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Abstract in English

Public spending on child care has taken a high flight in the Netherlands. One of the key policy goals of child care subsidies is to stimulate labour participation. We study the impact of child care subsidies on labour participation using a general equilibrium model. Next to the labour supply choice, we also model the choice over formal and informal care. The choice between formal and informal care plays an important role in the overall impact of child care subsidies on labour participation. The model is calibrated to Dutch data. Our analysis shows that existing child care subsidies have promoted labour participation. However, at the current average subsidy rate of almost 80%, a further increase in the subsidy rate is a rather ineffective way to promote formal participation, the main effect being substitution of informal for formal care.

Key words: child care subsidies, labour participation, general equilibrium

Abstract in Dutch

De subsidies voor formele kinderopvang zijn de afgelopen jaren fors geïntensiveerd. Een belangrijk beleidsdoel van kinderopvangsubsidies is het stimuleren van formele arbeidsparticipatie door ouders. In dit document analyseren we het effect van kinderopvangsubsidies op de arbeidsparticipatie met behulp van een algemeen-evenwichtsmodel. Het model is gekalibreerd op Nederlandse data. Naast de arbeidsaanbodbeslissing wordt daarbij ook de keuze tussen formele en informele opvang gemodelleerd. De endogene keuze tussen formele en informele opvang speelt een belangrijke rol bij het effect van kinderopvangsubsidies op de arbeidsparticipatie. Onze analyse laat zien dat de bestaande subsidies een positief effect hebben gehad op de arbeidsparticipatie. De subsidievoet is met gemiddeld bijna 80% inmiddels echter zo hoog geworden, dat een verdere verhoging vanuit participatie-oogpunt weinig effectief is. Een verdere verhoging van de subsidievoet leidt met name tot het vervangen van informele opvang door formele opvang.

Steekwoorden: kinderopvangsubsidies, arbeidsaanbod, algemeen evenwicht

Contents

Preface

Public spending on child care has risen substantially over the past years in the Netherlands. Indeed, subsidy rates for formal child care and the share of young children participating in formal child care are by now comparable to Scandinavian countries. One of the key objectives of child care subsidies is to stimulate formal labour participation by parents, in persons and in hours per week. This document employs a general equilibrium model to study the impact of child care subsidies on formal participation, calibrated to Dutch data.

The author is grateful to the Ministry of Education, Culture and Science for data used in Figure 2.1 and Figure 2.4, Janneke Rijn (CPB) for constructing the Labour Force Survey data used in Figure 2.2, and Mariëlle Cloïn (SCP) for the data used in Figure 2.3. Furthermore, the author thanks Albert van der Horst, Ruud de Mooij, seminar participants at the Utrecht School of Economics and participants at the conference '24ormore' in Amsterdam for comments and suggestions.

Coen Teulings
Director

Summary

Recent years have witnessed a number of dramatic changes in the child care market. The government has increased the subsidy rate for formal child care. As a result the cost share of parents dropped from 40% on average in 2005 to 20% in 2009. At the same time, the use of formal child care increased sharply, the use of informal child care dropped sharply, and labour participation by young mothers went up. In this document we develop a model to study the impact of child care subsidies on the use of formal and informal child care, and (female) participation.

We introduce child care subsidies in the general equilibrium model MIMIC. The subsidies affect the decision of parents of whether or not to work, and how many hours to work, and whether they will use formal or informal child care. A higher subsidy rate for formal child care increases the marginal return of working more hours. As a result, more parents decide to start working, or to work more hours. In particular secondary earners and single parents (mostly women) who are more responsive to financial incentives than primary earners (mostly men). Our model produces results that are in line with micro-econometric studies on the impact of child care subsidies on labour supply. The effect on labour supply is small, in particular at high subsidy rates, and the (small) effect is bigger for single parents.

A second effect of subsidies for formal child care is that they make formal child care more attractive than informal child care. The choice over formal and informal care depends on the parental fees for both types of care and an idiosyncratic preference for formal over informal care. These preferences capture e.g. quality differences between formal and informal care as perceived by parents. We calibrate this preference distribution so that the share of parents choosing formal and informal care is in line with the data, and the price elasticity of formal child care is in line with empirical studies. A drop in the parental fee for formal care will cause some parents to switch from informal to formal care. This is a problem when it comes to labour participation as parents that switch from informal to formal care give up a compensating differential between formal and informal care. Indeed, following a price drop of formal care, the last parent to switch to formal care has a compensating differential that exactly offsets the difference in parental fees. Because some parents give up a compensating differential, part of the higher subsidies is `lost´ to substitution with little effect on labour supply.

We further calibrate the preference distribution for formal and informal care so that the price elasticity of the use of formal child care rises with the subsidy rate. The meta analysis of Ooms *et al.* (2003) suggests a price elasticity of formal child care of around .2. However, the steep rise in the use of formal child care following the drop in the parental fee in recent years suggests a much larger elasticity, in the order of .4. We capture both the lower elasticity in the past and the higher elasticity in recent years with our choice for a logistic (S-shaped) preference distribution.

Finally, we take into account that the subsidies have to be financed. In all simulations we

impose that the government maintains a balanced budget, where additional expenditures/savings are covered by an across-the-board increase/decrease in income tax rates.

In the calibrated model, we simulate small and big changes in the subsidy rate for formal child care. For an increase in the subsidy rate that implies a 25% drop in the parental fee, we find an increase in aggregate labour supply of only .05%. Aggregate employment gets a small additional boost from lower unemployment because employment becomes more attractive relative to unemployment. This moderates wage claims and stimulates labour demand. There is a large effect on formal child care, which rises by 10%, despite a small effect on labour supply, due to the substitution of informal for formal care.

The impact of changes in child care subsidies is nonlinear. This becomes more apparent once we consider bigger changes in the subsidy rate. In particular, when we reduce the subsidy rate, we lose labour supply at an increasing rate for every euro of subsidy we withdraw. The initial increase in the parental fee results mostly in substitution of informal for formal care. Once we increase the parental fee further, the substitution of informal for formal care becomes less important, and additional savings increasingly come from reduced labour supply.

To study what all current subsidies for formal child care have meant for formal participation we consider the extreme case of abolishing all subsidies for formal child care. According to the model, aggregate employment could fall by some .8% (labour supply of secondary earners and single parents with dependent children would fall by 1.4% and 6.8% respectively).

We also consider the other extreme of making child care `free´ for parents. Our simulation results suggest that this could be very costly in terms of public expenditures, due to a large shift of informal to formal care, with only a marginal effect on labour supply and employment. Indeed, a large part of the increase in labour supply due to the additional subsidies is lost due to the higher income tax rates to balance the government budget.

