marginal effects from the secondary parent's level of income



Notes: Determining whether the secondary parent's income is high or low is based on whether they earn more than the median income for the secondary parent in 2019 (410,124 DKK). None is determined by there being no secondary parent on record.

It is also possible that the subsidy affects employment heterogeneously in the cross-section between the mother's income (proxied by education) and her secondary parent's income. A low educated mother with a high income secondary parent may respond differently as their income likely is a smaller fraction of the total household income. This does however not appear to be the case, as seen in figure 7.5. The effects when there is no secondary parent does appear to be different depending on the mother's educational level. While both highly and low educated mothers with no secondary parent mainly have insignificant effects from the subsidy, there is a significant negative effect in the year the child turns 2 for the low educated mothers. A 1,000 DKK increase a month in the subsidy, decreases the probability of employment by 0.63 %-point for low educated mothers with no secondary parent.
The highly educated women with no secondary parents have almost no significant effects from the subsidy. This could indicate that the opportunity cost from exiting their employment is too high, and is exacerbated by the fact that there is no secondary income to fall back on.

Figure 7.5: Marginal effects from the interaction between the mother's education level and the secondary parent's level of income



These findings underscore the importance of considering the heterogeneous effects of the subsidy, as they have implications for policy formulation. Municipalities must be cautious not to under- or overestimate the subsidy's efficacy, as its impact varies across different socioeconomic strata as well as the subsidy level.

8 Misspecification Tests

To ensure the robustness of our Linear Probability Model (LPM) within the Continuous Treatment Difference-in-Differences (DiD) framework, a series of misspecification tests are conducted. These tests are essential for verifying the validity of our model. The assumptions of regressing an LPM are largely the same as for a normal linear regression, and will thus not be presented rigorously.

8.1 Model Specification - Why Fixed Effects

Our initial step involved the application of the Hausman test to discern the suitability of fixed effects over random effects in our model. The Hausman test is a statistical test that evaluates the consistency of an estimator when compared to an alternative, less efficient estimator that is also consistent under the null hypothesis. (Baltagi 2014) In our case, the test statistic yielded a chi-squared value of 25077.68 with 43 degrees of freedom, resulting in a p-value significantly lower than any conventional significance level (prob $>$ chi2 $= 0.0000$). These results decisively led us to reject the null hypothesis of no systematic difference in coefficients between the fixed and random effects models. The implication of this finding is clear: the differences in coefficients are systematic, affirming our decision to implement fixed effects in our model to account for unobserved heterogeneity.

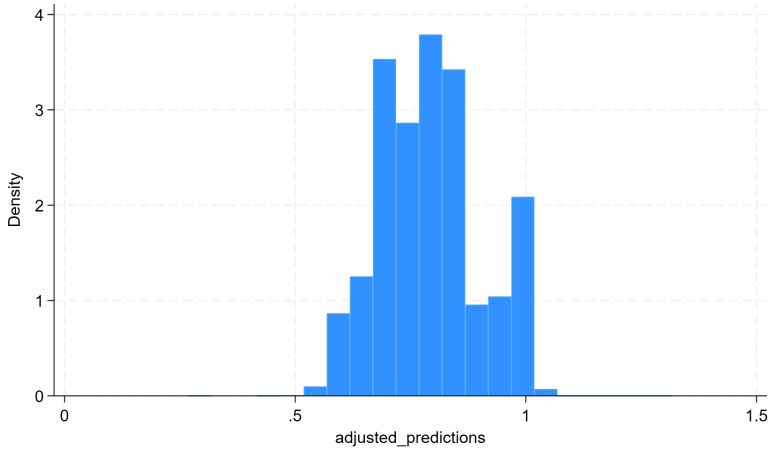
8.2 Other Relevant Tests

In addition to the Hausman test, several other diagnostic tests were employed to assess the specification of our model.

- **Modified Wald Test for Heteroskedasticity**: Because of the binary nature of our dependent variable, heteroskedasticity is highly likely. We test for this using the Modified Wald Test, and the test ($\chi^2(246543) = 2.2e^{38}$, Prob$>$ $\chi^2 = 0.0000$) suggests that standard errors are inapplicable, resulting in invalid inference. We therefore apply cluster robust standard errors taking both autocorrelation and heteroskedasticity into account.

