The causal effect of childcare subsidies on the labor supply of mothers with young children in the Netherlands

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Table of Contents

1. Introduction

Parents form a substantial size of the labor force and play a vital role in the labor market. In the Netherlands, parents with a child under the age of 12 make up approximately 25% of the labor force (SZW 2015: 6). The Ministry of Social Affairs and Employment stated in a policy review that increasing the labor supply of parents is desirable as it can contribute to economic growth and potentially address challenges associated with population aging. Furthermore, it can have a positive effect on the economic independence of mothers and overall quality of life (SZW 2015).

Many countries are particularly focused on improving the labor supply of mothers with young children. The emphasis on this group originates from the understanding that they hold considerable potential to augment the labor supply (Akgunduz and Plantenga 2011). An approach that is presented as one of the most effective methods to achieve this objective is the provision of childcare services and reducing the financial burden of childcare for parents (CPB 2015a). Policymakers frequently reference Scandinavian countries where there is substantial public expenditure on childcare and high participation rates among mothers. As a result, several countries and regions have partially adopted the Scandinavian model by offering generous childcare subsidies to parents with young children. One of these countries is the Netherlands, where the subsidy for childcare doubled in the period from 2005 until 2009 with the introduction of the Law on Childcare (Bettendorf *et al.* 2015). However, in response to the economic crisis in 2008, the Dutch government opted to reduce childcare subsidies from 2010 until 2013. Subsequently, from 2015 onwards, they made the decision to reinvest again and increase the subsidies with a notable rise occurring in 2016 and 2017.This study aims to examine the causal effects of the two childcare subsidy reforms in 2010-2013 and 2016-2017 on the labor supply of mothers. The labor supply is analyzed by breaking it down into two components: the number of individuals engaged in work and the intensity of work contributed by those individuals. This differentiation highlights the individual-level decision of whether to work and how much to work. These components are respectively known as the extensive margin and intensive margin of labor supply. At the aggregate level, the extensive margin is commonly quantified by the percentage of individuals of working age in paid employment, while the intensive margin is assessed by the average number of working hours (Blundell *et al.* 2011). In this study the labor participation and hours worked are also used to analyze the extensive and intensive margin of labor supply of mothers with young children. The explanatory research question that will be answered is:

What effect did the change in the childcare subsidies have in the periods 2010 until 2013 and 2016 until 2017 on the labor participation and hours worked of mothers in the Netherlands?

To capture the overall effects of the reforms on the two dependent variables participation and hours worked, this study follows the strategy used by Bettendorf *et al.* (2015) to analyze the effects of the Law on Childcare introduced in 2005 on the labor supply of mothers with young children. Namely, a difference-in-difference strategy (DID). The difference-in-difference strategy is preferable because it can use policy changes as exogenous variation in childcare prices for parents to deal with identification problems related to the endogeneity of the explanatory variables (*Ibid.*). Also, a comparable treatment group and control group is used. Mothers with the youngest child up to 12 years old who are living at home form the treatment group, because they can apply for childcare subsidies. Mothers with the youngest

child between 13 years and 21 years old, who are living at home, form the control group. However, this research distinguishes itself from the study of Bettendorf *et al.* (2015) in several ways. Firstly, it examines reforms in childcare subsidies in different time periods. Secondly, it not only analyzes an increase in childcare subsidies but also explores the impact of a decrease. Finally, it utilizes a different dataset, namely the LISS (Longitudinal Internet studies for the Social Sciences) panel administered by Centerdata (Tilburg University, The Netherlands)

This study draws on a variety of existing theories, both at the micro-level, like the collective model and the basic labor supply model and at the macro-level, like the welfare state regimes, to derive the hypotheses. In this study a small negative effect is found with the retrenchments in childcare subsidies in 2010 until 2013 for participation and hours worked that are significant. In the period 2016-2017 a small positive effect is found of the investment in childcare subsidies on the participation and hours worked that are also significant.

Overall, this study makes several valuable contributions to the academic literature. These contributions are further explained after the literature review. First, while most studies have focused on an increase in childcare subsidies, this study stands out as one of the first to utilize a difference-in-difference strategy in analyzing a decrease in childcare subsidies. Second, to the best of my knowledge, this is the first study that employs the LISS data panel to analyze the effects of childcare subsidy reforms with a difference-in-difference approach. Third, this study also focusses on several subgroups, to get a more nuanced view of the results. Finally, to my knowledge, this study is the first one that examines the increase in childcare subsidies in 2016 and 2017 using a difference-in-difference strategy.

Next to the academic relevance, there is also a societal relevance of this study. Like mentioned before, promoting an increase in the labor supply of parents is considered desirable due to its potential to foster economic growth and address issues related to the population aging. Furthermore, this endeavor is often accompanied by the recognition of positive effects on the economic independence of mothers and the overall improvement of quality of life (SZW 2015). Second, the discussion about free childcare in the Netherlands found new ground lately (NOS 2023). This research might contribute to this discussion. Finally, the reforms are done in a highly developed OECD country. Similar countries who are planning to reform the childcare subsidy policies might take interest in the results of this study.

2. Literature and theory

In this part, first an overview of the literature is given, second a theoretical framework is provided, third the hypotheses are formulated and finally the academic relevance is discussed more extensively.

2.1 Literature review

In this literature review, first the international studies are analyzed and after that the studies conducted in the Netherlands.

2.1.1 International studies

Internationally, a vast amount of research has been conducted on the effect of the costs of childcare on the labor supply of parents, but the results are not always unambiguous. In the analysis of the effects, it's important to make a distinction between the influence of the

costs of childcare on the use of childcare (price elasticity of the demand of formal childcare) on the one side and on the other side on the labor supply (labor supply elasticity). From the literature it turns out that (small) changes in the costs of formal childcare influence the use of childcare: people use more formal childcare with low costs and less when it becomes more expensive (Berenschot 2021). According to the meta-analysis conducted by Ooms *et al.* (2003), variations in childcare pricing have been found to influence the demand for childcare, highlighting differences across different forms of childcare. They find a price elasticity of -0,15 for daycare, so a price increase of 10% would lead to a decrease of 1,5% in demand. For guest parents they find a price elasticity of -0,7. This forms a substantial difference of 5,5% and shows that the demand for guest parents is more sensitive to price changes then the demand for daycare. A reason for this could be that guest parents are more easily replaceable with informal childcare (Berenschot 2021).

When looking at the empirical studies that analyze the relationship between the costs of formal childcare and the labor supply of mothers, different sources of variation are exploited. The costs of childcare can differ across regions, at the household level or because of childcare policy (reforms). The initial empirical investigations revolved around cross-sectional regressions of employment, using public childcare as the primary explanatory variable. However, these studies encounter significant methodological difficulties, primarily due to the endogeneity of formal childcare and employment in such estimations. Endogeneity occurs when a variable, observed or unobserved, that is not included in our model is related to a variable that's incorporated in our model. There are many variables that can for example potentially influence the decisions for formal childcare, like trust in formal childcare institutions. So, that's why these studies encountered significant methodological difficulties (Müller and Wrohlich 2020). Of these studies, the prevailing body of research is primarily focused on studies conducted in the United States (Han and Waldfogel 2001, Baum 2002, Meyers *et al.* 2002, Anderson and Levine 2000). They nearly all consistently establish a significant relationship between childcare costs and maternal employment. Blau and Currie (2006) provide a comprehensive analysis of this body of research and present estimated price elasticities of maternal employment related to childcare ranging from 0,06 to -3,60. They suggest that the variations in estimated price elasticities of maternal labor participation regarding childcare costs can be primarily attributed to methodological differences, such as discrepancies in model specifications, inclusion/exclusion restrictions, and control variables. They argue that these methodological factors play a more significant role in explaining the differences observed, rather than variations in data sources and samples.

Studies employing structural approaches that directly model the childcare decision and maternal labor supply tend to yield smaller employment elasticities concerning childcare costs. More recently, researchers have employed quasi-experimental settings created by policy reforms to address some identification issues (Müller and Wrohlich 2020). When individual data regarding the utilization of subsidized childcare is accessible, researchers employ exogenous variation as an instrument to address childcare choices within an instrumental variable (IV) framework (Fitzpatrick 2010, Fitzpatrick 2012, Berlinksi *et al.* 2011). This variation can for example arise from the staggered introduction of subsidies or the expansion of subsidies (Blau and Tekin 2007, Felfe *et al.* 2014). In situations where household information on childcare choice is unavailable, quasi-experimental variation is employed within a difference-in-difference (DID) or panel framework to identify intention-to-treat effects. These studies, for example, leverage exogenous variation within a specific

state (Berger and Black 1992) or examine the differences between a treated region and the remaining parts of the country (Goux and Maurin 2010, Gelbach 2002).

Quasi-experimental studies have provided valuable insights that offer a nuanced perspective on the earlier literature's unequivocal findings. A considerable portion of quasi-experimental studies fails to identify statistically or economically significant effects (Fitzpatrick 2010, Havnes and Mogstad 2011, Lundin et al. 2008), highlighting the complexity of the relationship. Moreover, results often exhibit heterogeneity, for example, employment effects are more frequently significant for single mothers as opposed to married or cohabiting mothers (Cascio 2009, Goux and Maurin 2010).

2.1.2 Dutch Studies

In the Netherlands, the found effects of costs of childcare on the labor supply of women is in general small (Akgunduz en.Plantenga 2011, Bargain et al. 2012, Jongen 2010, Wetzels 2005), or can't be demonstrated (Portegijs et al. 2006).

The CPB (a Ducth institute that does economic prognoses and analyses) did several studies on the effects of the costs of childcare on the maternal labor supply. In 2015 they compared different fiscal instruments with each other that could promote the maternal labor supply in the Netherlands (CPB 2015a). This comparison pointed out that childcare subsidy was one of the most effective measures to incentivize especially mothers to start or stay working, but the effects are still small. The main reason given for the limited effects was that many parents choose to replace informal childcare with formal childcare when formal childcare becomes cheaper (CPB 2015a, CPB2015b, Jongen *et al.* 2014). The replacement of informal childcare with formal childcare is also called substitution. National and international literature show that this is an important reason why the increase in the use of formal childcare only has a limited relation with the increase in labor supply (Akgündüz and Plantenga 2011, Portegijs *et al.* 2014, SER 2016). Substitution partially correlates with working part-time because women who work part-time typically require childcare for only two or three days per week (what is in line with the cultural acceptance of the use of childcare in the Netherlands) (Merens *et al.* 2012). For part-time childcare, it's generally easier to find alternatives, such as working even fewer hours or utilizing informal childcare. The part-time model makes alternatives more readily available for formal childcare (Plantenga 2010) That's why part-time work is associated with weaker elasticities (Akgunduz en Plantenga 2011). So, research (Bettendorf et al. 2015, Jongen 2010) shows that in the Netherlands there have been many changes in the use of formal and informal childcare, but that the effects on the maternal labor supply have been moderate. Despite this, the CPB rapport still reasons that childcare subsidy is relative effective in comparison to other fiscal instruments because it focusses on mothers with young children, a group where much improvement in labor supply can be gained (CPB 2015a). Not due to the sheer number engaged in paid labor (77% of mothers aged 25 to 45 in 2017) (CBS 2017), but primarily due to the relatively high percentage of part-time workers and the low number of hours worked (80% of women worked part-time in 2017) (*Ibid.*).

In addition to the financial analyses from the CPB, the SCP (Social and Cultural Planning office, a national institute that conducts social research) conducted a more sociological research in 2013 (Portegijs *et al.* 2014). The primary factor was the reduction in childcare services. Various approaches were employed to investigate parental attitudes toward childcare in 2013 and whether they subsequently adjusted their work hours due to the cutbacks. The findings revealed that while many parents reduced their childcare usage

due to cost considerations, only a small fraction of parents actually decreased their working hours for this reason. Estimates indicated that around 2% to 3% of parents who were using formal childcare before the cutbacks commenced reduced their working hours as a consequence of the reductions (SZW 2015). The research also showed that the reduction in the use of childcare was sometimes a consequence instead of a cause of the reduction in the labor supply. A larger part of the parents started working less because they (partly as a consequence of the economic crisis) lost their jobs or could work less hours. Because of this they were able to care more for the children and could make less use of childcare (Portegijs *et al.* 2014).

In another report by the SCP concerning formal childcare and low-income households, they delve into the limited utilization of formal childcare within this demographic. They concluded that financial incentives account for only a portion of the explanation. Despite being largely unaffected by the cutbacks and benefiting from comparatively lower childcare fees, the utilization of childcare remains relatively low. The report demonstrates that trust in childcare is diminished among lower-income households and suggests that this factor also contributes to the relatively low usage of childcare (Roeters & Bucx 2016).

Furthermore, smaller effects from changes in childcare costs are typically observed in countries with a high rate of women's labor participation (Lundin *et al.* 2008). In the Netherlands, a relatively high percentage of women is employed. Consequently, there might not be substantial room for further improvement in women's labor participation, meaning that additional increases in subsidies may not yield significant effects from a labor participation perspective (Jongen 2010). Additionally, countries with a high proportion of women participating in the labor force usually possess a well-established childcare infrastructure, which indicates that the demand for childcare is generally met. Moreover, alternative measures are often available to support women's labor supply. In the Netherlands, these include the option to work part-time, access to leave of absence, and more recently, flexible work arrangements (Portegijs *et al.* 2014).

Finally, not only financial-economic factors have an influence on the labor supply and childcare decisions of mothers. Cultural norms, views and preferences are also important factors that influence the choices of mothers (Cloïn 2010, Van Gameren and Ooms 2009, Portegijs *et al.* 2006).

In conclusion, it's essential to note the substantial diversity among the studies included in this analysis. They vary in terms of design, assumptions, and research methods. Moreover, sample compositions range widely, from exclusively (married) women with partners to single mothers. Furthermore, samples may solely consist of mothers or parents, or encompass individuals with varying socioeconomic statuses. These differences pose challenges when attempting to compare and interpret the results (Ooms *et al.* 2003).

To summarize, the literature does indicate the impact of childcare costs on its utilization, though the effects on labor participation are less clear-cut. Initial empirical investigations, primarily conducted in the United States, consistently revealed a significant relationship between childcare costs and maternal labor supply. However, these studies faced methodological challenges. More recently, researchers have employed quasi-experimental setups using exogenous variation to address identification issues. Quasi-experimental studies have provided valuable insights that offer a nuanced perspective compared to the earlier literature's unequivocal findings. These studies tend to yield smaller employment elasticities concerning childcare costs. In the Netherlands, the effects of

childcare costs on women's labor supply are generally small or challenging to demonstrate. Several reasons contribute to this. Substitution, the prevalent part-time working model, an already high women's participation rate, a well-established childcare infrastructure, and alternative measures supporting women's labor supply all play roles.

2.2 Theoretical framework

This research is about the effect of childcare subsidies on the labor supply of mothers. In other words, what is the effect of an increase or decrease in the costs of childcare on the decision of mothers to participate on the labor market and the number of hours to work. To analyze this, first the entity that makes the decision is explored, after that the basic economic model wherein the decision is made is studied and finally the welfare state is investigated that influence the norms and values. The first two points are on the individual level and are micro-level theories, the last point is on a national level and can be considered as a macro-level theory.

2.2.1 The decision-making entity

Researchers have tried to understand labor supply choices by modeling the decision to participate on the labor market and the number of hours worked. The first step is to determine who makes the decision and what objective they aim to maximize. The literature commonly adopts one of the following approaches (Turon 2022).

In one approach, the decision-maker is the woman as an individual, whether she is a single or married mother. This perspective, can for example, consider the woman's response to tax and benefit reforms, as lone mothers are particularly affected by welfare reforms due to their sensitivity to incentives for labor supply participation and vulnerability to poverty. Other studies focus on individual labor supply models for women, whether they are single or married, with the assumption that the spouse's labor earnings are fixed (*Ibid.*).