Our analysis suggests that the higher subsidy rate for formal child care has played a big role in the steep rise of the use of formal child care, but only a minor role in the rise in female participation. Most of the subsidies have gone to substitution of informal for formal child care. Furthermore, when we increase the subsidy rate, subsidies are `lost´ at an increasing rate to substitution of informal for formal care. This makes a further increase in the average subsidy rate (currently almost 80%) rather costly in terms of stimulating labour supply.

Another way to motivate higher subsidies for formal child care is to assume that participation in formal child care stimulates the development of the child. However, empirical studies give a mixed picture on this, it may benefit some groups, but hurt others. A further increase in the subsidy for formal child care would mostly lower the price of high income families, whereas participation in child care seems to be mostly beneficial for children from low income families.

1 Introduction

The participation rate of Dutch women has risen dramatically over the past decades.[1] In 1975, the participation rate of Dutch women was still the lowest in the OECD at 31%.[2] By 2007, the participation rate of Dutch women had risen to 71%, the highest participation rate for women in the EU-15 after the Nordics.[3] A large part of the rise in participation has been by women with young children.

With the rise in female participation, child care subsidies have received increased attention in the Netherlands. Many have pointed to the Nordics where high public spending on child care goes hand in hand with high participation rates of women.[4] Recent years have witnessed a dramatic increase in public spending on formal child care in the Netherlands, and participation rates (>50% for 0-3 year olds) and subsidy rates (close to 80% on average[5]) are by now comparable to the Nordics.

In this paper we study the relation between (female) participation and public spending on formal child care. Indeed, high public spending goes hand in hand with high female participation, but correlation is not causation. The question is whether high public spending on formal child care is driving the high participation rate of Nordic women, or whether the high participation rate of Nordic women is driving high public spending on formal child care, or both? We consider the causal relation running from child care subsidies to participation. We study this relation in a general equilibrium model with at its core a micro simulation model for labour supply. In the labour supply module, we convert the child care subsidy into an equivalent increase in the net wage. This is complicated by the fact that individuals may choose between formal and informal care. Indeed, in calculating the equivalent increase in net wages we take into account that parents may give up compensating differentials (*e.g.* quality differentials) when they switch from informal to formal care. The general equilibrium context is also important, since it allows us to take into account relevant mechanisms running via the budget constraint of the government (no manna from heaven) and via wage formation (subsidies and taxes affect equilibrium unemployment). The model is calibrated on Dutch data (levels) and international studies (elasticities).

This is not the first study by CPB Netherlands Bureau for Economic Policy Analysis into the

[1] E-mail: jongen@cpb.nl.

[2] Source: OECD Labor Force Statistics, women aged 15-64.

[3] In terms of full time equivalents, the participation of Dutch women still remains low by international standards. Indeed, some 60 percent of employed Dutch women worked part-time in 2007, by far the highest share in the OECD.

[4] A cross-country study by Jaumotte (2003) suggests that a positive relation between public spending on formal child care and female participation rates remains after controlling for other factors.

[5] Source: Ministry of Education, Culture and Science.

effects of child care subsidies, the present study builds on Graafland *et al.* (2001).[6] A number of reasons motivated this sequel. An essential part of the setup in Graafland *et al.* (2001) was the rationing in the formal child care market. This rationing seems to have largely disappeared (see *e.g.* Portegijs *et al.*, 2006). Furthermore, the analysis in Graafland *et al.* (2001) was based on the old system of `supply oriented´ financing of child care in the Netherlands. Under the old system, some places were subsidized by the state, some places were subsidized by employers, and some places were not subsidized. Since 2005, with the introduction of the *Wet kinderopvang* (Law on child care), all places that meet certain criteria receive the same subsidy by the government. Another simplification was the replacement of a `voluntary´, and hence rather heterogeneous, contribution by employers by a premium, in 2007. The smaller role of rationing and the uniform financing allow for a somewhat simpler modelling of child care subsidies and labour supply. This then allows us to complicate things in another direction, we introduce a structural model for the choice between formal and informal care, an important factor in the labour supply effect of child care subsidies. This sequel further allows us to use more recent data on the use of formal and informal care, and some recent studies on the price elasticity of formal child care (in particular the meta analysis by Ooms *et al.*, 2003) and the wage elasticity of labour supply (in particular the meta analysis by Evers *et al.*, 2008). Furthermore, we can now compare the results with the recent empirical literature on the impact of child care subsidies in Europe, where most `older´ studies were typically on US data, and the results seem to differ between Europe and the US. Also, we consider a number of policy options that were not studied by Graafland *et al.* (2001), like `free´ child care (for parents), and an income dependent tax credit for secondary earners with young children.

The outline of the paper is as follows. In Section 2 we first consider some data on child care and female participation in the Netherlands. Next, Section 3 starts with a general introduction to the model we use for the analysis, and subsequently considers in more detail how child care affects the different model blocks. In Section 4 we discuss the calibration of the model and Section 5 gives the simulation results. In Section 6 we provide some sensitivity analyses. Section 7 compares the findings with some other studies, where we focus on recent studies for Europe. In section 8 we compare the impact of child care subsidies with the impact of a secondary earner tax deduction. After discussing some remaining issues in Section 9, Section 10 concludes.

[6] Hence the `revisited´ in the title.

2 Data on child care and female participation

Figure 2.1 shows the rise in formal child care in the Netherlands. The solid line gives the number of full time places for 0-3 year olds.[7] The dashed line is the number of `full time´ places for 4-12 year olds, out-of-school care as Dutch children typically (98%) go to school from the age 4 onwards.[8] Both series show a steady increase since the early 1990s, and the growth seems to accelerate over the period 2005-2008. The latter will in part be due to the business cycle upswing during this period, but an important factor is presumably also the sharp drop in the price of formal child care (see below).

Another interesting development is in the formal use of so-called `guest parents´. Guest parent care is small scale formal care for 0-12 year olds, typically at the home of the care taker or of the child. As we can see from the data, it was not a big phenomenon up to 2005, and if anything it seemed to decline over the period 2001-2004. But that changed dramatically after 2005. With the introduction of the Law on child care in 2005, subsidies for guest parents became similar to those for care in centres, effectively they became much higher. Hence, for parents and guest parents it became much more interesting to organise the care formally. Furthermore, with some delay, people figured out that informal care by relatives and friends was now also considered guest parent care, and this was presumably a major factor in the rapid rise in guest parent care in recent years.[9]

One of the important drivers of the steady increase in formal care has been the rise in the participation of working mothers with young children. Figure 2.2 gives the annual growth rates for employment and average hours worked for women aged 20-50 with a child less than 12 years old. For comparison we also consider women aged 20-50 but without a child less than 12 years old. We see that over the whole period the growth in the participation rate of `young mothers´ has been substantially above that for other women. Furthermore, for both groups the growth rate seems to drop over the period 1995-2005, followed by an upswing in 2006 and 2007. A simple `eyeball´ test lends little support to the hypothesis that the much higher subsidy rate for formal child care after 2005 has spurred the recent rise in participation by young mothers. Indeed, the business cycle upswing seems a more likely candidate. Figure 2.2 also shows the remarkable stability of hours worked per woman, both for young mothers and other women. Over the whole period, the growth of hours worked has fluctuated around zero.