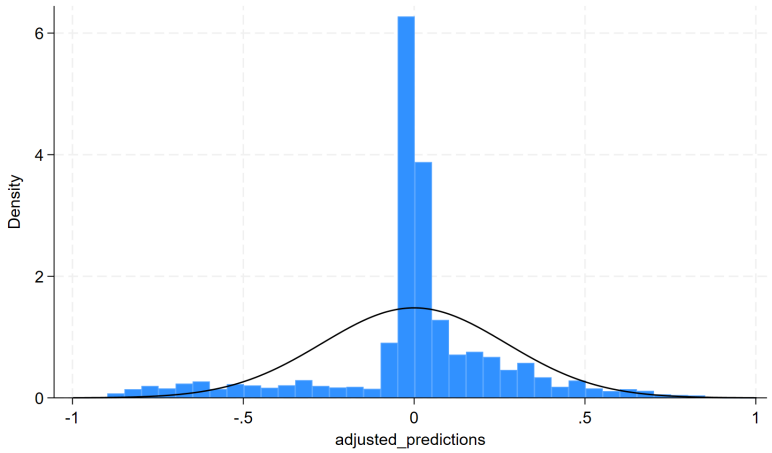
- **Predictions of the model**: The linear specification of our model allows for unfeasible prediction. The predictions of the model should not be less than 0 or above 1. If there are significant amounts of predictions above 1, then the model is definitely unfit to serve as a probability indicator. We find that < 500 predictions are outside the 0-1 span, relative to the total 1,123,502 predictions, which is roughly 0.04% of all predictions. Thus, there are not a significant amount of predictions outside the reasonable bounds of values.
- **Normality of the error term**: Figure 8.2 shows the residuals of the model, plotted against the applicable hypothetical normal distribution illustrating complete normality. As the dependent variable is binary, the error terms are likely not normally distributed, as seen in the graph. Nonetheless, this is not an issue as our sample size is very large, and CLT will ensure our estimators are normally distributed.

Figure 8.1: Predictions of the model in the sample



Notes: *adjusted_predictions* is the actual prediction histogram of the model, minus any bins that would have less than 5 observations.

Figure 8.2: Residuals of the model



Notes: *adjusted_predictions* is the actual prediction histogram of the model, minus any bins that would have less than 5 observations.

Based on the above considerations, we find it valid to apply inference to our regression results. However, the model could theoretically be improved functionally in a non-linear probability modelling.

8.3 The Probit Model

To validate our results, we complement our LPM with a non-linear probit model. The probit model is specifically designed to model binary dependent variables, making it an obvious candidate for the modelling of employment. However, standard probit models (e.g., xtprobit) cannot incorporate fixed effects, which are essential given the panel structure of our data. Likewise, the interpretation of the results are not straightforward nor additive, complicating the analysis of heterogeneous effects. By comparing the homogeneous LPM and probit model estimates, we enhance the robustness of our findings and validate the model choice for our Continuous Treatment DiD analysis. The regression results can be seen in table 11.7. The probit model qualitatively gives the same results as our preferred homogeneous LPM, showing a significant negative effect from the subsidy in $t = 2$ and $t = 3$.

9 Discussion

In assessing the impact of Home-Based Child Care Subsidies (HBCCS) on employment, our study tries to take economic, social, and policy variables into account. Employing a linear probability model within a Difference-in-Differences (DiD) framework served as our primary analytical lens. A probit regression model presents a promising alternative for future analysis, offering better suitability for binary outcomes and the capacity to manage non-normal error distributions (for smaller samples). Adjustments for non-linearity in future models could enhance the precision of estimated effects, potentially revealing more nuanced insights into labor force dynamics.