Another approach, known as the unitary model, assumes that either both spouses have the same preferences, or one spouse makes all the decisions. In this model, the household maximizes a fixed utility function over time, and decisions are independent of each spouse's income share. However, empirical studies have challenged this assumption, indicating that it may not accurately reflect reality. Despite this, the unitary approach remains popular due to its simplicity (*Ibid.*).

The third approach, called the collective model, considers bargaining between spouses in making decisions to achieve Pareto-efficient outcomes. This approach applies to both consumption decisions and labor supply choices. Spouses may have different preferences, and the household's behavior depends on their relative bargaining power. The share of household income and factors influencing bargaining strength play a role in decision-making. The decision-making entity in this model maximizes a combination of both spouses' utilities. Empirical evidence generally supports the collective model over the unitary assumption. For instance, research by Fortin and Lacroix (1997) examined Canadian data and found that the collective model better explained household labor supply for most subgroups. Further research has incorporated public goods into the collective model, highlighting the inadequacy of a model based solely on private commodities for households with children. Understanding couples' decisions using the collective model is valuable for assessing policies targeted at specific spouses. Such policies, by influencing the relative income shares of spouses, affect their weights in the household objective function and consequently influence household decisions (Turon 2022).

This study is convinced that in households with two spouses the collective model can be applied because of the empirical evidence. So, the household's behavior depends on the relative bargaining power.

2.2.2 Basic model of labor supply and childcare

The prevailing theoretical framework utilized in the literature to analyze the impact of childcare prices on labor supply is primarily based on the basic static labor supply model, with adaptations made to incorporate childcare prices and decision-making. The main idea of the basic static labor supply model without the adaptation is as follows: as the wages increase, it encourages more people to join the workforce. This can be explained by the substitution effect, where the attractiveness of paid work rises, prompting individuals to trade leisure time and unpaid work for paid employment. Additionally, a higher hourly wage has an income effect, allowing individuals to earn the same income while working fewer hours. Consequently, a higher hourly wage can potentially lead to a decrease in labor force participation. The theory does not specify which effect outweighs the other (Kok *et al.* 2011). However, empirical research demonstrates that the positive substitution effect for women is considerably larger than the negative income effect. As a result, an increase in the hourly wage leads to a higher labor supply among women in general (Blundell and Macurdy 1999).

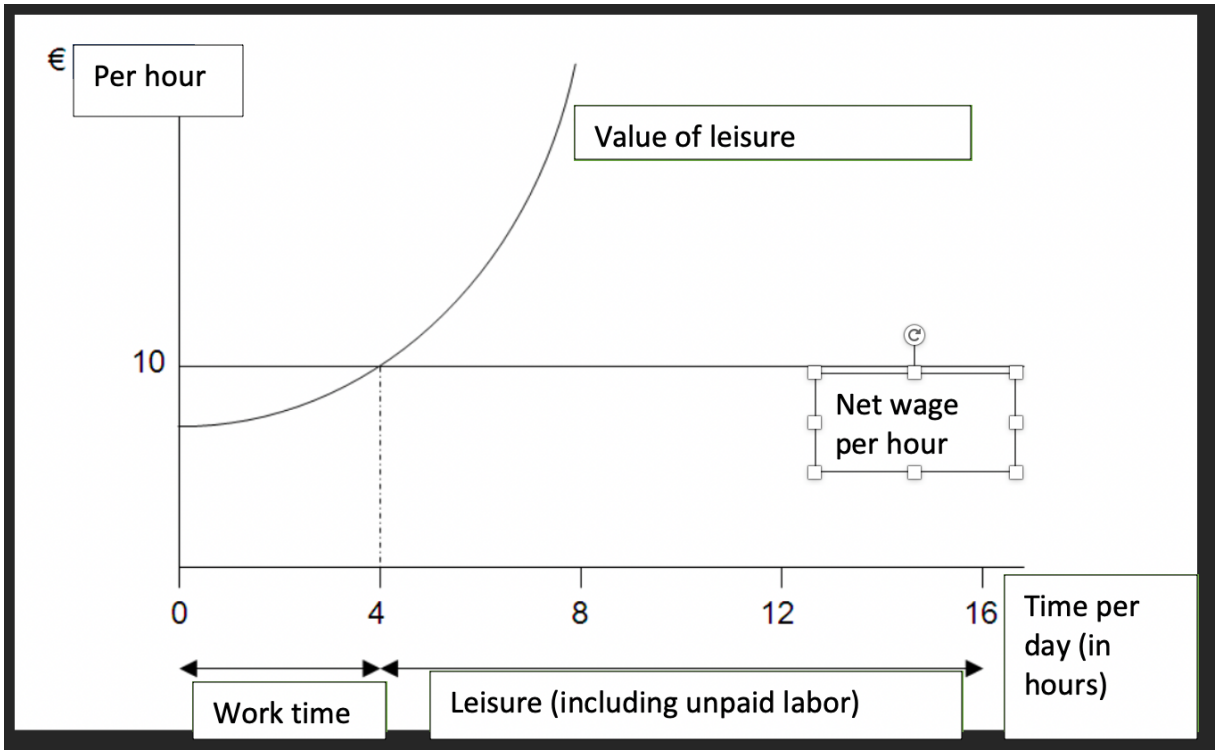

Figure 3.1: Value of paid labor and leisure. Source: Kok *et al.* 2011.

The trade-off people make between paid work, leisure time and unpaid work is illustrated in figure 3.1**.** The x-axis represents the number of hours per day, excluding eight hours of sleep. The individual has the opportunity to earn a net wage of €10 per hour in the labor market. The minimum desired hourly wage or the reservation wage is determined by the value attributed to leisure time, which includes unpaid work. The reservation wage refers to the minimum wage that a worker is willing to accept in order to take up a specific job. As the individual works more hours, the value of leisure time increases because it becomes scarcer (Kok *et al.* 2011). In this specific example (figure 3.1), the optimal balance is

achieved at four hours of paid work per day. At this point, the value of leisure time and unpaid work is equivalent to the individual's net hourly wage. The individual has no incentive to work more hours as the value of leisure time surpasses the net hourly wage. Similarly, the individual does not wish to work fewer hours. By exchanging hours of leisure time for paid work, the individual can enhance their overall well-being or utility. Therefore, the individual decides to allocate four hours to paid work and enjoys 12 hours of leisure time.

If the value of leisure time and unpaid work increases the curved line moves upwards, resulting in a reduction in the number of hours worked by the individual. At the same time, if the value of leisure time and unpaid work were lower, the individual would have chosen to work more hours. Similarly, if the net wage decreases, the straight horizontal line shifts downward, leading to a decrease in the number of hours worked. The value of the last hour of forgone leisure time corresponds to the net hourly wage (*Ibid.*).

Heckman (1974) was among the first to recognize the significance of childcare prices for female labor supply and introduced the simple static labor supply model with modifications that incorporate childcare prices and choices, a study referred to as pioneering work in this field by Blau and Robins (1988). Over time, several variations of the static model have been proposed, offering different levels of flexibility by incorporating factors such as childcare quality, unpaid care, and household decision-making (Blau and Robins 1988, Connelly 1992, Ribar 1995, Powell 2002, Tekin, 2007).

Labor supply models typically begin with a utility function (U) that encompasses both consumption (c) and leisure (l). The maximization problem in labor supply models involves two constraints. The first constraint is the time constraint, represented by the equation $l + h = T$, where l denotes leisure time, h represents hours of work, and T represents total available time. The second constraint is the budget constraint, given by $C = y + wh$, where c represents consumption, y denotes non-labor income and w represents the wage rate (Agkunduz and Plantenga 2015).

As explained above, the reservation wage plays a crucial role in an individual's decision to participate in the labor force. In order to engage in the labor market, individuals must ensure that their benefits from working exceed their reservation wage. Thus, their utility from working should be greater than or equal to their reservation wage to ensure a non-negative surplus. The utility function U(c,l), as defined earlier, can be illustrated through a series of indifference curves. Each indifference curve represents different combinations of consumption and leisure that result in the same level of utility for the individual. These curves typically have a convex shape, indicating that the marginal value of leisure increases as the number of working hours increases, and vice versa. The degree of convexity depends on the substitutability between consumption and leisure (*Ibid.*).

In addition to consumption and leisure, unpaid work, such as providing childcare, can be considered as a potential third component in the decision to participate in the labor force. As providing childcare can be seen as a form of leisure, dedicating time to taking care of the children comes at the expense of participating in paid labor. So, to incorporate childcare in the labor supply model the following budget constraint is proposed $C = y + (w-p)h$ where p is the price of formal childcare. In the simplified budget constraint, the price of childcare is considered as an equivalent to a tax on wages. It is assumed that for every hour of work, an hour of childcare needs to be purchased. Consequently, the effects of changes in childcare prices are similar to those of changes in taxation. Higher childcare prices make it less likely for the effective wage rate (w - p) to surpass the reservation wage, which affects the decision to participate in the labor force. In other words, as the price of formal childcare

(p) is subtracted from the wage rate (w), the inclusion of formal childcare in the model results in a lower net wage. Therefore, the utilization of formal childcare has a negative impact on women's labor supply decision (*Ibid.*).

To mitigate the adverse impact of formal childcare on women's labor force participation, the government may offer subsidies. These subsidies involve partially compensating the hourly cost of childcare, resulting in reduced expenses for parents by the amount of the subsidy. The subsidy rate is represented by s and the following budget constraint can be formed C = y + (w - p + s)h. Since (w-p+s) lies in between (w-p) and w, childcare subsidies serve to partially mitigate the adverse impact of childcare costs on the maternal labor supply. Consequently, these subsidies have the potential to encourage greater participation in the labor market and can also incentivize women who are already participating to increase their level of labor supply (*Ibid.*).

The basic model can be enhanced by considering two common modifications: unpaid care and the quality of childcare. Incorporating unpaid care allows for a departure from the assumption that formal childcare hours must align with working hours. This modification provides an explanation for the phenomenon of working women who do not utilize formal care services. The other modification involves challenging the assumption that the quality of childcare is uniform across different types of care, including maternal care and other forms of care (*Ibid.*).

2.2.3 Social norms and welfare state regimes

The theoretical framework on welfare state regimes highlights the role of social norms in shaping the maternal labor supply decisions. As a result, parents' decisions regarding paid and unpaid work are influenced by these societal norms rather than being made in isolation. Grunow *et al.* (2012) emphasize that social norms regarding the behavior of mothers can have a stronger impact on decisions than individual characteristics. Geisler and Kreyenfeld (2011) argue that the welfare state regimes are established within the societal norms, but the societal norms are also perpetuated within welfare state regimes. This suggests that welfare state regimes can play a role in reinforcing specific norms around work and care (Gangl and Ziefle, 2015).

The concept of different welfare state regimes, rather than a single unified model, was developed by Esping-Andersen (Arts and Gelissen 2002). His original classification identified three main types: social democratic, conservative, and liberal welfare state regimes (*Ibid.*). Despite having many social democratic characteristics, the Netherlands is classified as a conservative welfare state by Visser and Hemerijck (1997), renowned experts on the Dutch welfare state. The conservative welfare state regime contributes to the creation of ‘structures of inequality’, specifically concerning family and household configurations as well as gender roles (Esping-Andersen 2018). The Dutch conservative welfare state regime has historically promoted a strong male breadwinner culture, leading to a division of labor where women primarily engage in unpaid work and men in paid work. Consequently, traditional gender roles have been prevalent in family structures, with women being expected to assume the responsibilities of childcare and housework (Berenschot 2021). When couples become parents, mothers are typically seen as the primary caregivers, while men are expected to play a supporting role (Esping-Andersen 2018).

According to the theoretical framework on welfare state regimes, national assumptions about gender greatly influence men's and women's engagement in both paid and unpaid work (Hook 2006). A welfare state regime can contribute to an environment that

promotes a particular division of tasks between genders (Geist 2005). In the context of the Dutch conservative welfare state regime, there has been a longstanding endorsement of a "gendered allocation of labor" (Berenschot 2021). But a welfare regime is not the only factor that influences societal norms, aspects like cultural heritage, family and peer dynamics, and social stigma also play an important role (Gimenez *et al.* 2011). Moreover, societal norms frequently exhibit non-uniformity within a country. For example, an examination of the labor supply among various immigrant groups reveals that female migrants with non-western backgrounds, in general, tend to have a lower labor supply than native Dutch women. However, women with a Surinamese background often match the labor supply of native Dutch women and display an even higher degree of economic independence. This phenomenon can be attributed, among other factors, to disparities in societal norms (Merens *et al.* 2012).

In summary, the collective model, grounded in relative bargaining power, serves to comprehend decision-making entities. The basic static labor supply model, supplemented with childcare considerations, helps grasp the balance between paid employment and leisure, encompassing unpaid work. Additionally, the welfare regime aids in comprehending the societal norms that impact labor supply choices. However, welfare regimes aren't the sole influencers of societal norms, and societal norms can vary within a country.

2.4 Hypotheses

Following the literature review and the theoretical framework, this section introduces the hypotheses of this research. Because this study analyzes two different reforms, the hypotheses are introduced in two parts. The initial section pertains to the reforms spanning from 2010 to 2013, while the subsequent section delves into the reforms encompassing the years 2016 and 2017.

2.4.1 Reform 2010-2013

After the economic crisis, the government decided to cut back on childcare subsidy. Particularly from 2011 onwards, the subsidies began to decrease, leading to increased childcare costs for parents. Initially, as demonstrated, childcare subsidies could augment mothers' net wages. Although the policy isn't gender-specific, mothers are typically the primary caregivers. This means that they are most likely to substitute between hours worked and leisure or unpaid labor and that in the basic labor supply model the costs of childcare are calculated over their net wage. A reduction in subsidies would result in a decline in a mother's net wage. Consequently, the net wage might not surpass the reservation wage as easily, making working less advantageous compared to leisure. Given this perspective, it is anticipated that reduced subsidies would lead to decreased maternal labor supply. However, the impact is likely to be limited, given the prevalence of part-time work among women and the potential to substitute formal childcare with informal alternatives.

Second, a reduction in the subsidies might reduce the bargaining power of the mothers in a two-person household. Again, since the costs of childcare are most likely calculated over the net income of the mother, a reduction in the subsidy would mean that the mother can bring less resources into the household. This would result in a reduction of the bargaining power of the mother. An effect of this might be that the mother has to do more unpaid work in the household. But it must be noted that the preferences of the spouses are not known.

In line with the arguments given, it's expected that the retrenchment in childcare subsidies caused a reduction of the labor participation of mothers. This leads us to the first hypothesis:

Hypothesis 1.1: The reduction in the childcare subsidy from 2010 to 2013 has a negative effect on the labor participation of mothers.

This study also explores working hours due to the large proportion of part-time employed mothers in the Netherlands, combined with the relatively fewer hours worked compared to similar nations. We anticipate analogous outcomes as with labor participation, guided by the same reasoning. The only difference is that with hours worked the effect might be smaller. This reason for this is that the participation rate is already relatively high, and the hours worked relatively low. So, in participation there is more room for loss in comparison to hours worked. This leads us to the second hypotheses:

Hypothesis 1.2: The reduction in the childcare subsidy from 2010 to 2013 has a negative effect on the hours worked by mothers.