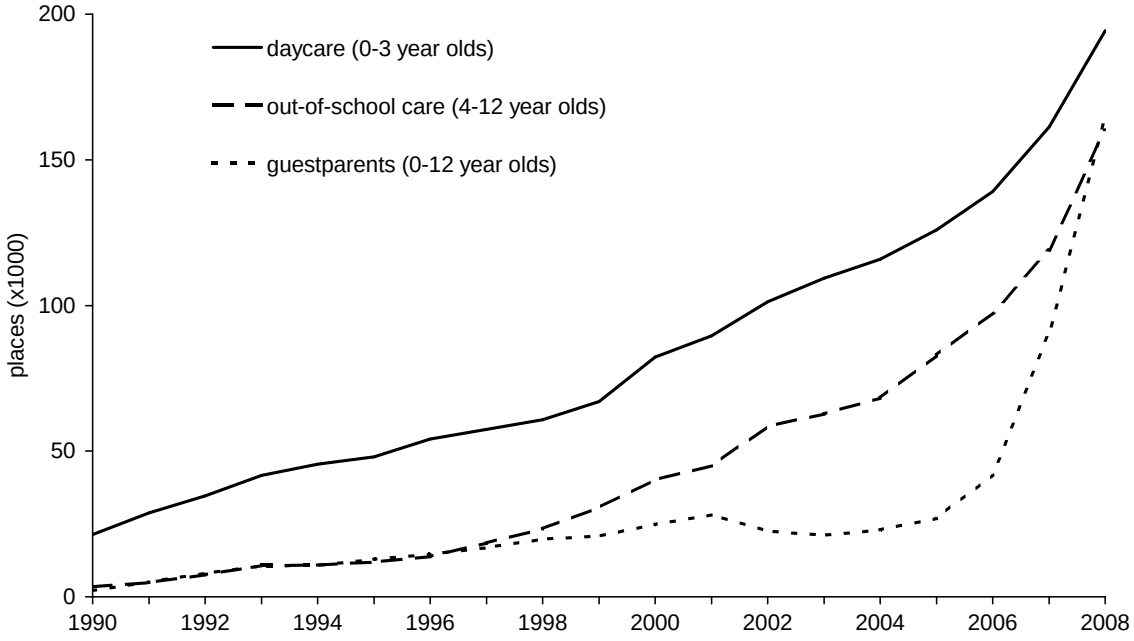
Another (perhaps related) driver of child care is presumably changing preferences towards

[7] Most children go to daycare only 2 or 3 days a week, as most mothers work only part time.

[8] A `full time` place for 4-12 year olds is about half of a full time place for a 0-3 year old (50 hours per week), they spend most of the working day at school with the exception of Wednesdays and (often) Fridays, and during school holidays.

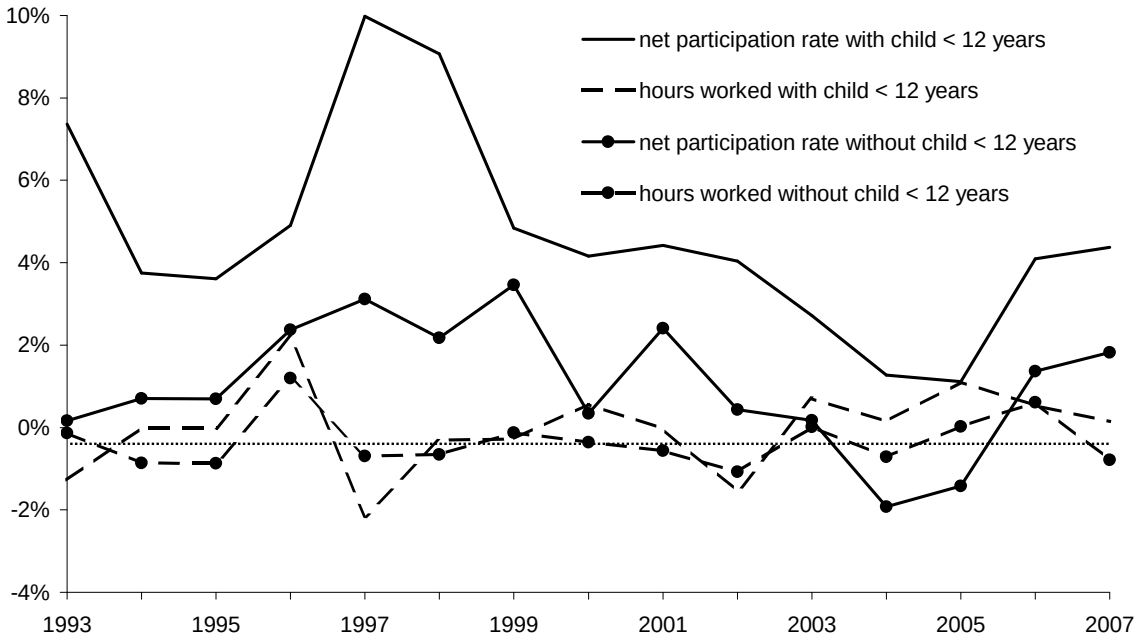
[9] The interested reader may consult *e.g.* www.doltje.nl to check the subsidy they can get. For example, a couple that earns about 50 thousand euro and whose parents (officially) take care of two grandchildren for 24 hours per week get over 10 thousand euro of subsidy per year.