Geographical mobility poses another layer of complexity. It introduces the potential for selection bias, where families predisposed towards home-care might gravitate towards municipalities with more generous HBCCS. This propensity could skew our understanding of the subsidies' effectiveness. Addressing this bias requires innovative methodological approaches, such as the application of instrumental variables or propensity score matching, which can provide more definitive causal interpretations. However, as explained in 5.2, we find it unlikely that this has a large impact on our results.

The quality of local child care services is also a significant factor that might intersect with the availability of HBCCS to influence parental employment decisions. (BUPL 2023) Lower-quality services could serve as a factor in deciding to stay at home, just like subsidies, thus affecting employment across municipalities in varied ways. Integrating child care quality metrics into the analysis could offer a more comprehensive view of the interplay between service quality and subsidy utilization.

While our focus was on the immediate effects of HBCCS, the broader temporal scope remains a domain requiring further exploration. Long term studies could explore whether the employment patterns we observed are enduring or if they diminish as children grow older. Such long-term analysis is vital for informed policy-making and for understanding the life-cycle effects of child care subsidies.

Additionally, cultural norms and societal expectations about parenting roles present underlying currents that could influence labor participation (Engster and Stensöta 2011). Our model does not account for these cultural dimensions other than through the fixed effects, and employing sophisticated variables that can measure these idiosyncrasies could further nuance our analysis.

Restrictions in our sample also present limitations. Our analysis exclusively included mothers whose first-born child was between 0-5 in 2019-2021, a demographic that does not necessarily represent the broader population of mothers who may have multiple children and different levels of engagement with HBCCS. A more inclusive sample could offer a richer understanding of the subsidies' impact across a wider spectrum of family structures.

Additionally, we are unable to control for the possibility that mothers of children with special needs may be more inclined to opt for HBCCS. This specific data is not available in our dataset, and may not be achievable for this time frame, as the children aren't necessarily diagnosed this early. This potential source of unobserved heterogeneity is neither unique to an individual woman nor time-invariant, which means it is only accounted for in the residuals of our model. Should data on the special needs status of children become available in the future, incorporating it into our model could substantially enhance the accuracy and robustness of our findings.

Lastly, the coinciding timeline of our study with the COVID-19 pandemic cannot be overlooked. The pandemic's ubiquitous impact necessitates consideration of its potential to confound the effects observed. Despite assuming that the pandemic's effects were uniformly distributed—thus being absorbed by the time-fixed effects in our model—a deeper investigation into its specific influence on labor market participation would contribute to a more rigorous understanding of the period analyzed.

In conclusion, while our study sheds light on certain aspects of HBCCS's role in women's employment, it also opens avenues for more comprehensive future research. Expanding the scope to include broader de-

mographic parameters, integrating quality assessments of child care services, and devising methodologies to address inherent biases are essential steps forward. As policies and social norms continue to evolve, so too must our analytical frameworks to ensure they capture the full spectrum of influences on labor market behavior.

10 Conclusion

The primary objective of this study was to dissect the multifaceted relationship between Home-Based Child Care Subsidies (HBCCS) and women's employment within the Danish context. Our findings, drawn from a robust analysis employing a Difference-in-Differences (DiD) approach, paint a complex picture of the socio-economic forces at play.

We observed a maximum of a 0.09 pct. point decrease in employment per 1,000 DKK monthly increase among women who were eligible for HBCCS, signifying that the financial incentives provided by the subsidy have a (statistically significant) effect on their employment decisions. The effects of the subsidy are nonlinear wrt. its level, and we found that a potential subsidy below 100,000 DKK a year had no significant effect on employment. When the potential subsidy was above 100,000 DKK, we found that a 1,000 DKK increase per month, decreased the probability of employment by 0.4 %-points.
Notably, the effect of the subsidy when above 100,000 DKK varied considerably across different socio-economic factors, with a disparity in response between mothers with different educational backgrounds of up to 0.17 pct. points. Mothers with lower educational attainment were more likely to reduce their labor force participation in response to the availability of HBCCS in the beginning of the child's life, highlighting the role of economic incentives and opportunity costs in shaping labor market behaviors.