Given the acknowledgement in previous studies that results may vary among different subgroups, this research also focuses on specific subgroups to gain a more detailed understanding of the data. By studying these subgroups, we aim to uncover potential subgroup-specific effects or interactions, providing nuanced insights into the research findings. First the subgroups of mothers with the youngest child of 0-3, 4-8 and 9-12 are studied. Since mothers with the youngest child of 0-3 make the most use of formal childcare in comparison to the other groups (SCP 2020). It's expected that the reduction in the subsidy has a larger effect on mothers with the youngest child of 0-3. This leads us to the third hypothesis:

Hypothesis 1.3: The reduction in the childcare subsidy from 2010 to 2013 has a larger negative effect on the labor participation of mothers with the youngest child of 0-3 in comparison to mothers with the youngest child of 4-8 or 9-12.

The second subgroup is formed by single women and women in couples. Since single mothers are expected to have a lower household income, the reduction might have a larger effect. This is because the percentage of net income that goes to childcare is relatively large. So, it's expected that the reduction in the subsidy has a larger effect on single mothers. This leads us to the fourth hypothesis:

Hypothesis 1.4: The reduction in the childcare subsidy from 2010 to 2013 has a larger negative effect on the labor participation of single mothers in comparison to mothers in couples.

Finally, we look at the subgroup of mothers with a low income, middle income and high income. At first, we would expect a larger effect for mothers with a low income because the percentage of net income that goes to childcare is relatively large. On the other side, the reductions in the subsidy mainly focused on households with a middle and high income (Portegijs *et al.* 2014), what might make the effect smaller for mothers with a low income.

Also, the research of the SCP (Roeters & Bucx 2016) showed that mothers with a low socioeconomic status are less likely to use formal childcare. This might also influence the effect. That's why similar effects are expected. This leads us to the following hypothesis:

Hypothesis 1.5: The reduction in the childcare subsidy from 2010 to 2013 has a similar negative effect on the labor participation of mothers with a low, middle, and high income.

2.4.2 Reform 2016-2017

In 2015, the government opted to reinvest in childcare, leading to the augmentation and extension of childcare subsidies. This led to a general reduction in childcare costs for parents. Similar outcomes are foreseen as those during the reforms in 2010-2013, albeit in the opposite direction. Thus, the predominantly negative impact from subsidy reduction transforms into a positive influence due to the subsidy increase. As explained earlier, an upsurge in the subsidy would result in an elevation of the net wage. Consequently, the net wage would be more inclined to surpass the reservation wage, rendering work more valuable compared to leisure. The primary anticipated distinction lies in the scale of the effect, given the already relatively high labor participation rate. Consequently, there is more to potentially lose than to gain. Hence, the impact on labor participation is expected to be less pronounced with a subsidy increase in contrast to a subsidy decrease.

It might also increase the bargaining power of the mothers in a two-person household. Since the costs of childcare are most likely calculated over the net income of the mother, an increase in subsidy would increase the resources the mother brings into the household and thus increase the bargaining power.

In line with this reasoning, it's expected that the investment in childcare subsidies caused an increase in the labor participation of mothers. This leads us to the first hypothesis:

Hypothesis 2.1: The increase in the childcare subsidy from 2016 to 2017 has a positive effect on the labor participation of mothers.

Furthermore, this study also examines working hours. However, this time, a greater effect is anticipated compared to labor participation, as there is a greater potential for mothers to increase their working hours. This brings us to the following hypothesis:

Hypothesis 2.2: The increase in the childcare subsidy from 2016 to 2017 has a positive effect on the hours worked of mothers.

For the subgroup of mothers with the youngest child of 0-3, 4-8 and 9-12 we expect there to be a larger effect on mothers with the youngest child of 0-3 in comparison to the other groups. The reason for this is that that mothers with the youngest child of 0-3 make the most use of formal childcare (SCP 2020). This leads us to the third hypothesis:

Hypothesis 2.3: The increase in the childcare subsidy from 2016 to 2017 has a larger positive effect on the labor participation of mothers with the youngest child of 0-3 in comparison to mothers with the youngest child of 4-8 or 9-12.

The second group subgroup is composed of single women and women in couples. Since single mothers are expected to have a lower household income, the increase might have a

larger effect because the percentage of net income that goes to childcare is relatively large. So, it's expected that the increase in the childcare subsidy has a larger effect on single women. This leads us to the fourth hypotheses:

Hypothesis 2.4: The increase in the childcare subsidy from 2016 to 2017 has a larger positive effect on the labor participation of single mothers in comparison to mothers in couples.

Finally, we look again at the subgroup of mothers with a low income, middle income, and high income. At first, we expect the effect to be larger for the mothers with a low income. But the childcare subsidy has been relatively constant in comparison to mothers with a middle and high income (Portegijs *et al.* 2014) and mothers with a low socioeconomic status are less likely to use childcare (Roeters & Bucx 2016). So, instead we expect similar effects. This leads us to the final hypothesis:

Hypothesis 2.5: The increase in the childcare subsidy from 2016 to 2017 has a similar positive effect on the labor participation of mothers with a low income in comparison to mothers with a middle and high income.

2.5 Academic relevance

This study is based on the study by Bettendorf *et al.* (2015) since they use a difference-in-difference strategy to analyze the effect of the reforms of the childcare subsidy in 2005 on the labor supply of young mothers with a similar control group and treatment group. Still, this study can make an academic contribution for the following reasons. First, most research focusses on the effect of increases in the childcare subsidies. This study focusses not only on an increase but also on a decrease in the childcare subsidies. By my knowledge, this is one of the first studies to use a DID strategy to analyze a decrease in the subsidies. This might be interesting because the effects can be different with a decrease instead of an increase. Secondly, this study uses the LISS data panel. This data gives extensive information about the respondents over a longer period. This is the first study to use data of the LISS (Longitudinal Internet studies for the Social Sciences) panel administered by Centerdata (Tilburg University, The Netherlands) in a DID analyses on the effect of childcare subsidies on the labor supply of mothers. Additionally, this gives the opportunity to analyze several subgroups. By incorporating variations in coefficients for all covariates between subgroups, the analysis acknowledges the possibility of heterogeneity or diversity in the associations between the covariates and the outcome across different subgroups. This approach facilitates a more comprehensive understanding of the data by offering detailed insights and identifying potential subgroup-specific effects or interactions. It enables researchers to uncover nuanced relationships and gain a deeper understanding of the underlying dynamics within each subgroup. Finally, this research is the first to my knowledge to use a DID strategy to analyze the latest reforms in 2016 and 2017. When more reforms are analyzed, a more comprehensive image of the effects of childcare subsidies can be formed.

3. Institutional context and the reforms

In this part, the reforms in 2010 until 2013 and 2016 until 2017 are clarified. But to understand the childcare system and women participating on the labor market in the Netherlands, first a general explanation of childcare is given, second a brief historic

overview of the childcare system and women participating on the labor market is given until 2005, after that the Law on Childcare introduced in 2005 is explained because this still forms the basis for how childcare is organized and in the final parts an overview is given of the reforms in childcare subsidies in 2010 until 2013 and from 2016 until 2017.

Formal childcare is considered to be an important tool for emancipation, equality of opportunity and labor participation. That's why many countries have tried to improve the accessibility, affordability, and quality of childcare (SZW 2015). In the Netherlands you can apply for childcare subsidies if you make use of formal childcare and work, attend education or are looking for a job. In a two-parent household both parents need to work. Formal childcare means care of providers that are registered with the National Registry Childcare (*Landelijk Register Kinderopvang*). The providers of formal childcare can be center-based daycare (*kinderdagverblijf*), center-based out-of-school care (*buitenschoolse opvang*) or guest parents (*gast ouders*) (Roeters and Bucx 2018). There are two groups of children for whom the parents can receive childcare subsidies. The first group consists of children who don't go to primary school yet, usually between 0 and 3 years old. These children can go to center-based daycare, so called playgroups (*peuterspeelzalen*) or informal childcare. Playgroups provide part-time care usually for not more than 4 hours per day and this is commonly used by families in which one of the parents doesn't work. So, this means that parents cannot apply for the regular childcare subsidy for the playgroups. The second group consists of children who go to primary school, usually between 4 and 12 years old. These children can go to center-based out-of-school care and informal childcare. Both groups can also go to guest parents, this's small-scale care at the home of the children or at the home of the guest parent (Bettendorf *et al.* 2015). Parents who can apply can get the subsidy for a maximum of hours and a maximum hourly rate. Expenditures that exceed the maximum, need to be paid by the parents themselves. The precise maximum hourly rate and maximum hours of childcare is calculated by the hours worked by the parents and the type of childcare. The subsidy is also means tested (Berenschot 2021).

3.1 History of childcare and labor participation until 2005

In the first years after the second world war only one third of the women were active on the labor market in the Netherlands. Of this group of women, half was under the age of 25 (Van den Brink 2020). This was mainly caused by the traditional family values, namely that the women work until they get married and after that the man becomes the sole breadwinner. The idea was that women would stay home after marriage to take care of the children. The only formal childcare that existed at this time was meant for women who were obligated to work for financial reasons and women who are not able to take care of their children. This was (partly) financed by the municipality through the Law for the Poor (*Armenwet)* which got replaced by the General Social Welfare Law (*Algemene Bijstandswet)* in 1965 (Berenschot 2021).

In the sixties the traditional family values were under pressure. The second feminist wave criticized the existing values surrounding participation of women on the labor market and the limited role of men in the household. According to the feminist organizations, one of the reasons many married women left the labor market was the absence of childcare facilities and the high costs of individual options (*Ibid.*).

In the seventies the discussion shifts from the needs of women to the needs of children. The focus moves to possible advantages for the development of children in

playgroups where they can interact with peers. Consequently, in the first half of the seventies different groups of women begin with successful initiatives and increasingly more play groups are established, often partly subsidized by municipalities (Van Rijswijk 1981). Between 1960 and 1980 the number of playgroups increase from 100 to more than 3000 (Tijdens and Lieon 1993) So, childcare increased in this period but not enough to explain the further participation of women on the labor market (Berenschot 2021).

The economic crisis at the beginning of the eighties led to a lot of unemployment. One of the solutions to this problem was the redistribution of labor through part-time jobs. Working part-time became more accepted and in the following years the legal position of the part-time workers was reinforced. Partly due to these developments the share of part-time jobs in the total employment increased a lot faster in comparison to surrounding economies, as can be seen in figure 1.1. A large part of the part-time jobs arose in the service sector, with the according demand for (parttime) labor around peak hours. These jobs were often filled by women who entered the labor market in a period when social norms about working mothers changed fast. Reasons given for this are the increased educational attainment and, specific to this time, the increased change of having an unemployed partner. The entry of many women into the labor market contributed to economic success of the part-time model in the Netherlands (Van den Brink 2020).

While in the early seventies the employment rate of women in the Netherlands between the age of 15 and 64 was approximately 30% and in comparison to surrounding countries rather low. The employment rate of women started to rise after the economic crises in the eighties and now it is one of the highest in the OECD as can been seen in figure 1.3.

Accordingly, the demand for daycare starts to increase in the nineties. But at this point, the vast majority of daycare exists of playgroups. The primary objective of playgroups is to provide children a place to play with their peers a few days each week, thereby creating opportunities for their holistic development. Playgroups are for this reason less suitable to facilitate the combination between care and work. Because of the relatively small capacity of daycare the demand starts to exceed the supply. In addition, the government wants to incentivize women to work longer because the hours worked per week by women remained in comparison to surrounding countries relatively low and the share of women working part-time relatively high (Berenschot 2021). As can been seen in figure 1.4, in 2000 women in the Netherlands worked approximately 25 hours per week, while women in surrounding countries worked around 5 to 10 hours more. At the same time, the share of women working part-time was approximately 70% in the Netherlands. As can been seen in figure 1.2, this was by far the largest share among surrounding countries. To stimulate and facilitate the labor supply among women, formal childcare is seen as an important asset by the government. So, to further encourage the labor supply among women in the Netherlands, especially the hours worked, and to increase the capacity of the childcare, the government starts a trajectory to change the policy around childcare. Finally, this results in the Law on Childcare (*Wet Kinderopvang*) in 2005 (Berenschot 2021). The two main goals of the reform were first to simplify it for parents to combine care and work, and second to stimulate better quality care (Ministerie van Sociale Zaken en Werkgelegenheid 2012).

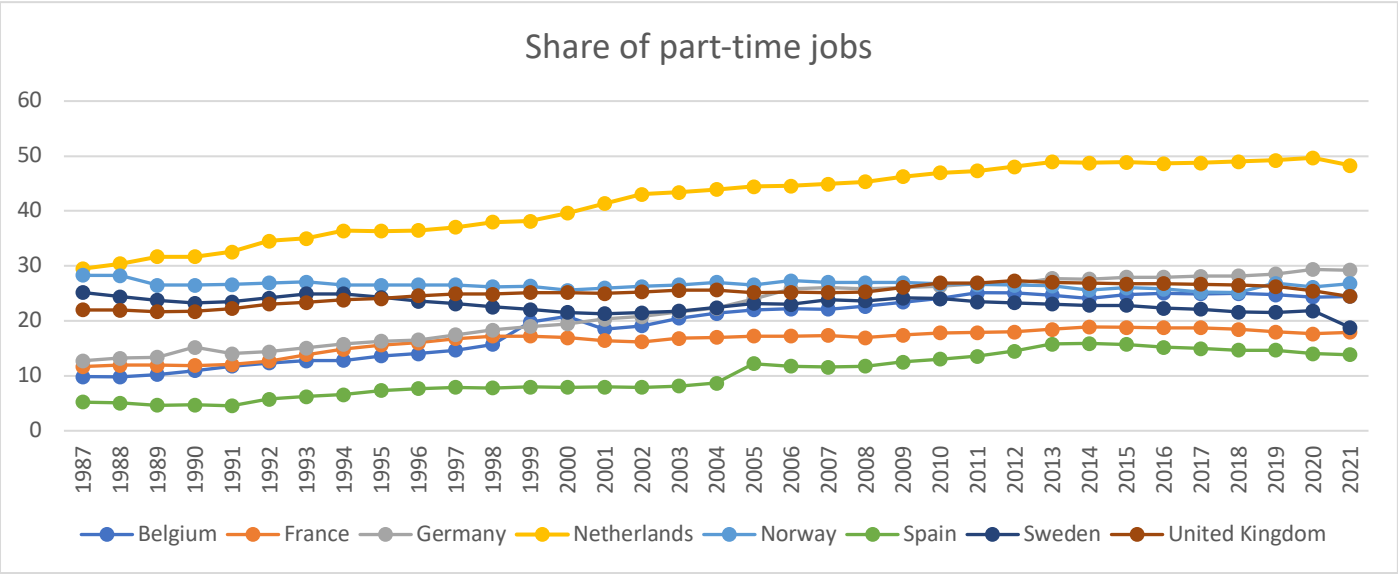

Figure 1.1: Share of the part-time jobs of the total amount of jobs. Source: OECD 2023