Figure 2.1 The rise in formal child care in the Netherlands



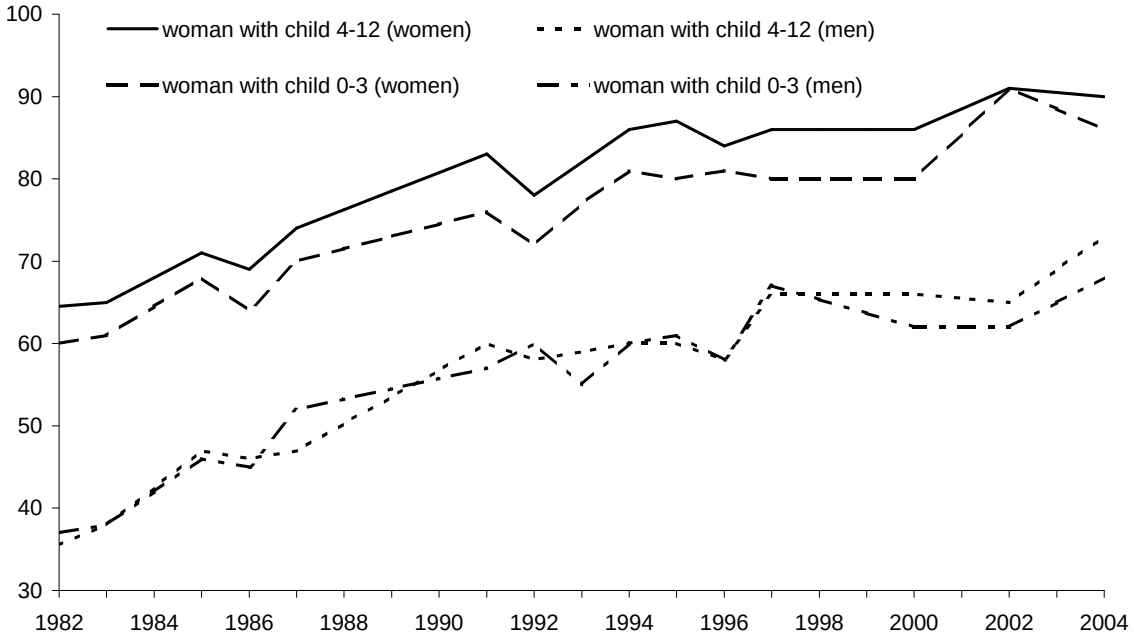
Source: Statistics Netherlands, Ministry of Education, Culture and Science and own calculations.

Figure 2.2 Growth rates participation women (20-50), with/without a child $<$ 12 years



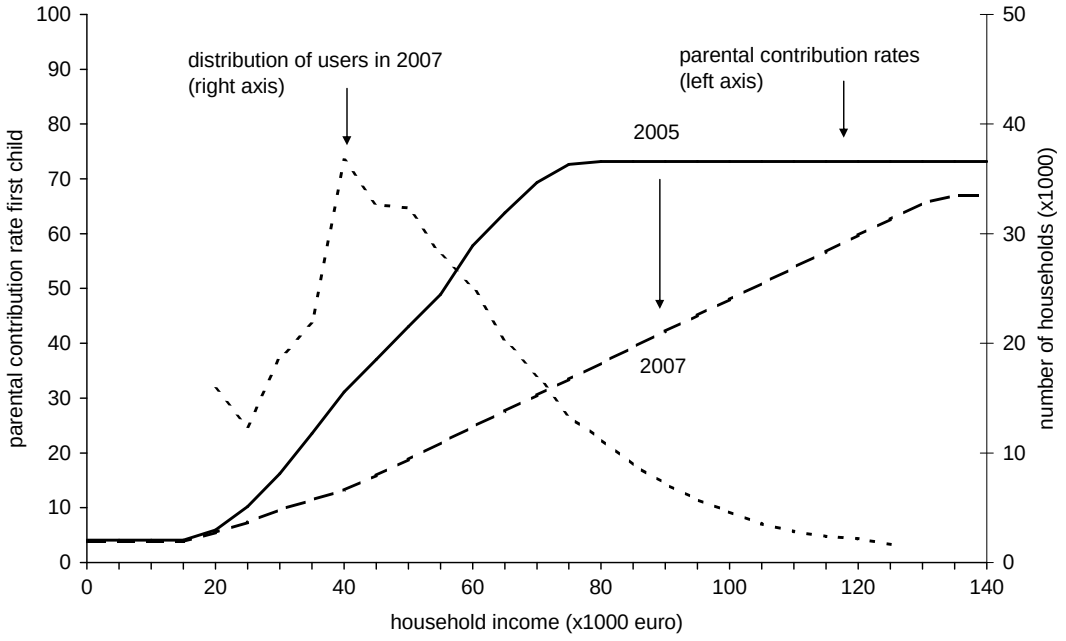
Source: Labour Force Survey (1993-2007).

Figure 2.3 Share of individuals (16-74) that agree with "working mother not a problem"



Source: Portegijs *et al.* (2006).

Figure 2.4 Cost shares for parents by income for the first child, 2005 and 2007



Source: Ministry of Education, Culture and Science and own calculations.

the use of formal care. As an indicator, Figure 2.3 shows the share of individuals (16-74) who agree with the statement "A working mother is not a problem", over the period 1982-2004 (unfortunately the question was dropped in later surveys). Presuming that most people have no problem with female participation *per se*, this could be seen as an indicator of attitudes towards sending children to child care. The share of women who agree with the statement has risen by some 20 percentage points over this period. The share of men who agree with the statement has risen even more, by some 35 percentage points, but a sizeable gap remains between the opinions of men and women. Although changing preferences probably contributed to the rise in formal child care, explaining the recent acceleration in the growth of formal child care with an acceleration in preference changes seems rather convenient, and also unnecessary.

Indeed, a more likely candidate for the recent surge in the use of formal child care is the dramatic drop in the parental contribution rate in 2006 and 2007. Up to 2005 the contribution rate for formal child care for parents dropped as well, but gradually, as more and more subsidized places by firms and the government became available.[10] Since 2005, all formal child care places get the same subsidy rate. In 2006 and 2007 the government increased the subsidy rate substantially, in part financed by the introduction of a premium for employers. Figure 2.4 shows the change in the cost share of formal child care for the first child for parents from 2005 to 2007. In both years, households with a lower income get a higher subsidy rate, but we see that the main change from 2005 to 2007 was for the middle and high income households. Taking into account the different (more generous) subsidy rate for the second (and third *etc.*) child and weighing the households by their densities we find that the average cost share of parents in formal child care dropped from 37% in 2005 to just 19% in 2007.[11]

The final part of the story is the substitution of informal care for formal care. As more formal places became available and the price of formal places for parents dropped, parents became increasingly able and eager to use formal care. According to Groot and Maassen van den Brink (1996) the share of formal child care in both formal and informal care was 16% in 1995. By 2006 the share of formal care had risen to 41% (Statistics Netherlands). More recent data are scarce. The survey results of Berden and Kok (2009) suggest there was a massive shift from informal to formal care between 2004 and 2008: for 0-3, 4-7 and 8-12 year olds, the share of parents using formal care in the total of parents using formal and informal care rose from respectively 58 to 77%, 22 to 54% and 21 to 44%. These dramatic shifts can explain the rapid rise in the use of formal care following the sharp drop in the price for parents in 2006 and 2007. The rise in the participation of mothers is a less likely candidate, since the growth rate of the participation by working mothers has been `average´ at best when we consider the past say 10

[10] For example, subsidized places by firms rose from 25 to 82 thousand between 1994 and 2001 (Statistics Netherlands).

[11] Source: Ministry of Education, Culture and Science.

years, see Figure 2.1.[12]

Below we outline a model that is able to capture these stylised facts on the use of formal and informal child care, and female participation, and allows us to study the causal relation between them.

[12] Though one could argue that additional working mothers have to rely more heavily on formal child care than in the past.