Importantly, our analysis was constrained by a relatively narrow timeframe. This limitation restricts our capacity to project the long-term impacts of HBCCS on women's employment. Nevertheless, within the observed period, the data indicates that HBCCS has had a modest impact on the employment of Danish mothers in the short term.

Furthermore, the limited generalizability of the findings, due to the specific sample of first-time mothers living in Denmark for at least seven of the past eight years, points to the need for an expanded study. Future research that encompasses a broader range of family structures, allowing men to enter the study population, could offer more definitive and general insights into the effects of HBBCS.

In conclusion, while HBCCS appears to influence the employment trends of Danish mothers, the exact nature and extent of this influence are nuanced and context-dependent. Policymakers must, therefore, tread carefully in the design and implementation of such subsidies, taking into account not only the immediate economic implications but also the longer-term social and labor market dynamics. It is clear from our findings that a one-size-fits-all approach is insufficient. Tailored strategies that consider the diversity of mothers' circumstances and needs are crucial for crafting effective and equitable child care policies.

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11 Appendix

All regressions are available at https://github.com/tnr489/HBCCS.

Table 11.1: Description of Variables

Variable	**Description**
aeld_tid2	Post
c.pot_tilskud	Treatment Intensity
c.betalt_dagsats	Opportunity Costs
civst_n	Civil Status
hfudd_n	Educational Level
c.far_indk	Secondary Parent's Income (1,000 DKK)
befaar	Time-fixed Effects
ant_boern_n	Number of Children
alder_n	Age of Subject

Table 11.2: Regression results, Homogeneous model

Variable	Coefficient	P>|t|	Variable	Coefficient	P>|t|
aeld_tid2×*c.pot_tilskud*			aeld_tid2×*c.far_indk*		
-3	0.0		-3	-0.052	0
-2	0.0		-2	0.009	0.25
-1	0.0		-1	0.063*	0
0	0.05	0.21	0	-0.001	0.81
1	-0.053	0.16	1	0.005	0.3
2	-0.068*	0.02	2	-0.001	0.85
3	-0.088*	0.01	3	-0.009*	0.02
4	-0.01	0.74	4	-0.004*	0.0
5	0.037	0.25	5	-0.001	0.1
aeld_tid2×*c.betalt_dagsats*			befaar		
-3	0.0		2012	-1.276*	0
-2	0.0		2013	-1.615*	0
-1	0.0		2014	-1.162*	0
0	2.314*	0	2015	-0.733*	0.0
1	0.694*	0	2016	-0.78*	0
2	-0.361*	0.0	2017	-0.787*	0
3	-0.448*	0	2018	-0.478*	0.01
4	-0.521*	0	2019	-1.061*	0
5	-0.042*	0	2020	-2.194*	0
			2021	0.0	
aeld_tid2					
-2	1.915*	0	ant_boern_n		
-1	1.779*	0	1	-8.048*	0
0	-7.234*	0	2	-13.514*	0
1	0.313	0.64	3+	-18.272*	0
2	7.663*	0			
3	10.141*	0	alder_n		
4	12.787*	0	20-25	0.411	0.26
5	15.024*	0	25-30	0.059	0.88
			30-35	1.152*	0.01
civst_n			35-40	-0.197	0.7
Married	1.004*	0	Over 40	-3.449*	0
hfudd_n			_cons	76.287*	0
Eud	-8.002*	0	-	-	-
KVU	2.069*	0	-	-	-
LVU/PHD	22.235*	0	-	-	-
MVU/BACH	8.165*	0	-	-	-
			-	-	-

Notes: All values in percent. All values of a monetary value are additionally multiplied by 12, to interpret the effect from an increase in the monthly HBCCS-rate.

Table 11.3: Marginal effects, heterogeneous effect of the subsidy depending on Educational Level

Post	Low	P>|t| Low	High	P>|t| High
-3	0.000	-	0.000	-
-2	0.000	-	0.000	-
-1	0.000	-	0.000	-
0	0.344*	0.02	0.082	0.22
1	-0.351*	0.00	-0.181*	0.00
2	-0.191*	0.00	-0.126*	0.00
3	-0.068	0.31	-0.098*	0.02
4	0.020	0.74	-0.029	0.43
5	0.100	0.10	-0.012	0.75

Notes: The marginal effects of the subsidy wrt. maternal educational level when the potential subsidy is over 100,000 a year. All values in percent. All values of a monetary value are additionally multiplied by 12, to interpret the effect from an increase in the monthly HBCCS-rate.