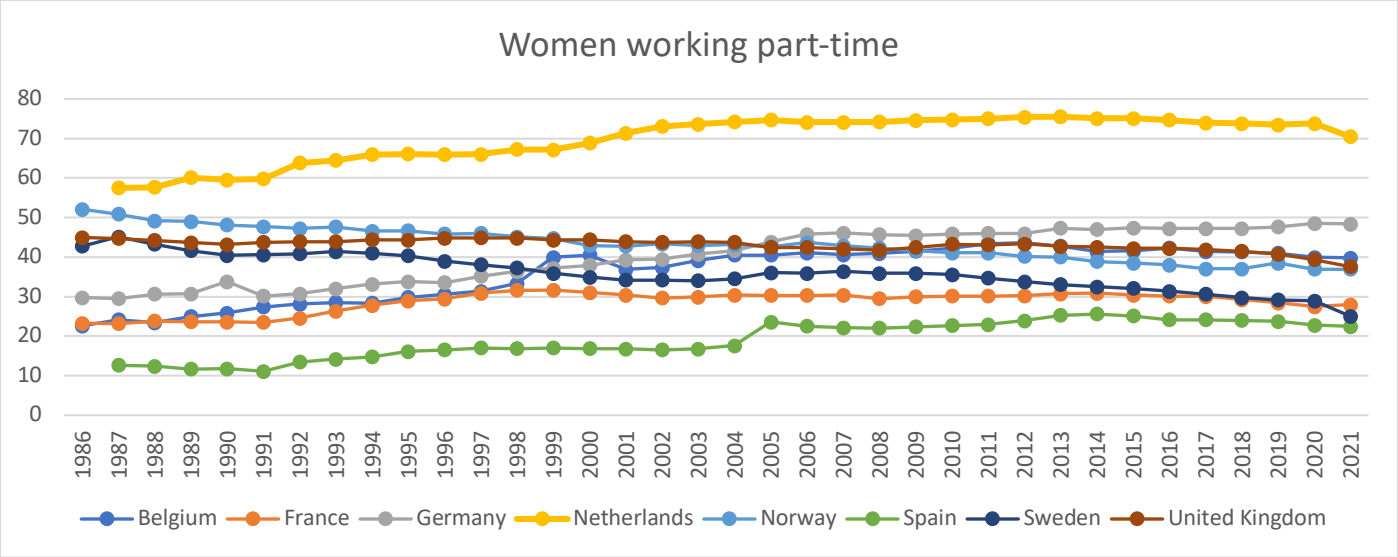

Figure 1.2: Percentage of women working part-time. Source: OECD 2023

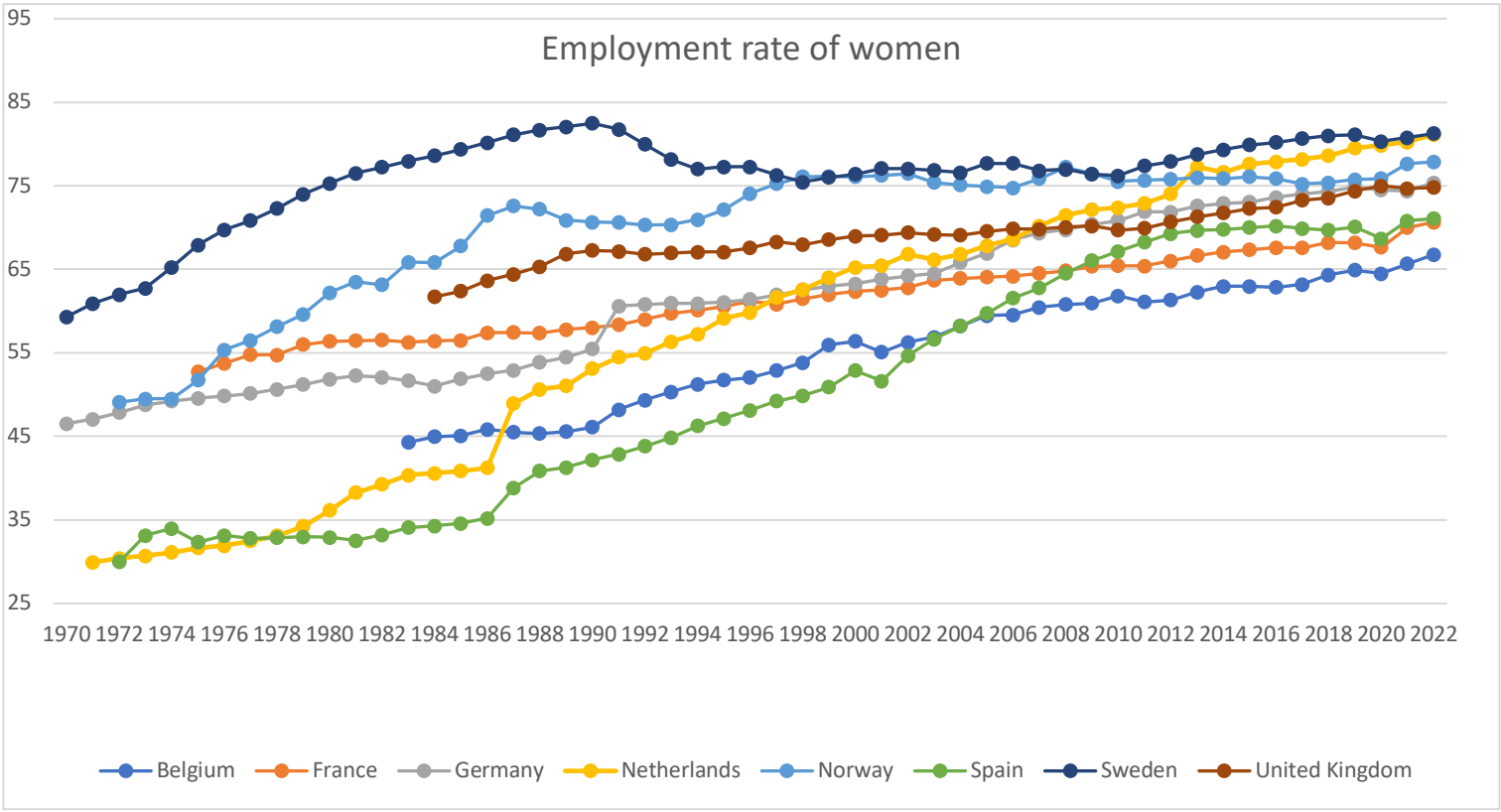

Figure 1.3: Percentage of women who are employed. Source: OECD 2023

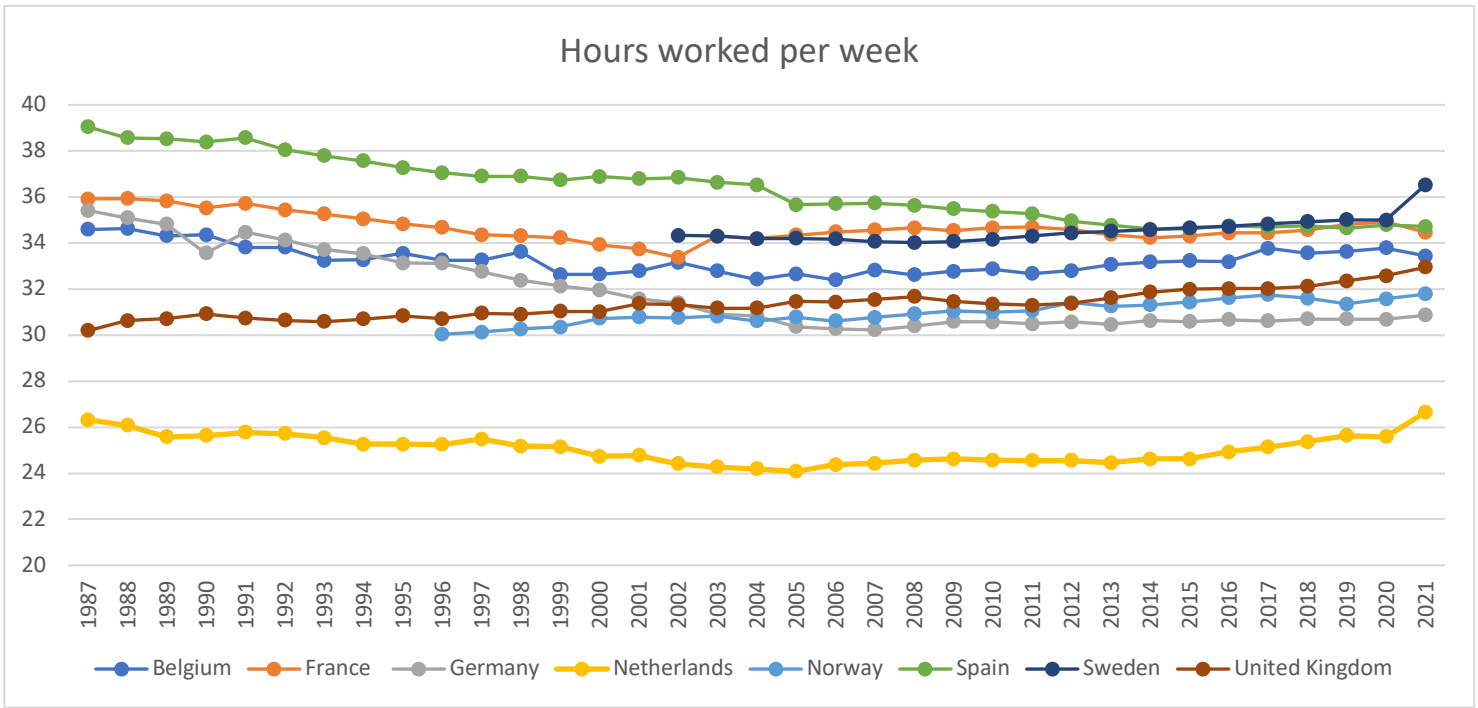

Figure 1.4: Average hours worked per week by women. Source: OECD 2023

2.2 The Law on Childcare

Before the Law on Childcare, municipalities were separately responsible for childcare policies. With the introduction of the law in 2005, the childcare in the Netherlands got their own legal framework and the subsidy for formal childcare was unified. From 2005 onwards all formal childcare places could get the same subsidy from the government and this subsidy was now directly transferred to parents instead of the childcare institutions (Portegijs *et al.* 2014). This transformation from a subsidized welfare sector to a market sector was supposed to create an environment where childcare institutions would compete for the favors of the parents. The market forces were supposed to ensure that only the suppliers that meet the requirements of the parents would remain, that the price developments would be in line with the market and that there would be no waiting lists (Veldheer *et al.* 2012). The Law on Childcare also made the so-called guest parent care eligible for subsidies. However, a maximum rate was set and if parents would exceed this maximum, they would have to pay the amount above the maximum by themselves (Bettendorf et al. 2015).

A tripartite financing was chosen for the new policy, where parents, government and employers all have to pay a third part of the costs. But at this point it was not mandatory for employers to contribute. The size of the subsidy was determined by the income of the parents but was at least 33,3% for the first child (Portegrijs *et al.* 2014). In 2006 and 2007 the childcare subsidy was raised drastically, especially for middle and higher incomes. This was a compensation for the fact that they still had to pay relatively much for childcare under the Law on Childcare (Plantenga *et al.* 2005). At the same time, the government made the contribution of employers to the costs of formal childcare mandatory on the first of January 2007 (Bettendorf *et al.* 2015). Also in 2007, the motion of Aartsen/Bos was introduced (Tweede Kamer 2005). It stated that primary schools are required to supply pre-school care and after-school care on weekdays between 07:30 and 18:30 or facilitate other organizations to do this, starting in the schoolyear 2007/2008. Finally, in 2009 there was a small reversal by the government of the policy change, since the subsidy was reduced to some extent. But in comparison to 2005 there was still a huge drop in the fee for childcare for parents for middle- and high-income households (Bettendorf *et al.* 2015). In conclusion, because of the measures taken by the government the costs for parents declined by half and the formal childcare increased substantially in the period 2005-2009, especially for guest parents and out-of-school care (*Ibid*.)

2.3 Reforms 2010-2013

The increase in use of formal childcare was so big that the government took measures, in the first instance to counteract improper use of the subsidies (Portegijs *et al.* 2014). On the first of January 2010, a change in the law for guest parents was introduced. An unintended consequence of the Law on Childcare was that people who provided informal childcare, like grandparents, registered as guest parent. This meant that the parents could now also get a subsidy for the childcare that was previously largely unsubsidized (Portegijs *et al.* 2006)**.** So, a part of the increase of guest parents was caused by the conversion of informal childcare to formal childcare by the same people. From the children that in 2007 were taken care of by a guest parents for the first time, 85% only went to informal childcare a year before (Bos and Huynen 2010**).** So, it was often not a real but an administrative (and with that a financial) increase in the use of this form of childcare. The government discouraged this practice and began to set more requirements for guest parents (Portegijs *et al.* 2014). For example, guest parents had to begin to follow training programs, the childcare spaces had to meet

requirements and the GGD got the assignment to monitor the guest parents. The GGD is the common health service which is meant to protect, guard and improve public health (GGD 2023). The GGD was already monitoring other childcare institutions (Tweede Kamer 2009). In 2010, the maximum hourly rate was also considerably reduced. In 2009, the maximum rate that was used at that time was still higher than the hourly rate of all forms of childcare. Since then, this maximum rate that was annually indexed (except for 2012) was not able to keep up with the rising prices. So, from 2010 onwards users of childcare paid more on average than the subsidy compensated (SZW 2015).

Nevertheless, the expenditures from the government for childcare kept rising and it turned out that year after year the costs were higher than calculated because of the unexpected fast increase in the number of children that went to formal childcare. In 2005 the government spend 673 million on childcare subsidies. In 2011 this increased almost five times to 3,1 billion. Without any further measures it was expected that this would grow further until 3,6 billion in 2015 (Rekenkamer 2014). In addition, because of the economic crisis the income of the government declined, and they were forced to retrench, also in childcare. So, in 2011 the subsidy was lowered, and in 2012 again. This was especially noticed by the middle- and higher-income groups and less by the people with a lower income. Also, from 2012 onwards the number of hours for what the parents could get a subsidy was connected to the hours worked by the least working parent (until a maximum of

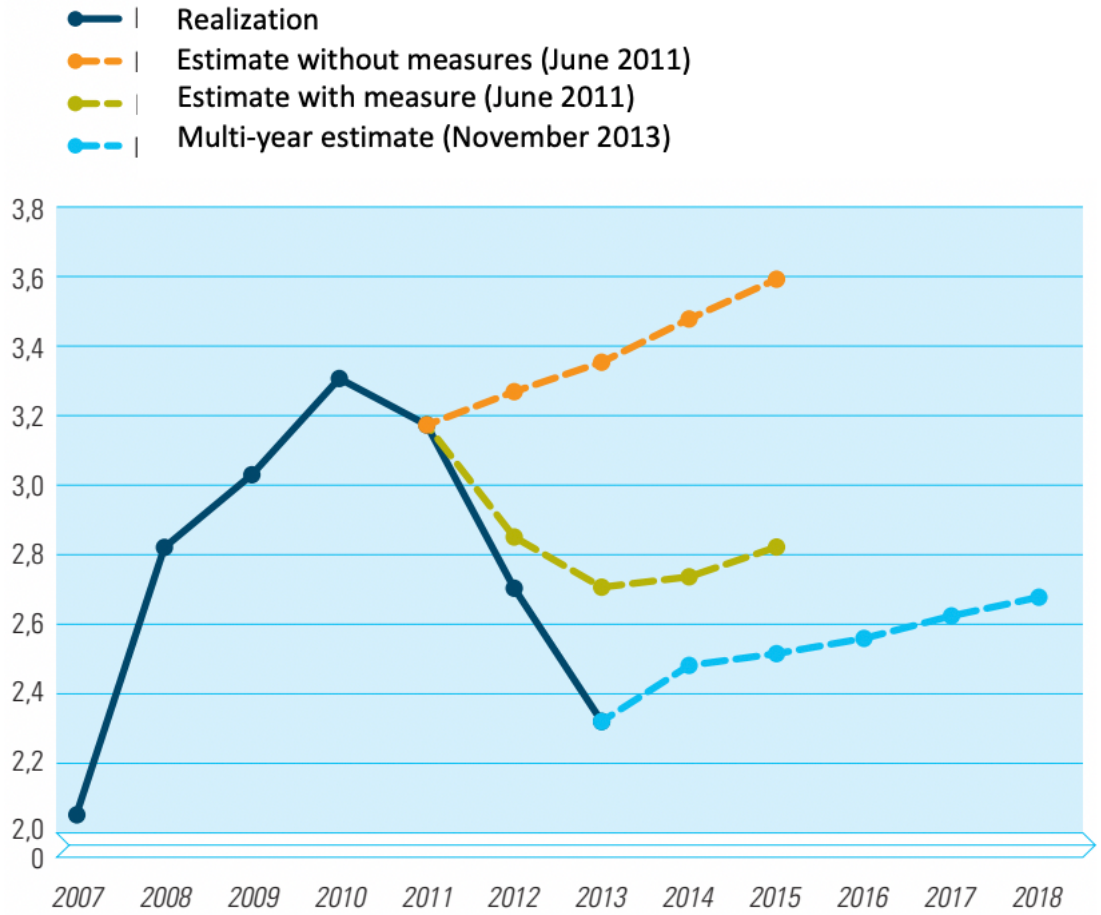

Figure 2.1: Estimates and realization of the costs of the childcare subsidy. Source: Rekenkamer 2014

230 hours every month). In 2013 the childcare subsidy for the first child was again lowered, and for parents with a high income (from around 118.000 per year) it was abolished (Portegijs *et al.* 2014). With these measures the government hoped to cut 420 million in the expenditures of childcare in 2012, and in 2013 to increase the cuts until 650 million euros. In 2014 it became clear they more than succeeded. The expenditures of the childcare subsidies were even reduced with 536 million more than expected (Rekenkamer 2014). This was caused by an unexpected drop in children with the right for a subsidy (see figure 2.2**)** and a drop in the average hours of care parents could apply for. The reduction in expenditures was more because the government still expected a small grow in the use of childcare in their calculations despite the retrenchments (Rekenkamer 2014). These calculations are shown in figure 2.1**.** A part of the children who didn't get the subsidy anymore in 2013, probably still went to formal childcare. It's estimated that this applies to 40% of the children who didn't get a subsidy anymore. So, the number of children in formal childcare declined less than the figures of the subsidy suggest (Tweede Kamer 2014).