3 The model

We study the impact of child care subsidies in the so-called MIMIC model of CPB Netherlands Bureau for Economic Policy Analysis. We first give a brief informal introduction to the MIMIC model, and subsequently consider the adaptations we made to study the impact of child care subsidies.

3.1 A brief introduction to MIMIC

MIMIC is a computable general equilibrium models that CPB typically employs to study the long term impact of policy changes targeted at the labour market. Behavioural equations are derived explicitly from utility and profit maximisation, given technology and policy. MIMIC incorporates broadly accepted economic theories of labour supply, wage formation and job matching. The structural setup of MIMIC facilitates easy interpretation of simulation results in terms of rational individual behaviour, and makes the simulation results less prone to the Lucas-critique. For a detailed overview of the model see Graafland *et al.* (2001). De Mooij *et al.* (2006) give a recent overview of a large number of simulations and relate the outcomes to the findings in the literature on welfare state reform. Child care subsidies affect the agents in the model mainly through labour supply and wage formation. We consider the model blocks below.

3.2 The labour supply model

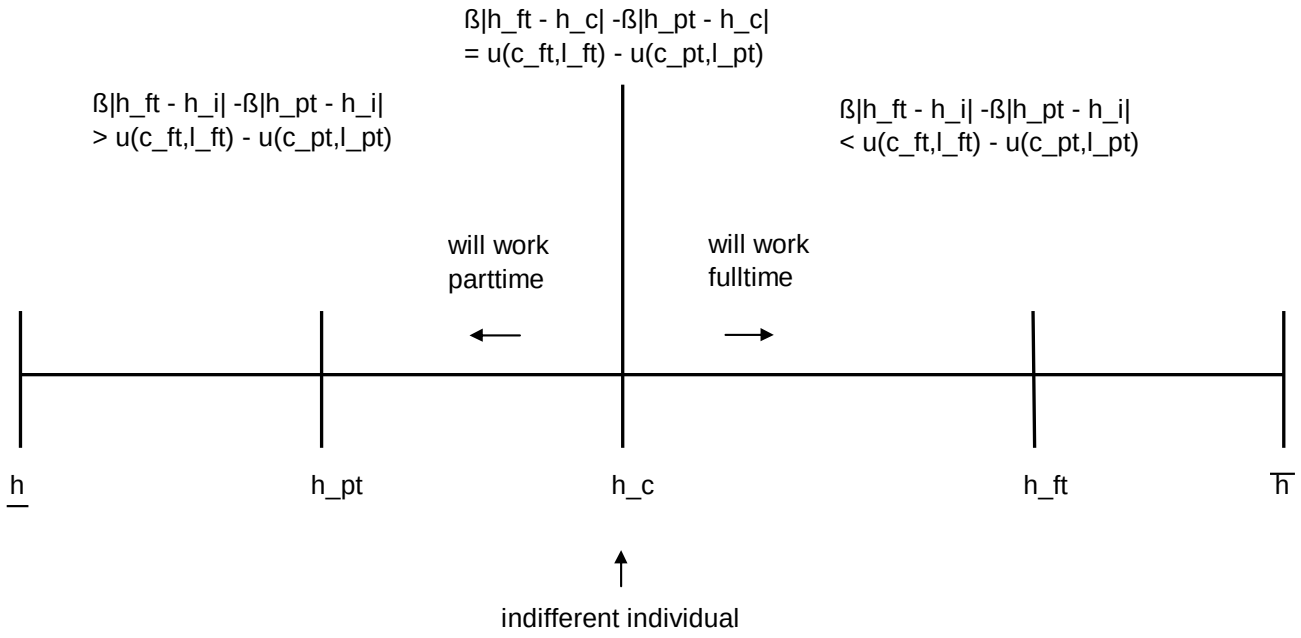
3.2.1 The general setup

The labour supply model in MIMIC distinguishes 40 types of households, which together represent the total population aged over 15 in The Netherlands. Two types of households are directly affected by child care subsidies: single-parent and two-parent households with dependent children. The analysis below gives the determination of labour supply for two-parent households, the determination of labour supply for single-parent households goes along similar lines.

Individuals maximize the utility of the household. For simplicity we assume that partners in the household take the labour supply choice of the other partner as given. Individuals can choose from a discrete set J of working hours options. Furthermore, to reproduce heterogeneous hours choices across households, we introduce an idiosyncratic preference for working hours h_i by individual i. When the individual deviates from h_i he or she incurs a cost β per hour deviation. Let h_j denote the number of working hours in labour supply option j. Furthermore, let c_j and l_j denote consumption and leisure for the household in option j, respectively. Utility for individual i in option j is then given by

$$U(c_j, l_j, h_j, h_i) = u(c_j, l_j) - \beta |h_j - h_i|, \tag{3.1}$$

Figure 3.1 Discrete choice model of labour supply



where $u(.)$ denotes `common´ utility derived from consumption and leisure in option j (a Stone-Geary function) and $\beta|h_j - h_i|$ is the idiosyncratic deviation cost from individual i when choosing option j.

Idiosyncratic preferences for working hours are uniformly distributed over individuals between the lower bound $\underline{h}$ and the upper bound $\overline{h}$. We can determine which individuals choose which labour supply option by looking for the individuals that are indifferent between two particular labour supply options. Figure 3.1 illustrates the procedure graphically for the simplified case where individuals can only choose between a part time and a full time job (the method is the same for our setup with more options). Denote working hours in the part time and full time job by h_{pt} and h_{ft} respectively, and consumption and leisure by c_{pt} and c_{ft}, and l_{pt} and l_{ft} respectively. Choosing the part time option generates utility $u(c_{pt}, l_{pt}) - \beta|h_{pt} - h_i|$ and choosing the full time option generates utility $u(c_{ft}, l_{ft}) - \beta|h_{ft} - h_i|$. Provided that the difference in common utility between the two options is not too big, those with high/low h_i will prefer the full time/part time option. The individual that is indifferent between both options has $h_c = \frac{u(c_{pt},l_{pt})-u(c_{ft},l_{ft})+h_{ft}+h_{pt}}{2}$.

Given the common utilities in each option we choose the distribution of individual preferences for working hours so that all options are filled and the shares in the different options are in line with the data. We choose the deviation cost parameter β, so that the wage elasticity of labour supply for breadwinners, partners and singles is in line with empirical studies (see the calibration below). Specifically, when we increase the wage rate, more individuals will choose to work full time, h_c will shift to the left, and we use β to steer how many individuals will switch

from part time to full time.

3.2.2 Labour supply with child care

Next we introduce child care. We consider how working hours translates in total child care demand, the choice between formal and informal child care, and finally child care costs per labour supply option.