Table 11.4: Marginal effects, heterogeneous effect of the subsidy depending on income level of secondary parent

Post	None	P>|z| None	Low	P>|z| Low	High	P>|z| High
-3	0.0		0.0		0.0	
-2	0.0		0.0		0.0	
-1	0.0		0.0		0.0	
0	0.291	0.17	0.154	0.18	0.074	0.35
1	-0.099	0.7	-0.326*	0.0	-0.233*	0.0
2	-0.342*	0.05	-0.187*	0.0	-0.132*	0.0
3	-0.199	0.48	-0.145*	0.01	-0.068	0.11
4	-0.254	0.32	0.007	0.91	-0.03	0.42
5	-0.531	0.07	0.154*	0.01	-0.042	0.29

Notes: The marginal effects of the subsidy wrt. secondary parent's income level when the potential subsidy is over 100,000 DKK a year. All values in percent. All values are additionally multiplied by 12, to interpret the effect from an increase in the monthly HBCCS-rate.

Table 11.5: Marginal effects, heterogeneous effect of the subsidy depending on Educational Level and secondary parents income, Low educational level

Low Edu, Post	None	P>|z| None	Low	P>|z| Low	High	P>|z| High
-3	0.000		0.000		0.000	
-2	0.000		0.000		0.000	
-1	0.000		0.000		0.000	
0	0.042	0.94	0.468*	0.02	0.161	0.49
1	-0.409	0.38	-0.345*	0.01	-0.358*	0.02
2	-0.632*	0.03	-0.186*	0.02	-0.137	0.14
3	-0.475	0.30	-0.093	0.31	-0.022	0.82
4	-0.601	0.15	0.056	0.51	-0.003	0.97
5	-0.545	0.25	0.257*	0.01	-0.065	0.44

Notes: The marginal effects of the subsidy wrt. secondary parent's income level and maternal educational level when the potential subsidy is over 100,000 a year. All values in percent. All values of are additionally multiplied by 12, to interpret the effect from an increase in the monthly HBCCS-rate.

Table 11.6: Marginal effects, heterogeneous effect of the subsidy depending on Educational Level and secondary parents income, High Educational Level

High Edu, Post	None	P>|z| None	Low	P>|z| Low	High	P>|z| High
-3	0.000		0.000		0.000	
-2	0.000		0.000		0.000	
-1	0.000		0.000		0.000	
0	0.405	0.05	-0.024	0.86	0.016	0.84
1	0.164	0.54	-0.229*	0.03	-0.194*	0.00
2	-0.138	0.50	-0.159*	0.02	-0.108*	0.01
3	0.024	0.95	-0.172*	0.03	-0.065	0.17
4	-0.016	0.96	-0.037	0.61	-0.027	0.51
5	-0.578	0.11	0.038	0.62	-0.023	0.60

Notes: The marginal effects of the subsidy wrt. secondary parent's income level and maternal educational level when the potential subsidy is over 100,000 a year. All values in percent. All values are additionally multiplied by 12, to interpret the effect from an increase in the monthly HBCCS-rate.