Under the influence of the increase in demand until 2011, a lot of investors invested in building new nurseries and daycare centers for out-of-school care. The number of childcare buildings increased every year until 2012 and the spaces for children increased from 416.000 in 2010 to 470.000 in 2013 (Portegijs *et al.* 2014). Because of this the waiting lists for daycare spaces disappeared and every parent could then choose on average between fifteen nurseries within a radius of three kilometers from their home address (CBS 2014). Of course, for the investors in childcare the decline was a less favorable situation. In 2013 the number of registered childcare buildings declined, and the registered bankruptcies increased in the National Register for Childcare *(Landelijk Register Kinderopvang en Peuterspeelzalen)* (Portegijs *et al.* 2014).

When it became clear halfway through 2012 that childcare subsidies would again be reduced in 2013, an uproar began in the Netherlands. Newspapers wrote that childcare would become too expensive and interest groups warned the government that many parents would turn their back on childcare (Portegijs *et al.* 2014). Indeed, in 2012 the number of children with a subsidy declined for the first time after years of increase. This decline continued until 2014 as can be seen in figure 2.2**.** Finally, the government decided to increase the budget slightly and from 2014 onwards the budget was supposed to rise with 100 million every year. This was mainly targeted at middle income families' first child (SZW 2013).

2.4 Reforms 2016-2017

In 2015 the debate about childcare changed again and in a policy review the ministry of Social Affairs and Employment Opportunities argued to focus on labor participation of parents by pointing out the size of the group (SZW 2015). Working parents with a child below the age of 12 form around 25% of the labor force and are an important pilar of the labor market. The ministry argued that a higher labor participation of parents is desirable because it would promote economic growth and could be a solution in the ageing of the population. The positive effects on economic independence of mothers and the general quality of life are also named (SZW 2015). So, it's decided that in 2016 the budget for childcare is raised structurally with 290 million in 2016 and again with 136 million in 2017 (Tweede Kamer 2016b). Also, the maximum rate for childcare was increased and 45 million was reserved in

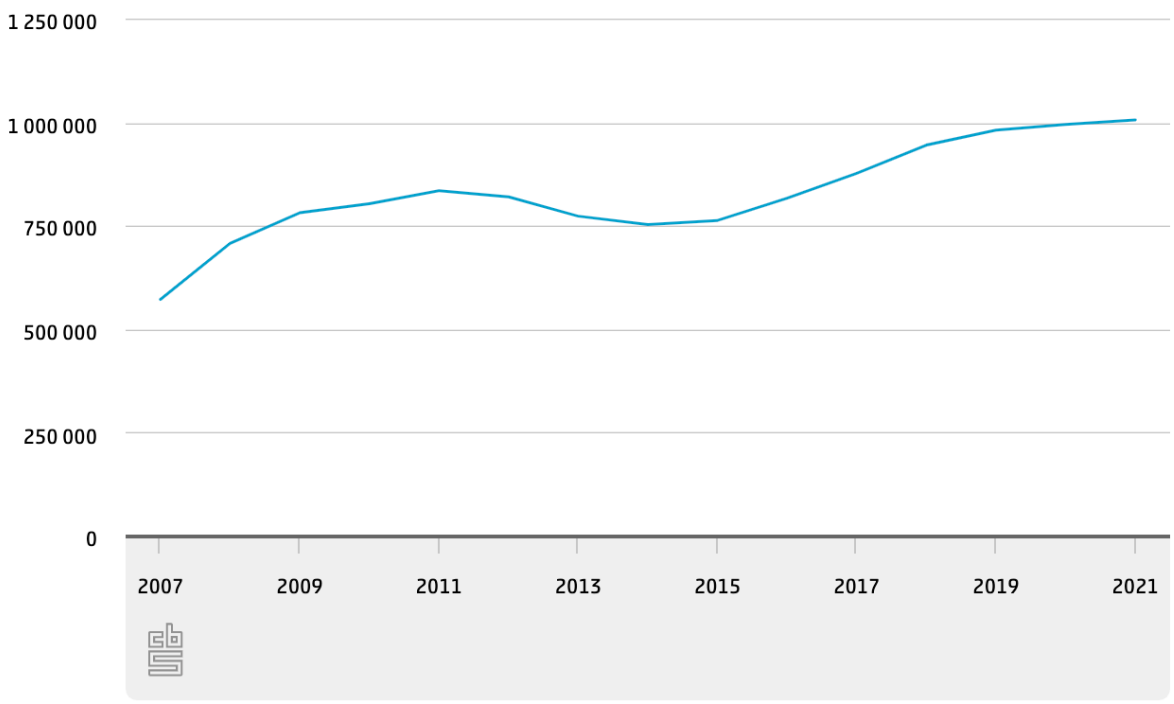

Figure 2.2: Number of children receiving childcare subsidy. Source: CBS 2022

the budget for this in 2017. Between 2015 and 2017 the accessibility to childcare subsidies was temporally increased by expanding the group that would be able to apply (Tweede Kamer 2016a, Tweede Kamer 2016b). Until 2015, parents who would lose their job and didn't study, did a reintegration procedure, or did an integration course, lost the subsidy for childcare after three months. In 2015 this was expanded to six month and in 2018 this expansion no longer applied (Tweede Kamer 2016b, Belastingdienst 2017). Finally, in 2016 the government gives municipalities a budget to expand the childcare supply for parents who can't apply for childcare subsidy, don't go to primary school yet and don't go to formal childcare (Tweede Kamer 2016b). The budget for this was 10 million in 2016 and was supposed to grow annually with 10 million, until 60 million in 2021. This didn't mean that childcare would become free for this group, contribution from the parents could still be demanded (*Ibid.*).

So, the policies around childcare subsidies were characterized by change. From 2005 onwards the government invested in childcare, but also retrenched. The basic elements of the Law on Childcare introduced in 2005 do still apply. Parents who qualify, receive a subsidy and there are regulated market forces based on demand-financing. To summarize the changes we use figure 2.3, where the division of the costs of childcare between parents, the government and employers is visualized. A decline in the costs for the parents is shown until 2007. There is a small increase in the costs in 2009 when the government started to reverse the policy changes, but the real increase starts from 2010 onwards. This is in line with the retrenchments introduced in 2010 until 2013. Then in 2014 the government stops the retrenchments and increases the subsidy slightly. But the real decline in costs for the parents starts in 2016 and 2017, what is again in line with policy changes and the increase of the

subsidy from 2016 onwards. The analysis goes until 2017 for reasons later explained. We see a similar trend in the costs of the subsidy for the government shown in figure 2.4.

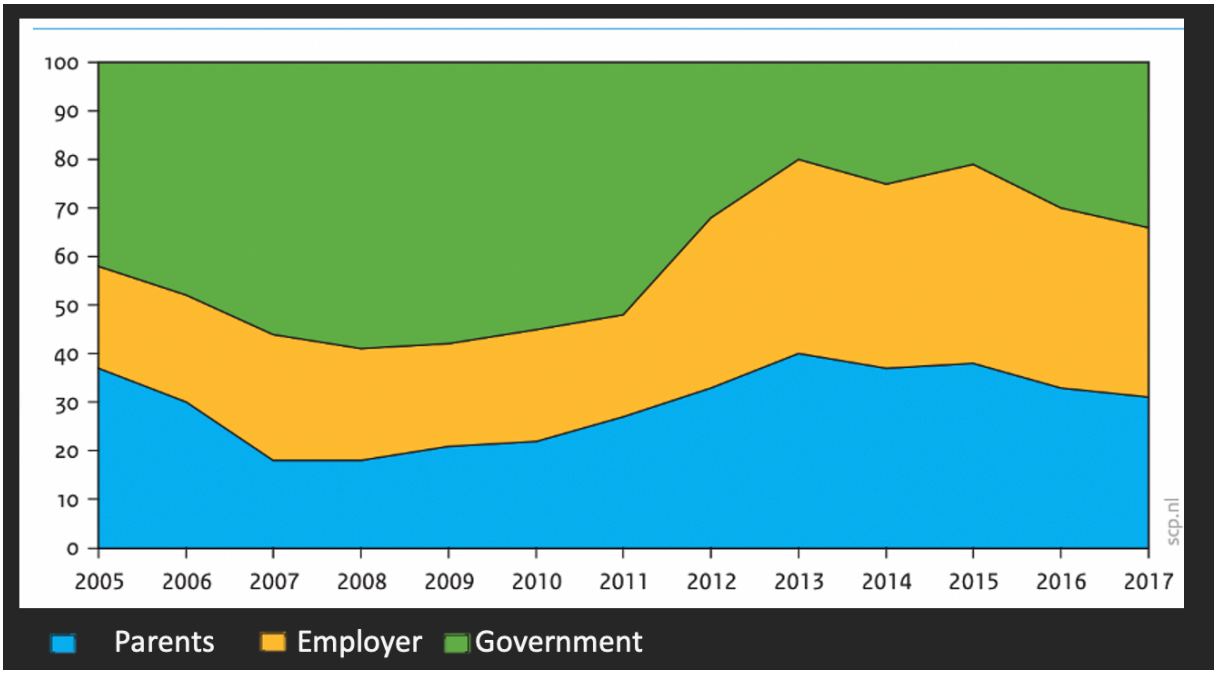

Figure 2.3: Share parents, employers, and government in the costs of childcare. Source: Portegijs *et al.* 2014

From 2010 onwards the costs for the government starts to decline until 2015 and raises again in 2016 and 2017. This rise and decline in costs can partly be explained by the inflow and outflow of children with the right for a childcare subsidy shown in figure 2.2**.** But in 2015 the costs still decline somewhat while the number of children with a subsidy increase slightly.

2.5 Combination credit

With a difference-in-difference strategy it's important to see if there are any other policy changes in the same period that might influence the outcome variables of the treatment group and control group. After examining different taxes and subsidy changes, one tax was found that might influence the outcome. The complication comes from the Combination credit (*Inkomensafhankelijke Combinatiekorting*). The Combination credit gives a tax reduction to families with a child up to 12 years old and is calculated over the salary of the second earner or single parent. This credit is meant to increase the labor participation of parents. Since the credit targets the same group as the childcare subsidies, only the joint effect of the two measures can be estimated. The maximum amount of money that could be settled with the Combination credit increased from 1871 euro in 2011 to 2133 euro in 2012. This should have an opposite effect as the retrenchments in the childcare subsidies in the same period. In 2016 the amount increased again from 2152 euro to 2769 euro (Michiels *et al.* 2022). This should have the same effect as the increase in the childcare subsidies.

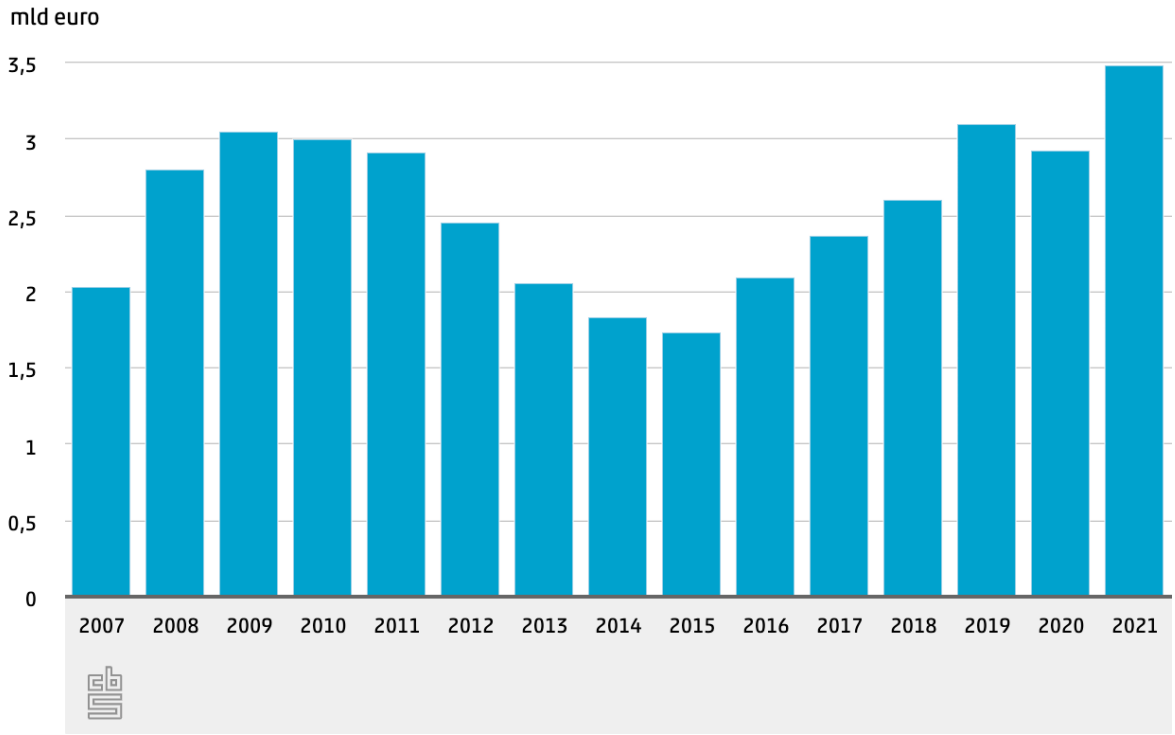

Figure 2.4: Payments of the government for childcare subsidies in billion euros. Source: CBS 2022

2.6 Summary

Since there are a lot of changes in taxes and childcare subsidies, all the changes are summarized in table 2.1.