From hours worked to total child care demand

We take the perspective of the (potential) secondary earners in the household, which we will call `partners´ (the decisions of the breadwinners are determined in a similar way). Let h_p denote the number of hours worked by the partner in a particular labour supply option, and let $\overline{h_b}$ be the (given) number of hours worked by the breadwinner. We assume that the partner and breadwinner minimize the demand for child care outside the household by minimizing the overlap in working hours. The demand for child care outside the household, cc, is given by

$$cc(h_p) = \max\{0, \overline{h_b} + h_p - h_{ft}\}, \tag{3.2}$$

where h_{ft} is the number of working hours of a full time equivalent.[13]

In the model we only distinguish between families with and without children. However, not all families with a child in the model have a child aged 0-12. Furthermore, many parents use (typically) unpaid informal care by family and friends, and the 4-12 year olds only need to use out-of-school care `part time´, *i.e.* after school hours. In general, we may wish to distinguish between child care for 0-3 and 4-12 year olds, given that certain policies may target only one group of young children. To capture these factors, average paid child care demand for 0-3 and 4-12 year olds in a labour supply option with hours h_p is

$$cc_3(h_p) = \gamma_3 \max\{0, \overline{h_b} + h_p - h_{ft}\}, \tag{3.3}$$

and

$$cc_{12}(h_p) = \gamma_{12} \max\{0, \overline{h_b} + h_p - h_{ft}\}, \tag{3.4}$$

respectively. The parameters γ_3 for 0-3 year olds and γ_{12} for 4-12 year olds capture that only part of working couples with dependent children has a child in the relevant age category, only part of them uses paid care, and 4-12 year olds only need formal care after school hours.

We implicitly assume that the use of *unpaid* informal care is a non-choice. Indeed, data from Portegijs *et al.* (2006) suggest that parents are at a corner regarding the use of unpaid care; they

[13] Some examples illustrate that the relation above makes sense. When the partner does not work there is no demand for child care, when the breadwinner works full time and the partner works 50 percent they demand child care for 50 percent of a full time place, and if both the breadwinner and the partner work 80 percent (`4 days a week´) they demand 60 percent of a full time place (`3 days a week´).

would like to use more if it were available.[14] However, as we will see below, we may wish to relax this assumption when we consider the extreme case where the government pays the full price of child care, `free´ child care for parents.

The choice between formal and informal care

Next we consider how households allocate the remaining demand for child care over paid formal and paid informal care. This depends on two factors: i) the price of formal care relative to informal care, and ii) an idiosyncratic cost or benefit of using formal care relative to informal care.

First consider the prices of formal and informal care. For simplicity we assume that the full price of paid formal care p_w and paid informal care p_b is independent of household income. However, parents receive a subsidy for the use of formal care which depends on household income. As we can see from Figure 2.4 above, the cost share s_w for parents can be well approximated by a minimum percentage $\underline{s_w}$ up to some income $\underline{y}$, a cost share that rises linearly with income at rate mp_w beyond $\underline{y}$, up to some maximum income where we reach a maximum cost share $\overline{s_w}$, or

$$s_w(\overline{y_b}, y_p) = \min\{\max\{\underline{s_w}, \underline{s_w} + mp_w(\overline{y_b} + y_p - \underline{y})\}, \overline{s_w}\}, \tag{3.5}$$

where $\overline{y_b}$ is the income of the breadwinner and y_p is the income of the partner in some labour supply option. Individuals with a higher income will pay more for formal care and hence will be less inclined to use formal care, *ceteris paribus*.

However, not all low income households use formal care and not all high income households use informal care.[15] Indeed, parents differ in their valuation of formal and informal care, for various reasons. Some parents may prefer to use an unsubsidised au pair who will also take the children to social activities like sports clubs. Other parents may simply not want to bother with the administrative procedures related to formal care. We capture all these individual reasons for preferring informal over formal care (and *vice versa*) with an idiosyncratic distribution for a relative cost or benefit using informal care over formal care across households.[16] This distribution also allows us to calibrate the price elasticity of formal care independent of the labour supply effect. The choice over formal and informal care together with the effect on labour supply determines the overall price elasticity.

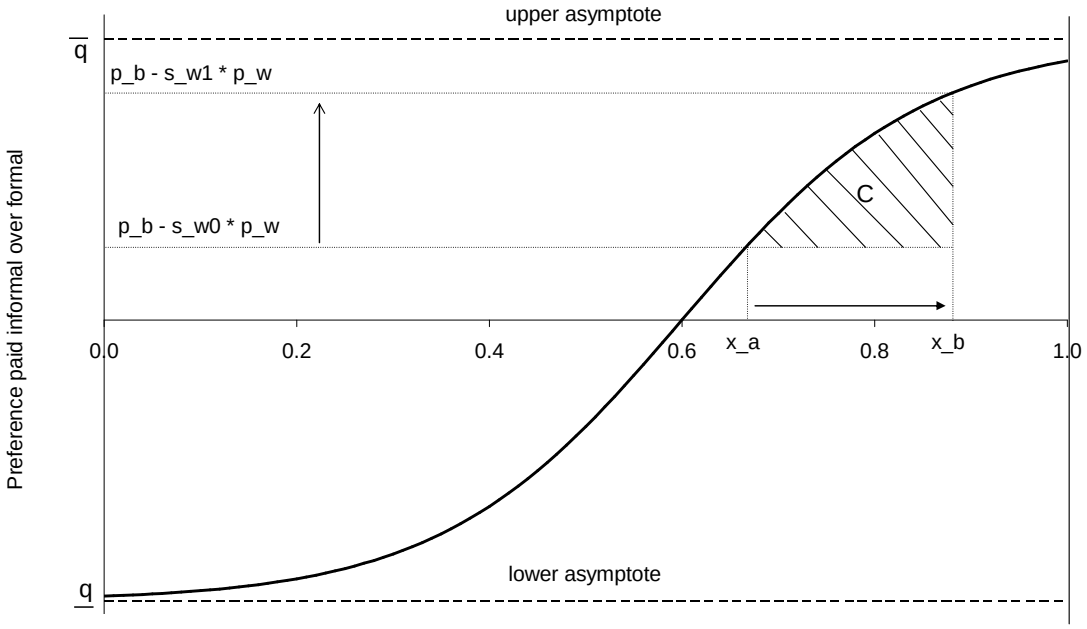
Figure 3.2 illustrates this idiosyncratic relative benefit/cost distribution graphically. Households are ordered according to their idiosyncratic benefit/cost for formal over informal

[14] In the survey of Portegijs *et al.* (2006), of the parents with children 0-12 year old, 43 percent of parents would like to use informal care by relatives and friends, but only 26 percent can realize this demand.

[15] See *e.g.* the "Monitor Arbeid en Zorg" from Statistics Netherlands.

[16] An alternative interpretation is that there is not a single price for paid informal care, but a distribution of paid informal care prices.