Table 11.7: Probit Model regression

Variable	Coefficient	P>|t|	Variable	Coefficient	P>|t|
aeld_tid2×*c.pot_tilskud_reg*			aeld_tid2×*far_indk_niveau*		
-3	0.0		-3#Low	-29.299*	0
-2	0.0		-3#None	-35.119*	0
-1	0.0		-2#Low	-32.527*	0
0	0.054*	0.0	-2#None	-61.727*	0
1	-0.014	0.4	-1#Low	-34.87*	0
2	-0.032*	0.02	-1#None	-88.147*	0
3	-0.055*	0	0#Low	-0.512	0.77
4	-0.026	0.08	0#None	69.442*	0
5	-0.014	0.36	1#Low	-9.337*	0
			1#None	2.743	0.58
aeld_tid2×*c.betalt_dagsats_reg*			2#Low	-16.155*	0
-3	0.0		2#None	-20.0*	0
-2	0.0		3#Low	-9.154*	0
-1	0.0		3#None	-12.528*	0.01
0	2.5*	0	4#Low	-4.405*	0.01
1	0.923*	0	4#None	-3.519	0.52
2	0.257*	0	5#Low	-0.985	0.61
3	0.348*	0	5#None	0.083	0.99
4	0.542*	0			
5	0.709*	0	befaar		
			2012	-9.962*	0
aeld_tid2			2013	-14.582*	0
-2	27.152*	0	2014	-13.652*	0
-1	40.936*	0	2015	-11.609*	0
0	-126.143*	0	2016	-10.804*	0
1	-56.83*	0	2017	-8.053*	0
2	-16.553*	0	2018	-2.445	0.12
3	-15.436*	0	2019	-0.331	0.85
4	-16.711*	0	2020	-7.015*	0
5	-15.485*	0	2021	5.388*	0.01
civst_n			ant_boern_n		
Married	13.954*	0	1	-75.208*	0
			2	-113.868*	0
hfudd_n			3+	-166.193*	0
Eud	62.487*	0			
KVU	96.188*	0	alder_n		
LVU/PHD	134.986*	0	20-25	37.045*	0
MVU/BACH	92.942*	0	25-30	53.123*	0
			30-35	81.079*	0
-	-	-	35-40	87.892*	0
-	-	-	Over 40	86.957*	0
-	-	-			
-	-	-	_cons	72.081*	0
-	-	-	/lnsig2u	31.525	
-	-	-	sigma_u	117.073	
-	-	-	rho	57.817	

Notes: All values in percent. We use the far_indk_niveau instead of far_indk as the probit model is sensitive to continuous variables. As the coefficient aren't directly interpretable, we only use the model to look at the direction the variables affect the probability of employment.

Table 11.8: Labor Force participation, Model regression

Variable	Coefficient	P>|t|	Variable	Coefficient	P>|t|
#c.pot_tilskud_reg			#c.far_indk		
-3	0.0		0	-0.004*	0
-2	0.0		1	0.001	0.05
-1	0.0		2	0.005*	0
0	0.01*	0.0	3	0.0	0.54
1	-0.013*	0	4	0.0	0.62
2	-0.007*	0.0	5	-0.0	0.66
3	-0.006*	0.02	6	-0.001*	0.02
4	0.001	0.82	7	-0.0*	0
5	0.006*	0.02	8	-0.001	0.14
#c.betalt_dagsats_reg			befaar		
-3	0.0		2012	-0.387*	0.03
-2	0.0		2013	-0.356*	0.04
-1	0.0		2014	0.035	0.86
0	0.24*	0	2015	0.172	0.38
1	0.001	0.91	2016	0.096	0.61
2	-0.044*	0	2017	0.346*	0.05
3	-0.013	0.18	2018	0.392*	0.01
4	0.001	0.89	2019	-0.19	0.07
5	0.006	0.53	2020	-0.47*	0
			2021	0.0	
aeld_tid2					
-2	1.038*	0	ant_boern_n		
-1	0.724*	0	1	-8.713*	0
0	-12.548*	0	2	-15.555*	0
1	4.366*	0	3+	-22.436*	0
2	7.769*	0			
3	8.52*	0	alder_n		
4	10.141*	0	20-25	1.901*	0
5	11.446*	0	25-30	0.962*	0.01
			30-35	2.079*	0
civst_n			35-40	1.595*	0.0
Married	0.593*	0	Over 40	-0.071	0.91
hfudd_n			_cons	72.834*	0
Eud	-2.817*	0	-	-	-
KVU	7.865*	0	-	-	-
LVU/PHD	37.586*	0	-	-	-
MVU/BACH	15.301*	0	-	-	-
			-	-	-

Notes: All values in percent. No values are multiplied by 12.