Table 2.1: Summary reforms childcare

Year	Policy change	Effects on childcare
2009	- **Small deduction in the childcare subsidy**	- **Costs parents for childcare increase slightly** - **Costs of subsidy for the government still increase slightly**
2010	- **Change law guest parents** - **Maximum hourly rate reduced**	- **More requirements for guest parents** - **Small increase in the costs of childcare for parents** - **Small decline in the costs of childcare for the government**
2011	- **Subsidy lowered in general**	- **Increase in the costs of childcare for parents. Especially**

		for people with a middle and higher income - **Small decrease in costs of childcare subsidies for the government**
2012	- **Subsidy lowered in general** - **Number of hours parents can get a subsidy for connected to parent with the least working hours** - **Increase of Combination credit**	- **Relatively large increase in the costs of childcare for parents. Especially middle and higher income** - **Relatively large decrease in costs of childcare subsidies for the government** - **Decrease in children that apply for a subsidy**
2013	- **Subsidy in general lowered and for high income abolished**	- **Large increase in the costs of childcare for parents. Especially for people with a high income** - **Large decrease in costs of childcare subsidies for the government** - **Decrease in children that apply for a subsidy**
2014	- **Slight increase in budget. Especially for people with a middle income**	- **Small decrease in cost of childcare for parents** - **Small decrease in costs of childcare subsidies for the government** - **Decrease in children that apply for a subsidy**
2015	- **Extension of who can apply for the subsidy until 2017**	- **Costs for parents stay approximately the same** - **Small decrease in costs of childcare**

		subsidies for the government - **Small increase in children that apply for a subsidy**
2016	- **Subsidy in general increased** - **Increase of Combination credit**	- **Relatively large decline in in cost of childcare for parents** - **Relatively large increase in costs of childcare subsidies for the government** - **Larger increase in children that apply for a subsidy**
2017	- **Subsidy in general increased** - **Increase in the maximum rate that is subsidized**	- **Decline in in cost of childcare for parents** - **Increase in costs of childcare subsidies for the government** - **Increase in children that apply for a subsidy**

4. Data and method

In this part of the paper, first the data set for this analyses is introduced, second the use of a difference-in-difference design is explained and justified, third the hypotheses are operationalized and finally some descriptive statistics are provided.

4.1 Data

In this research data of the LISS (Longitudinal Internet studies for the Social Sciences) panel administered by Centerdata (Tilburg University, The Netherlands) is used. It consists of 5000 households, and it contains approximately 7500 individuals. A true probability sample of household drawn from the population register by Statistics Netherlands is used to form the panel. A computer and internet connection is provided to households that could not participate otherwise. The general information of the households is provided and updated at regular time intervals. They are paid for each questionnaire completed (Centerdata 2022).

Part of the LISS panel is the LISS Core Study. This is a longitudinal study that is repeated every year and is supposed to document changes in the life course and living conditions of the panel members. That makes this dataset especially useful for studying societal and group specific phenomena. Analysis with this data set can provide valid results, since the LISS dataset is considered to be representative of the Dutch population. The panel covers eight questionnaires and each of them covers a different theme. Answers from different questionnaires can be matched through identifiers or individual numbers. In this study two different questionaries are used, namely the Family and Household questionnaire

and the Work and Schooling questionnaire. In addition, the background variables are used, this is a separate questionnaire that can be updated every month by the respondents (*Ibid.*).

Since it is a longitudinal study, it would for example be interesting to see if parents stopped using or started using formal daycare after the reforms. But because panel members had to answer two questionaries over quite some time and the sample in this research only consists of (young) mothers with children, not enough observations were left to make an analysis. That is why the data is treated as repeated cross-sectional.

So, for this research the questionaries contain relevant data for labor supply, household characteristics and individual characteristics. For the labor supply a (net labor) participation variable is created for respondents who chose one of the answers in the questionnaire that indicates they are actively working. The following question is used for the dependent variable participation: '*Please indicate which of the following statements apply to your situation. Try to be as thorough as you can'*. When the option *'I perform paid work (even if is it just for one or several hours per week or for a brief period)'* or *'I perform paid work, but am looking for more or other work'* was chosen, they were treated as people who participate on the labor market. This means this study looks at the net labor participation. For the dependent variable hours worked, the question is *'How many hours per week are you employed in your job, according to your employment contract?'* A limitation of this question might be that is about the hours worked according to the employment contract instead of actual hours worked, what might be different for several reasons. But this question can still give a good indication of an increase or decrease in hours worked. Other questions used from the Work and Schooling questionnaire are about being a pensioner, taken early retirement and having a disability.

For the household characteristics, questions are used about the number of children, age of the children, use of informal childcare and until 2014 if any children are deceased. The reason we need to know if a child is deceased and which one, is that until 2014 the question about the number of children also included the deceased children. For this research the deceased children are removed from the household. The variable number of children needed to be corrected again for 2009 until 2012. Because when the respondents answered the questionnaire the year before, the number of children was missing in the current year, but the age of the children wasn't. So, I corrected the number of children according to the given number of ages from the children.

Finally, for the individual characteristics there are variables for sex, age, household size, education, a dummy for being single, individual gross income and household gross income. Because with income there are also the choices to say you don't know how much it is or you prefer not to say it, less observations are available for this category. For income three categories are created. The first is a monthly gross income below 2300 euro, the second between 2300 euro and 5600 euro and the third above 5600 euro. The categories are based on the definition of low, middle and high income from the CBS (van den Brakel and Ament 2010).

Unfortunately, this study meets some difficulties with the data from 2018 onwards. The average participation takes an unexpected drop in 2018 that is hard to explain and not in line with the trend, as can be seen in figure 4.2**.** Also, the data in 2019 is quite different because in this year the mean of people with a disability is suddenly 0,33 in comparison with 0,04 on average in other years. It's hard to say how this influences the results, so that why the analysis doesn't extend beyond 2017.

4.2 Difference-in-difference strategy

Researchers have various methods at their disposal to measure the causal effect of a treatment. Among these methods, the randomized controlled trial (RCT) is often regarded as the gold standard for establishing causal relationships (Toshkov 2016). In an RCT, individuals are randomly assigned to either a treatment group or a control group, where the treatment group receives the specific treatment while the control group does not (Toshkov 2016). This random assignment ensures that any observed differences between the two groups can be attributed solely to the treatment itself (Angrist and Pischke 2015). However, conducting RCTs in public administration can present practical, ethical, or even feasibility challenges (Toshkov 2016). For instance, in cases where randomizing the allocation of childcare subsidies entitlement is required to examine its causal effect on labor participation, it might be considered ethically controversial (Toshkov 2016). As a result, researchers in political science have developed alternative methods to investigate causal effects when RCTs are not feasible.

A different method that can be used when the RCT is not possible is the difference-in-difference method (DID). First, the DID will be introduced and after that the preference for this method is justified.

The difference-in-differences method revolves around comparing the before-and-after differences in outcomes between a treatment group and a control group. The treatment effect is determined by examining the difference between these differences, hence the name 'difference-in-difference'. A crucial assumption in the DID approach is that the trends in both groups are similar leading up to the reform, and that in the absence of the reform, these trends would have continued unchanged. This assumption is commonly referred to as the parallel trend assumption or the common time effect. If this assumption is violated, it becomes impossible to accurately estimate the treatment effect. In other words, the validity of the DID method relies heavily on the assumption that the trends of the treatment and control groups would have followed a parallel path in the absence of the

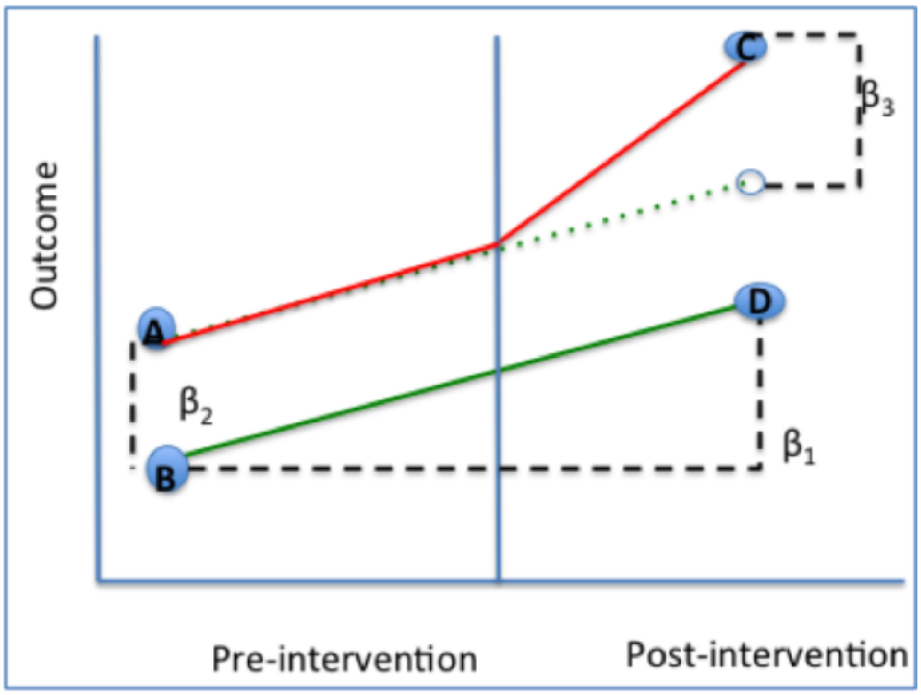

Figure 4.1: Difference-in-difference model. Source: Mailman School of Public Health 2023

reform. To apply the difference-in-differences method, it is common to include an interaction term between time and treatment group dummy variables within a regression model. This interaction term captures the differential changes over time between the treatment and control groups, allowing for the estimation of the treatment effect. By incorporating this interaction term, the DID approach enables researchers to examine how the treatment group's outcomes deviate from the control group's outcomes over time, providing insights into the causal impact of the treatment. The basic DID regression equation is as follows: $Y= \beta0 + \beta1*[Time] + \beta2*[Intervention] + \beta3*[Time*Intervention] + \beta4*[Covariates]+\varepsilon$. We explain this further with the visualization in figure 4.1. The coefficient $\beta0$ is the baseline average or constant and can be calculated by taking point B. Coefficient $\beta1$ is the time trend or time effect in the control group and can be calculated by subtracting point B from point D. Coefficient $\beta2$ is the difference between the groups pre-intervention or group effect and can be calculated by subtracting point B from point A. Coefficient $\beta3$ is the difference in changes over time or treatment effect and can be calculated in the following way: (C-A)-(D-B).

A reason to use this method is the in-depth overview from Blau and Currie (2006) of the relationship between parental labor supply and the cost of childcare. They argue that the variety in the results of the studies is just in a small part because of the differences in data sources or samples used. But that the larger part of the variation is due to identification problems associated with the endogeneity of the explanatory variables. A solution to this problem is using exogenous variation in the cost of childcare. To accomplish this, a quasi-experimental method that uses policy discontinuities or changes as exogenous variation in the prices of childcare of parents can be used. Hence, the DID strategy (Bettendorf et al. 2015).

4.3 Operationalization

In the following part the DID strategy is operationalized for the two reforms.

4.3.1 Reforms 2010-2013

First the policy changes in 2010 until 2013. To analyze the effect of childcare subsidies on the participation of mothers on the labor market, Bettendorf et al. (2015) found that the mothers with children from 0 to 12 can form a treatment group and mothers with children from 13 to 18 can form the control group in a DID to analyze the effect of childcare subsidies

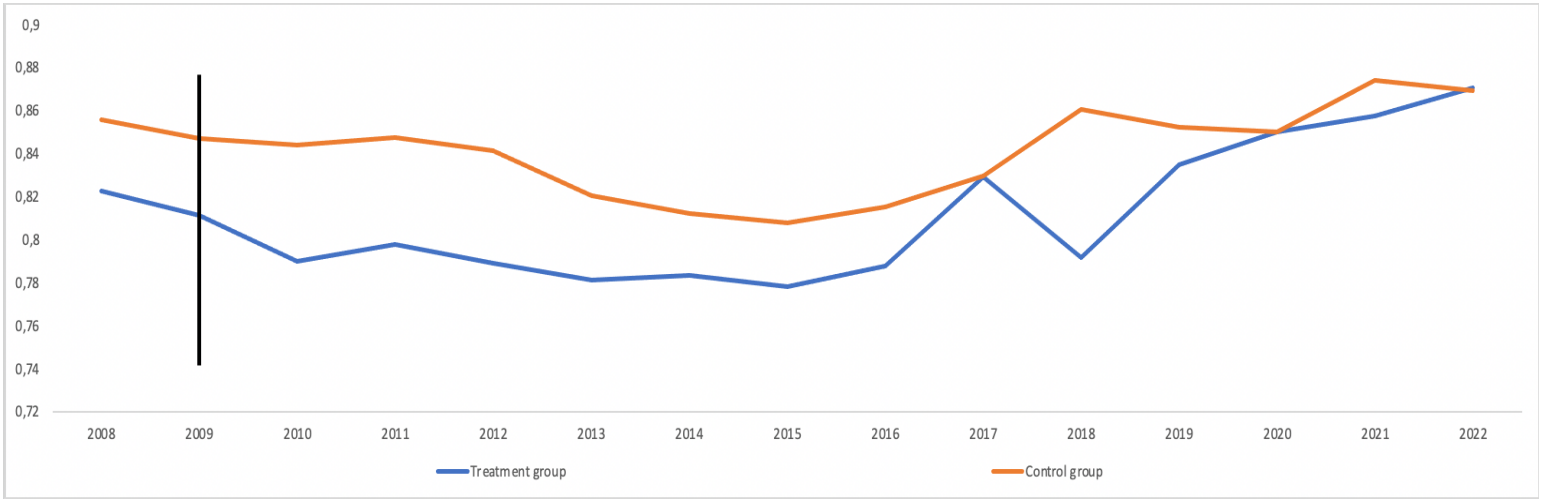

Figure 4.2: Mean participation treatment group and control group. Source: Own calculations

on the labor participation of women. With data from 1995 onwards that research shows that the two groups follow a common time trend until the reform in 2005. In this research we use a similar control group and treatment group. The treatment group consists of mothers with a youngest child up to 12 living at home. Furthermore, we restrict the analysis to mothers who are not a pensioner, didn't take early retirement, are released of the obligations to find new work after the loss of their previous job, have a household with one person or are disabled. Of course, you could still be able to work if you are disabled but the respondents are very inconsistent in their answers on the percentage of disability and in 2015 the question was changed. But even with consistent percentages, it would still be very hard to say how the disability would influence the labor participation. That's why the respondents with a disability are excluded from this research.

The control group comprises mothers with the youngest child aged between 13 and 21, residing at home. This age range is expanded to encompass a broader set of respondents. However, this extension might potentially reduce the comparability between the treatment group and control group due to various factors, including the increased age disparity among the mothers. This is because mothers with younger children tend to be younger than those with older children. However, upon contrasting the impact of childcare subsidy reforms on maternal labor supply, using a control group with the youngest child aged between 13 and 21 years (table 5.1, in the results section) versus one where the youngest child is between 13 and 18 years (table 8.1, in the appendix), it becomes evident that the outcomes are remarkably comparable. This implies that altering the age range of children within the control group does not significantly influence the primary findings. Consequently, in this study, we are assured in employing a control group encompassing children aged 13 to 21, which enhances the respondent pool. The other requirements of the control group are similar to the requirements of the treatment group. So, for example people with a disability are excluded.

First, it's important to see if the common time trend is not violated. This assumption cannot be tested, so we must visually confirm if there is a common time trend. To check for this, the mean of the participation is calculated for the control group and the treatment group for each year and visualized in figure 4.2. The orange line is for the control group and the blue line for the treatment group. The vertical line marks the start of the treatment or the policy change. The treatment is applied from 2010 onwards and we can see there is a common small downward trend following the financial crisis in 2008 and 2009. After 2009 the average participation of the treatment group declines, and the two lines slightly move away from each other. This trend is comparable to figure 2.4 in the years 2008 and 2009 the parental fees stay almost the same, in 2010 the fees start to rise, and it stabilizes again in 2014 and 2015. We get similar results if we look at the linear-trends model (figure 4.3), here the orange line is the treatment group and the blue line the control group. The first red vertical line represents the reform. Again, we see that the lines follow a common trend until 2009 and from 2010 onwards the lines slightly move away from each other. A limitation is that there are only two years before treatment, what doesn't give a lot of room to see if there is a common time trend. But it looks like the treatment group and control group follow a similar trend in 2008 and 2009. In combination with the confirmation of the common trend between similar groups in the research from Bettendorf et al. (2015), it can be said with enough confidence that the common time trend assumption is not violated.