Figure 3.2 The choice over paid formal and informal care



child care, where individuals to the left favour formal over informal care, *ceteris paribus*, and *vice versa* for the ones on the right. The benefits/costs are normalized so that they are comparable to child care costs. Suppose that a household i derives idiosyncratic utility in monetary terms of $q_{w,i}$ from formal care and $q_{b,i}$ from informal care. Household i-s idiosyncratic relative benefit/cost of using informal over formal care is then $q_{b,i} - q_{w,i}$, the solid curve A in Figure 3.2. We assume that these idiosyncratic benefits/costs follow a generalized logistic function. For household i who is located at x_i on the horizontal axis we have his or her idiosyncratic benefit/cost as

$$q_{b,i} - q_{w,i} = \underline{q} + \frac{\overline{q}}{1 + e^{-\phi(x_i - \overline{x})}}, \tag{3.6}$$

where $\underline{q}$ is the lower asymptote, $\overline{q}$ is the upper asymptote, $\overline{x}$ is the so-called inflection point where the derivative reaches its maximum, and we use ϕ to steer the derivative at some point x_i. This function generates the following behaviour. For an initial price of informal care p_b and formal care $s_{w0}p_w$ for parents, all individuals to the left of x_a will choose formal care, and the rest will choose informal care. When we increase the child care subsidy rate, the formal price for parents drops to $s_{w1}p_w$. As a result, more people will choose formal care, the share rises from x_a to x_b. The logistic shape further implies that when the price of formal care drops, parents will switch to formal care at an increasing rate, which we motivate in the calibration below. Furthermore, relevant for labour supply is that when we increase the subsidy, the government spends $(s_{w0} - s_{w1})p_w x_w$ more on subsidies, but the shaded area C is `lost´ since parents that switch to formal care give up their idiosyncratic benefit from using informal care over formal care.

The share of paid formal care follows from the condition that for the indifferent household we have $q_b(i) - q_w(i) = p_b - s_w p_w$, so

$$p_b - s_w p_w = q_b(i) - q_w(i) \Rightarrow x_i = \overline{x} - \frac{1}{\phi} \ln \left(\frac{\overline{q}}{(p_b - s_w p_w) - \underline{q}} - 1 \right). \tag{3.7}$$

We further assume that individuals are uniformly distributed over the x-s, hence x_i is also the share of individuals s choosing paid formal care. The resulting shares of households that chooses formal care will differ across household types and labour supply options, since the parental price of formal care $s_w p_w$ rises with household income.

The cost of child care relevant for labour supply

Now we have all the elements to calculate the average cost of child care for a particular household type in a particular labour supply option. For a particular labour supply option j with formal parental price $s_w(j)p_w$ the average cost of child care $p_{cc}(j)$ is

$$\begin{aligned} p_{cc}(j) &= \int_0^{s(j)} s_w(j)p_w - (q_w(i) - q_p(i))di + \int_{s(j)}^1 p_b - (q_b(i) - q_p(i))di \\ &= \int_0^{s(j)} s_w(j)p_w di + \int_{s(j)}^1 p_b di - \int_{s(j)}^1 q_b(i) - q_w(i)di - \int_0^1 q_w(i) - q_p(i)di. \end{aligned} \tag{3.8}$$

where we introduce a term $q_p(i)$ which is the average benefit or cost of using formal care relative to the care by the parents themselves, more on this below. The average price of child care in a labour supply option is a weighted average of the price for formal and informal care, minus the average idiosyncratic benefit/cost of individuals using informal care over formal care, and minus the idiosyncratic benefit or cost of formal child care relative to care by the parents themselves. Is there a gain for parents from using child care other than facilitating labour participation? This seems questionable, at least in the perception of the parents (which is what matters for labour supply). Most parents seem to minimize their use of child care, and hence there seems to be an additional cost associated with sending the kids to child care. However, it is hard to put a number on this. For simplicity we assume that there is no utility gain or loss for the parents from using formal child care relative to taking care of the kids themselves, so we set the last term in (3.8) to zero. This is actually innocuous, the last term is a constant per labour supply option in the simulations.

This still leaves the expression for the integral $\int_{s(j)}^1 q_b(i) - q_w(i)di$. Filling in (3.6) in (3.8) we find

$$\begin{aligned} \int_{s(j)}^1 q_b(i) - q_w(i)di &= (1 - s(j))\underline{q} + \overline{q} \int_{s(j)}^1 \frac{1}{1 + e^{-\phi(x_i - \overline{x})}} dx_i \\ &= (1 - s(j))(\underline{q} + \overline{q}) + \frac{\overline{q}}{\phi} \int_{s(j)}^1 \frac{1}{1 + e^{-\phi(x_i - \overline{x})}} de^{-\phi(x_i - \overline{x})} \\ &= (1 - s(j))(\underline{q} + \overline{q}) + \frac{\overline{q}}{\phi} \ln \left(\frac{1 + e^{-\phi(1 - \overline{x})}}{1 + e^{-\phi(s(j) - \overline{x})}} \right). \end{aligned} \tag{3.9}$$

So the average price of child care in a particular labour supply option is

$$p_{cc}(j) = \int_0^{s(j)} s_w(j) p_w di + \int_{s(j)}^1 p_b di - \left((1-s(j))(\underline{q} + \overline{q} + \frac{\overline{q}}{\phi} \ln \left(\frac{1+e^{-\phi(1-\overline{x})}}{1+e^{-\phi(s(j)-\overline{x})}} \right) \right) . \quad (3.10)$$

where $s(j)$ is the x_i from (3.7) (see above). For each labour supply option we have two of these prices, one for child care for 0-3 year olds, $p_{cc,3}(j)$, and for child care for 4-12 year olds, $p_{cc,12}(j)$. The cost of child care for a particular labour supply is then $p_{cc,3}(j)cc_3(j) + p_{cc,12}(j)cc_{12}(j)$. In each labour supply option we deduct these option specific child care costs from consumption.[17]

Let us briefly summarize how child care subsidies affect labour supply. Parents that work more use more formal child care. Over the additional hours of child care they also get additional subsidies, which stimulates labour supply. Working in the opposite direction is the drop in the subsidy per hour of child care with household income and hence hours worked. Furthermore, the choice between formal and informal care also depends on the subsidy rate. A higher subsidy rate will cause some parents to switch from informal to formal care. When they do so they give up a compensating differential, which also reduces the labour supply effect of a higher subsidy rate for formal child care.

3.3 Wage formation

Child care subsidies not only affect participation via labour supply but also via (equilibrium) unemployment. For unemployment it is the effect on labour costs that matters. However, since the determination of labour costs is similar to Graafland *et al.* (2001) and plays only a minor role in our quantitative results, we keep the discussion here informal and brief and refer the interested reader to Graafland *et al.* (2001).