Another way to see if there is a common trend is to use placebo dummies. We use DID technique to see if there is a significant effect in the pretreatment period, so in this case

in 2008 and 2009. We expect there to be no significant effect because it's before the treatment. In other words, we pretend there is a treatment in 2008 and 2009 by using placebo dummies but we want the effect to be insignificant. Otherwise, you can question if there is a common trend before the treatment. The results of the placebo dummies are reported later in this research.

Another important assumption is that there is no anticipation of the reform, and that the treatment group did not adjust their behavior or respond before the reform. This brings difficulties for the change in the requirements for the guest parents because the guest parents needed to attain a diploma what would at least take a year. So, this change was reported at least a year before the reform since the guest parents needed time to adapt. For this specific change there was time to adjust the behavior. But the reduction in subsidy and maximum hourly rate was only announced short before the introduction, namely on the 20th of September. Since the adjustment in the requirements for the guest parents didn't necessarily change the costs for childcare but mainly the use of the type of formal childcare, it can be said with enough confidence that there was not a lot of room to adjust the behavior.

To make an estimation of the effect on participation, a similar equation is used as in the study of Bettendorf *et al.* (2015):

$$y_{igt} = \alpha_t + \gamma_g + \chi_i\beta + \sum_{s=2013}^{2010} \delta_s D_{gs} + \epsilon_{igt}$$

The participation status of the women in the two groups is regressed on 'year fixed effects, group fixed effects, individual characteristics and a set of treatment dummies for each year after the reform' (Bettendorf et al. 2015: 116). Here, y_{igt} is the outcome of person i in group g in year t, α_t is the year fixed effects, γ_g is the group fixed effects, χ_i are the individual characteristics, β are the coefficients on the covariates, D_{gs} is a set of dummies that takes the value of one if individual i has a youngest child up to 12 years old in year s, δ is the coefficient on the treatment indicator and ϵ_{igt} are the residual errors. The group fixed effects capture the constant difference between the treatment and control group. The year fixed effects capture the common trend of the treatment and control group. In this first equation, the treatment effect is allowed to be different in each year after the policy change, but when the treatment effect is not significantly different from each other annually, we estimate the annual treatment effects together. So, for the first reform we estimate two

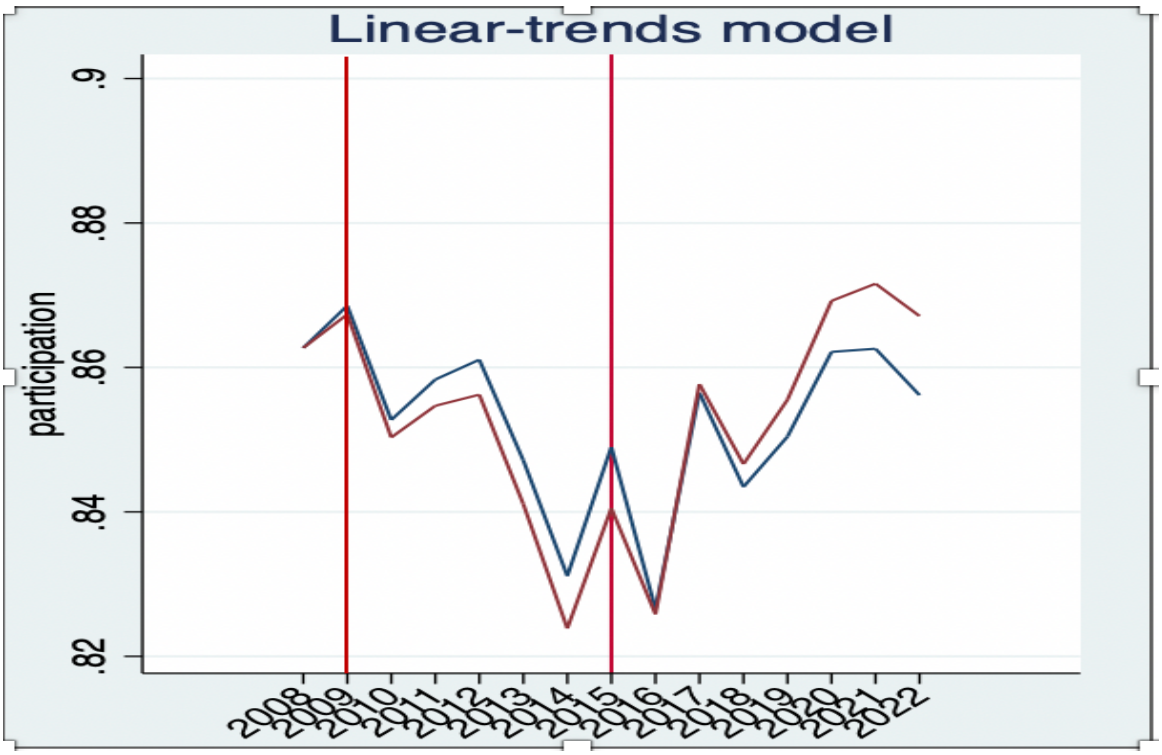

Figure 4.3: Linear-trends model of participation of the treatment group and control group. Source: Own calculations

treatment effects. The first is the short run treatment effect for 2010-2011 and the second one is the medium-run treatment effect for 2012-2013.

To estimate the effect for the subgroups the same equation for each subsample is used. This involves enabling variations in coefficients for all covariates across different subgroups, thereby accommodating differences.

Since participation is a discrete variable, the equation represents a linear probability model for measuring participation. In addition, we examine the impact on the number of hours worked per week. To do so, we adopt the approach suggested by Angrist and Pischke (2015) and estimate a linear model using the same sample of individuals employed in the participation equation. Consequently, we estimate the equation where 'y' represents the number of hours worked per week, which may include zero hours.

4.3.2 Reform 2016-2017

In the analyses of the policy reforms around childcare subsidies in 2016 and 2017, the same treatment group and control group is used. It's again important to first look if the common time trend is not violated. We want to visually confirm the trend again by looking at figure 4.4. This figure visualizes the mean of participation of the control group (orange line) and the treatment group (blue line). The vertical line represents the start of when it's expected to see an effect or from what point the treatment is active. Before the treatment, a common trend can be seen in 2014 and 2015. After 2015 the average participation of the treatment group inclines, and the two lines slightly move towards each other. This visualization is comparable with figure 2.4 where the parental fees almost stay the same in 2014 and 2015 and the parental fees start to decrease from 2016 onwards. Also, the results in the linear-trends model in figure 4.3 are comparable. The second red vertical line represents the

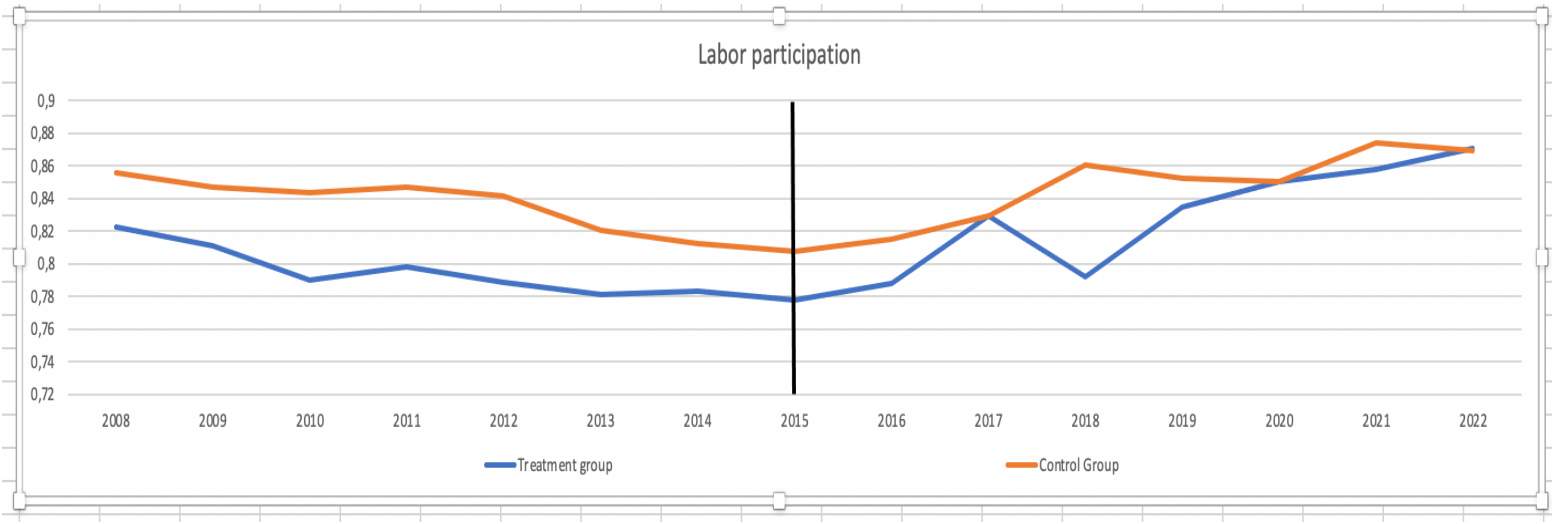

Figure 4.4: Mean participation treatment group and control group. Source: Own calculations

reform, the orange line represents the treatment group and the blue line the control group. As expected, the lines follow a common trend in 2014 and 2015 and in 2016 and 2017 the lines slightly move towards each other. There are again only two years before the treatment with a common trend, what might be a limitation in accepting the common time trend assumption. But with the visualization of a common time trend in 2008 and 2009, in 2014 and 2015, and the confirmation of the common time trend in the research from Bettendorf et al. (2015), it is expected that the common time trend assumption is not violated.

To control if there is no significant effect in 2014 and 2015, a placebo dummy is used in the mentioned years. Also, this result is reported later in the research.

Also, for this reform it's important that the change is not anticipated. This assumption might be in danger for this policy change. The increase in the childcare subsidy was already accepted by the government and reported in the media at the end of May 2015. This was seven months before the introduction of the policy change and gave the treatment group time to adapt. So, this might influence the results of the analyses. At the same time, most of the questionnaires are answered at the beginning of the year and at that point in 2015 the policy change was not known yet. So, most respondents answered the questionnaires before they could adapt to the policy change. That's why it can be said that the reform was not anticipated in the data that is used.

Since we estimate the effects of two different reforms, there is a second equation:

$$y_{igt} = \alpha_t + \gamma_g + \chi_i\beta + \sum_{s=2017}^{2016} \delta_s D_{gs} + \epsilon_{igt}$$

The only difference is that we estimate the treatment effect in the years 2016 and 2017. Again, we estimate the treatment effects together since the annual treatment effect is not significantly different. So, the short run treatment effect for 2016-2017 is estimated. Furthermore, the identical equation is employed for estimating each subsample within the subgroups and the approach suggested by Angrist and Pischke (2015) is used to estimate the impact on the number of hours worked per week.

4.3.3 Informal childcare

Like mentioned before, substitution between formal and informal childcare is an important factor. In table 4.1 the mean of the use of unpaid childcare is shown for the treatment group. We indeed see that the use of unpaid childcare decreases slightly in 2010, perhaps due to the changes in the requirements for the guest parents and starts to increase from 2011 onwards. Then it declines a bit in 2015, but really starts to shrink from 2016 onwards. This is in line with the expectation that when prices of formal childcare increase parents turn more often to informal childcare and when prices of formal childcare decrease, parents substitute informal childcare for formal childcare. So, unpaid childcare also needs to be controlled for in this analyses.

Table 4.1: mean use of unpaid childcare by treatment group

Year	Use of unpaid childcare
2008	0,325411
2009	0,323944
2010	0,321198
2011	0,339742
2012	0,33908
2013	0,347107
2014	0,366795
2015	0,364911
2016	0,350126
2017	0,305322
2018	0,322892
2019	0,315642
2020	0,239766
2021	0,281525
2022	0,308271

4.4 Descriptive statistics

In this analyses, the sample consists of mothers with children until the age of 21 who live at home. The full sample consist of 10301 mothers of whom 3408 in the control group and 6893 in the treatment group. The covariates that are used in the descriptive statistics are consistent with other research about the effect of childcare subsidies on mothers participating on the labor market. The covariates consist of number of children, age, single, low educated, middle educated, higher educated, gross income and gross income household. For the categorization of low, middle or higher educated the definition of the CBS (2019) is used. Low educated entails primary school and vmbo, middle educated entails havo, vwo and mbo, and higher educated entails hbo and wo (CBS 2019).

In this study, we employed Welch's t-test to compare the means of the control and treatment groups. This choice is supported by scholars who argue that Welch's t-test should be the default test due to its comparable performance to other t-tests and its effectiveness in cases of unequal sample sizes and variances between the groups (Lakens 2015, Ruxton 2006). If the mothers with a youngest child of 0-12 and the mothers with a youngest child of 13-21 are genuinely comparable, we would expect minimal or no differences in covariates between the treatment and control groups (Kluve and Tamm 2013).

Table 4.2: Descriptive statistics of treatment group and control group

	Control Group			Treatment Group			
Variable	No. Obs.	Mean	Standard deviation	No. Obs.	Mean	Standard deviation	t-stat
Number of children	3408	2,207	0,914	6893	2,143	0,981	1,246
Age	3408	46,63	4,143	6893	37,49	5,965	16,49***
Single	3408	0,161	0,368	6893	0,143	0,301	2,994
Low education	3408	0,241	0,428	6893	0,148	0,355	11,05*
Middle education	3408	0,463	0,4987	6893	0,415	0,493	2,639
High education	3408	0,293	0,455	6893	0,435	0,496	-14,41*
Gross income	2031	1638	1362	4348	1668	2171	-0,676
Gross income household	3082	5071	2912	6245	4895	2872	2,753

As can be seen in table 4.2, both groups are balanced in most of the covariates with a few exceptions. The exceptions which are significant at the 1% and 10% level are age, low educated and higher educated. The average age is higher for the control group but that seems inevitable considering the selection of the groups. The other exceptions are low educated and higher educated, in this case the treatment group seems to be more often higher educated and the control group more often low educated. But with only these exceptions, this research argues that the natural experiment is valid in this case.

5. Results

This section of the paper presents the findings of the study, followed by a comprehensive analysis and discussion of the results in relation to the hypotheses proposed earlier. Due to space constraints and the absence of statistical significance, the following regression tables do not provide individual reporting of all covariates.

5.1 Participation and hours worked

In the first table the results of the estimation for the effects of the reform on participation rate are shown for all women in the treatment group. In column(1) the estimation is done without any covariates, so without controlling for any individual or household characteristics. In the first two years of the treatment the effect is -3,4 percentage points, the second period the effect is -1,7 percentage points and the final period 1,9 percentage points, all significantly different from zero. When controlling for changes in the observed characteristics in column(2), the effects change to -2,9 percentage points, -1,5 percentage point, and 2,4 percentage points. In this scenario, the last two

treatment periods become less significant. When we control for unpaid childcare in column(3), we see that the effects change to -2,9 percentage points (a 3,7% decrease), -1,7 percentage points (a 2,2% decrease) and 2,3 percentage points (a 2,9% increase), all significant different from zero.

Like mentioned before, the common trend assumption is very important in the DID. To further enhance the assessment of the assumption's plausibility, we estimate the placebo treatment effect for the years 2008-2009 and 2014-2015. Because there have been no relevant policy changes in those years, a significant effect should not be found. The results of the estimates are reported in the last column(4). Both placebo effects are not significantly different from zero and it hardly effects the other treatment effects.

With this information, it's shown that reform in 2010-2013 has a significant negative effect on the labor participation of women and the reform in 2016-2017 has a significant positive effect on the labor participation of women. This means hypotheses 1.1 and 2.1 can be accepted.

In addition to participation, in this study the effect on hours worked per week are estimated. Again, the effects are estimated for all women in the treatment group. All women are included in the regression, both non-working women and working women. Again, a separate treatment dummy is estimated for the years 2010-2011 and 2012-2013.
Results of the estimates of the effects on hours worked per week without any covariates are shown in column(1). We find a significantly effect of -1,3 h per week for 2010-2011, -0,7 h per week for 2012-2013 and 1,8 h per week for 2016-2017. When the covariates are included in column(2) all the treatments stay significant but drop to -0,9 h per week for 2010-2011, 0,2 h per week for 2012-2013 and 1,4 h per week for 2016-2017. When unpaid childcare is controlled for in column(3) the treatment changes again, but not much to -0,9 h per week for 2010-2011 (a 4% decrease), -0,2 h per week for 2012-2013 (a 0,9% decrease) and 1,4 h per week for 2016-2017 (a 5,6% increase). In the last column(4) the placebo dummies are used. Again, because there have been no relevant policy changes in those years, a significant effect should not be found. It's shown that both placebo effects are not significant for 2008-2009 and 2014-2015. The placebo dummies hardly effect the other treatment effects, and all effects stay significantly different from zero. These results show that we can accept the hypotheses 1.2 and 2.2.

Table 5.1: Effect on participation

	(1) **No covariates**	(2) **With covariates**	(3) **Unpaid childcare**	(4) **Placebo**
Placebo 08-09				0,004
				(0,0018)
Treat 10-11	-0,034***	-0,029***	-0,029***	-0,030**
	(0,0002)	(0,0005)	(0,0003)	(0,0007)
Treat 12-13	-0,017***	-0,015**	-0,017**	-0,017**
	(0,0002)	(0,0009)	(0,0008)	(0,0004)
Placebo 14-15				-0,0009
				(0,0006)
Treat 16-17	0,019***	0,024*	0,023**	0,023**
	(0,0001)	(0,0024)	(0,0018)	(0,0017)
Observations	10301	10301	10301	10301

Robust standard errors in parentheses, * denotes significant at 10% level, ** at 5% level and *** at 1% level.

Table 5.2: Effect on hours worked

	(1) **No covariates**	(2) **With covariates**	(3) **Unpaid childcare**	(4) **Placebo**
Placebo 08-09				-0,175
				(0,094)
Treat 10-11	-1,301**	-0,961***	-0,975***	-1,004***
	(0,060)	(0,116)	(0,0140)	(0,011)
Treat 12-13	-0,713**	-0,237*	-0,241*	-0,226*
	(0,045)	(0,020)	(0,0193)	(0,052)
Placebo 14-15				0,449
				(0,083)
Treat 16-17	1,823**	1,385***	1,382***	1,565***
	(0,047)	(0,016)	(0,0147)	(0,011)
Observations	10301	10301	10301	10301

Robust standard errors in parentheses, * denotes significant at 10% level, ** at 5% level and *** at 1% level.

5.2 The subgroups

Then we turn to the results of the subgroups. In the tables with the results of the subgroups only the coefficients where all the covariates are included are shown. First, all the placebo dummies are insignificant, what means there was no significant effect found in the two years before the two reforms. This is what would be expected since there were no relevant policy changes.

When we look at the subgroup of mothers with the youngest child between 0-3 (column 1), 4-8 (column 2) and 9-12 (column 3). There is an effect for all the subgroups, and we see a larger effect for mothers with a youngest child from 0-3, except for the treatment in 2016 and 2017 (2,5 percentage points). There the mothers with a youngest child between

4-8 have a slightly larger effect (2,7 percentage points). This means that the hypothesis 1.3 and 2.3 can be accepted. When analyzing table 4, a larger effect can be found for single women (column 1) for all treatment periods. So, hypotheses 1.4 and 2.4 can also be accepted. Finally, the last subgroup of mothers with a low income (column 1), middle income (column 2) and high income (column 3). The effects for the mothers with a low income are higher in comparison to the mothers with a middle and high income. Except in the year 2016-2017, there the effect of the mothers with a middle income is slightly higher (1,9 percentage points) than the effect of the mothers with a low income (1,8 percentage points). For the mothers with a high income, no significant effect is found in the periods 2012-2013 and 2016-2017. This means that hypotheses 1.5 and 2.5 needs to be rejected.

Table 5.3: Effect on participation for subgroup of mothers with children from 0-3, 4-8 and 9-12

	(1) **Children 0-3**	(2) **Children 4-8**	(3) **Children 9-12**
Placebo 08-09	0,007	-0,008	0,006
	(0,0023)	(0,0016)	(0,0041)
Treat 10-11	-0,039**	-0,024*	-0,014**
	(0,0016)	(0,0039)	(0,0016)
Treat 12-13	-0,026***	-0,012*	-0,007**
	(0,0002)	(0,0017)	(0,0018)
Placebo 14-15	-0,006	-0,004	-0,014
	(0,0016)	(0,0015)	(0,0036)
Treat 16-17	0,025**	0,027*	0,011*
	(0,0023)	(0,0021)	(0,0028)
Observations	6367	5873	5403

Robust standard errors in parentheses, * denotes significant at 10% level, ** at 5% level and *** at 1% level.

Table 5.4: Effect on participation for subgroup of single mothers and mothers in couples

	(1) **Single women**	(2) **Women in couples**
Placebo 08-09	0,017	0,001
	(0,0147)	(0,0039)
Treat 10-11	0,039**	0,028**
	(0,0016)	(0,0016)
Treat 12-13	0,027**	0,014*
	(0,0048)	(0,0017)
Placebo 14-15	-0,017	0,003
	(0,0055)	(0,0014)
Treat 16-17	0,016*	0,013**
	(0,0005)	(0,0004)
Observations	1244	9057

Robust standard errors in parentheses, * denotes significant at 10% level, ** at 5% level and *** at 1% level.

Table 5.5: Effect on participation for subgroup of mothers with a low, middle and high income

	(1) **Low income**	(2) **Middle income**	(3) **High income**
Placebo 08-09	-0,002	-0,004	0,013
	(0,0012)	(0,0009)	(0,0045)
Treat 10-11	-0,041*	-0,018**	-0,009**
	(0,0071)	(0,0009)	(0,0011)
Treat 12-13	-0,032*	-0,014**	-0,006
	(0,0018)	(0,0011)	(0,0022)
Placebo 14-15	-0,002	0,017	0,013
	(0,0012)	(0,0034)	(0,0032)
Treat 16-17	0,018**	0,019**	0,008
	(0,0007)	(0,0002)	(0,0019)
Observations	2940	3158	4143

Robust standard errors in parentheses, * denotes significant at 10% level, ** at 5% level and *** at 1% level.

6. Discussion

The government has consistently prioritized increasing the labor supply of women in its policies, even during the years following the economic crisis in 2008 when stringent austerity measures were necessary (Merens *et al.* 2012). This objective remained pivotal due to its multifaceted benefits. Firstly, it would contribute to economic expansion and tackle challenges linked to population aging. Moreover, it would facilitate emancipation by reducing financial dependency among women and enhancing their overall well-being. Additionally, the existing gender pay gap and underrepresentation of women in top positions are partly attributed to differences in labor supply between genders. As women frequently opt for part-time work and fewer hours, particularly after the birth of their first child, it's presumed that such choices hinder their progression and earning potential. Therefore, by augmenting women's labor supply and promoting dual-earner households, it's anticipated that gender income disparities will decrease, and more women will ascend to leadership positions (*Ibid.*).

As previously discussed, childcare subsidies are regarded as a significant instrument by policymakers for augmenting maternal labor supply. Consequently, the inquiry emerges as to whether this anticipation is substantiated and whether the reduction and augmentation of childcare subsidies exert a substantial impact within the context of the Netherlands. Most results are in line with the expectations, there is a small but significant effect of the reform on labor participation for mothers with young children. There is a slight difference between the retrenchment period and the period of increasing childcare subsidies for participation, namely -2,9 percentage points against 2,3 percentage points or a 3,7% decrease against a 2,9% increase. This might suggest that retrenchments have a larger impact than an increase in the childcare subsidies for participation. This might be an effect of the idea that people tend to find loss worse than they enjoy gain (Boom Management 2017). At the same time, there are many other reasons that can be considered and the difference in the coefficient is just 0,6 percentage points. Also, the effect in 2012-2013 is smaller (-1,7 percentage points) in comparison to the effect in 2016-2017. This difference is also 0,6

percentage points. But the Combination credit might be of influence on this as explained below.

The treatment effect in 2012-2013 is notably less pronounced in comparison to 2010-2011. This observation is somewhat unexpected given that the cutbacks in childcare subsidies were more substantial in 2012-2013. A plausible explanation for this discrepancy could be the heightened Combination credit introduced in 2012, which might counteract the impact of the childcare subsidy reductions. As we analyze the combined influence of both the childcare subsidy and the Combination credit, it's conceivable that the reduction effect of subsidies in 2012-2013 might be mitigated due to the increased Combination credit. Since the Combination credit remains unchanged in 2010-2011, no notable alteration in the impact of childcare subsidies is projected. Conversely, the Combination credit experiences an upsurge again in 2016, implying an anticipated augmentation of the positive effect of childcare subsidies in 2016-2017.

When considering the hours worked per week, the results are relatively high in comparison to participation, an increase of 2,9% against an increase of 5,6% in 2016-2017. This might be explained by the relatively high share of part-time workers and already relatively high labor participation rate. Indeed, there is more room for improvement at the level of hours worked per week than the labor participation rate, leaving room for the incentive margin to respond. The opposite was expected in the period of retrenchments since there is more room to lose with participation then with hours worked. We can see that the differences are smaller in 2010-2011, namely a decrease of 3,7% for participation against a decrease of 4% for hours worked. In 2012-2013 we see that the effect for hours worked is smaller in comparison to participation, namely a decrease of 0,9% against a decrease of 2,2%. Thus, a cautious deduction can be made that investments in childcare subsidies yield a more pronounced effect on the working hours of mothers with young children, while retrenchments in childcare subsidies exert a relative larger impact on the labor market participation of mothers with young children.

In the subgroups we can indeed see that there are differences, but all groups have significant effects mostly in line with the expectations. Except the income subgroup, there the higher income group has no significant effect in 2012-2013 and 2016-2017. The results for the income subgroup suggest that when a larger percentage of the net income goes to childcare, the financial incentives from the subsidy are also larger. So, that could explain why the results show a larger effect for mothers with a low income even though this group makes less use of childcare and are mostly spared during the retrenchments in childcare subsidies. The same explanation around the financial incentives and percentage of the net income that goes to childcare could explain why there is no significant effect for the higher income group in 2012-2013 and 2016-2017.

The other two subgroups are in line with the expectations. Mothers with a youngest child between 0-3 make the most use of formal childcare and thus have the largest effect in comparison. Single mothers are more sensitive to financial incentives and probably have a relative low household income, so in comparison a larger effect can be found.

If we compare the results to other studies, the results take an intermediate position. Although, caution is needed when comparing between studies, the results are larger in comparison to a study in Norway by Havnes and Mogstad (2011) with a result of 0,06. But substantially smaller in comparison to research in Quebec by Baker *et al.* (2008) with a result of 0,55. A reason for the smaller effects might be that this study is more recent, and that the participation rate is already quite high. Fitzpatrick (2012) and Cascio (2009) point out that

higher participation rates might be a reason that smaller effects are found in more recent studies, since it's more likely that childcare subsidies are inframarginal in the participation decision. A reason that the results are larger in comparison to the study in Norway (Havnes and Mogstad 2011) might be that in the Netherlands only working parents are eligible for the subsidy and in Norway also non-workers can apply for childcare subsidy.

7. Conclusion

The research question this study tried to answer was:

What effect did the change in the childcare subsidies have in the periods 2010 until 2013 and 2016 until 2017 on the labor supply and hours worked of mothers in the Netherlands?

To answer this research question a difference-in-difference strategy was used, where the dependent variables were participation and hours worked. The control group was formed by women with the youngest child between 13 and 21 years old and the treatment group was formed by women with the youngest child between 0 and 12 years old. The data used was from the LISS (Longitudinal Internet studies for the Social Sciences) panel administered by Centerdata (Tilburg University, The Netherlands).

Based on the collective model, the basic labor supply model, the welfare state regimes and the literature about childcare and labor participation of mothers, a number of hypotheses were formulated. Since the first reform was a retrenchment and the second one an investment, this study expected different effects. A significant negative effect on participation and hours worked in relation to the retrenchment and a significant positive effect on participation and hours worked in relation to the investments.

In line with the theory and literature, most of the hypotheses were accepted. But the effects were small, suggested explanations are the substitution between formal and informal care, the already high participation of mothers in the Netherlands and social norms that shape the division of gender roles in paid and unpaid labor. However, as explained earlier, social norms are not consistent across all groups in the Netherlands (Merens *et al.* 2012). Therefore, when formulating general statements about social norms, one should exercise caution. Only the hypothesis about the subgroup of women with a low, middle, and high income was rejected. The significant effect on women with a low income was higher than expected. A reason for this could be the relatively large percentage of the net income that has to be paid for the formal childcare and an underestimation of the sensitivity for financial incentives for mothers with a low income.

An obvious topic for further research could be the reforms beyond 2017. At the same time, most research report small effects of increases or decreases in the subsidy in the Netherlands. Perhaps research focusing on social norms around childcare that might prevent women to participate on the labor market could be more fruitful. On the contrary, conducting such research would likely be most suitable in a qualitative approach. Because often extensive interviews and observations are needed to untangle the complexities of social norms that form the labor supply decisions of mothers in different groups (Berenschot 2021).

Lastly, this study does not delve into the perceived quality of formal childcare, although numerous studies underscore its significance in the decision to employ formal childcare and partake in the labor market (Akgunduz and Plantenga 2015). Furthermore, incorporating more microdata, such as the amount of received childcare subsidies or

utilization of specific childcare arrangements, would offer a more comprehensive perspective of the effects. Unfortunately, such microdata was unavailable for this research. Moreover, another aspect of interest is the precise net costs to the government. This would necessitate linking labor force participation data with childcare data, and subsequently connecting these datasets to a tax-benefit calculator to measure the government's financial inflows and outflows. Regrettably, I lack the requisite data for this analysis. These limitations could potentially be addressed through future research endeavors.

8. Appendix

Table 8.1: Effect on participation using a control group with the youngest child aged between 13 and 21 years

	(1) **No covariates**	(2) **With covariates**	(3) **Unpaid childcare**	(4) **Placebo**
Placebo 08-09				0,004
				(0,0016)
Treat 10-11	-0,039***	-0,033**	-0,033**	-0,035**
	(0,0001)	(0,0006)	(0,0009)	(0,0007)
Treat 12-13	-0,013**	-0,009***	-0,012**	-0,013**
	(0,0004)	(0,0006)	(0,0002)	(0,0005)
Placebo 14-15				-0,003
				(0,0006)
Treat 16-17	0,015***	0,019**	0,018**	0,018**
	(0,0002)	(0,0012)	(0,0008)	(0,0009)
Observations	9609	9609	9609	9609

Robust standard errors in parentheses, * denotes significant at 10% level, ** at 5% level and *** at 1% level.

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