Regarding wage formation what matters is that labour costs, and thereby unemployment, rise with the (average) tax and replacement rate (net income in unemployment over net income in employment). We assume that child care costs are like a tax on income (see above). Child care subsidies reduce child care costs and hence the tax on labour. This reduces labour costs and therefore equilibrium unemployment. Note however, that this only holds for child care subsidies that are not financed by taxes or employers premiums.[18] Child care subsidies also reduce the replacement rate, again lowering labour costs and reducing equilibrium unemployment. However, in the current system both parents need only work 1 hour per year to qualify for subsidies for the whole year. Noting that parents may not want to give up their place when they expect to be re-employed in the near future, and that the subsidy per hour rises when family income drops, many unemployed may still use formal child care. We have no information on the

[17] To be precise, we assume that child care costs are consumption from which the parents derive no utility.

[18] Premiums appear to have a similar effect on labour costs as taxes, see Folmer (2009).

use of formal child care by employment status. In the base setup we assume that 50% of child care costs enters the replacement rate.[19]

[19] Furthermore, taking into account that formal child care is only relevant for part of the workforce.

4 Calibration

We calibrate the scale parameters in the model to a projection for 2011, and the elasticity parameters to the findings of the meta analysis by Ooms *et al.* (2003) for child care, Evers *et al.* (2008) for labour supply and Graafland and Huizinga (1999) for wage formation. A detailed discussion of the calibration is given below.

4.1 Projection

We calibrate the scale parameters to reproduce a projection for the child care market in 2011. After the dramatic drop in the parental contribution rates in 2006 and 2007, the government increased parental contribution rates again in 2009 (somewhat, from 19 to 22% on average). Furthermore, in 2010 there will be a large cut in subsidies for guest parents. There are no further plans to change the subsidy rate after 2010 (at the moment), and hence 2011 and beyond can be seen as the new long term policy setup. Furthermore, with the projected dramatic cut in subsidies to guest parents, the child care system will become more reminiscent of the older system where it was largely unsubsidised, the period for which we have empirical studies on *e.g.* the price elasticity.

For formal child care in 2011 we use the projection of Commissie Van Rijn (2009), a committee that was instituted to study future developments of the child care market and analyse reform options. The projection for 2009 is a simple extrapolation of the data for 2008 and the preliminary data for 2009 (`technical analysis´). This results in a growth rate of 9% for daycare and 18% for out-of-school care for 2009. Guest parent care is projected to grow at a substantially slower pace than in 2006-2008, but still some 30% in 2009. For 2010 and 2011 the Commissie van Rijn (2009) projects that formal care for 0-3 year and 4-12 year olds will grow at 4.5% and 9% per year respectively (half of the growth rate over the period 1994-2004). Guest parent care will drop due to the dramatic drop in the subsidy rate. The preliminary data for 2009 indeed suggest a significant slowdown of the growth in daycare and out-of-school care.[20]

There are a number of reasons why we may expect a significant drop in the growth rate of formal child care, not only compared to the high growth rates of recent years, but also compared to the (lower) growth rates of *e.g.* the period 1994-2004 (before the Law on child care): i) the growth in female participation will be much lower than in the past (see Euwals and Folmer, 2009), ii) the parental contribution rate (and hence the price for parents) will no longer drop[21] and iii) supply has largely caught up with demand.[22] A significant slowdown in the growth of

[20] As projected by Jongen (2008).

[21] Before 2005 the parental contribution rate dropped mainly because more subsidized places became available, not because the subsidy rate for formal places went up.

[22] In 1990 the number of places on waiting lists was 130% of the number of formal places (CPB, 1998), by 2002 this

Table 4.1 Projected macro variables, 2011

	0-3 Year olds	4-12 Year olds	Total
Expenditures on formal child care[a]	2.36	.95	3.30 (100%)
- Government	1.12	.53	1.65 (50%)
- Employers	.66	.27	.93 (28%)
- Workers/parents	.58	.15	.73 (22%)
Share of paid formal care in total paid care	.90	.75	.85

[a] Numbers are in billions of euro.

formal care is also consistent with international data on participation rates by children in child care from OECD (2008). The Netherlands is quickly catching up with Scandinavia when it comes to daycare, see Jongen (2008). The participation rate of 0-3 year olds in formal care excluding guest parent care (which is an international oddity), is projected to increase from 25% in 2004, to 39% in 2007 and then to 54% in 2011. This is in line with the participation rates in Scandinavian countries (in 2004): 62% in Denmark, 44% in Norway, 40% in Sweden, 35% in Finland.[23]

The resulting aggregate expenditures on formal child care in 2011 are given in Table 4.1. By 2011, 3.3 billion euro (.6% of GDP) will be spent on formal child care. Given the projected employers premiums and the subsidy rates by income set by the government, parents will pay 22% of formal care (on average), employers 28% (via premiums) and the government 50% (via taxes).[24]

Table 4.1 also gives the projection for expenditures on paid informal care in 2011. Data, let alone projections, on informal care are rare and typically based on small samples. We take the sample of survey data from the most recent Labour Force Survey available, the one for 2007, the so-called *Monitor Arbeid en Zorg Module Kinderopvang*, as our starting point. In 2007, 77% of the parents used paid formal care as their main source of paid childcare for 0-3 year olds, and 23% used paid informal care. For 4-12 year olds the shares of paid formal and paid informal were 68% and 32% in 2007, respectively. We correct these numbers for the difference in hours per week in paid formal and paid informal care. Data from Kok *et al.* (2005) suggest that average hours per week are 19 and 15 hours respectively for formal and informal paid care for 0-3 year olds, and for 4-12 year olds they are 8 and 10 hours per week, respectively. After we take this into account we arrive at a share of 85% for formal care in total paid care for 0-3 year

percentage had dropped to 18% for daycare and 14% for out-of-school care (Ooms *et al.*, 2003) and by 2007 this percentage had dropped to less than 10% for out-of-school care (Taskforce Bestrijding Wachtlijsten Buitenschoolse Opvang, 2007).

[23] The comparison is somewhat complicated by the fact that paid (parental) leave around child birth is much longer in Scandinavia than in the Netherlands, see Jongen (2008). With shorter paid leave, participation rates by 0-3 year olds in formal care would probably be higher in Scandinavia.

[24] Source: Ministry of Education, Culture and Science, personal communication.

Table 4.2 Parameters, 2011

	0-3 Year olds	4-12 Year olds
Scale parameter for incidence of paid child care γ_3 and γ_{12}	.20	.10
Income up to which parents pay the lowest percentage $\underline{y}$	25.	25.
Income beyond which parents pay the highest percentage	138.	138.
Minimum contribution rate parents $\underline{s_w}$	.05	.05
Maximum contribution rate parents $\overline{s_w}$	.63	.35
Annual full time price of a paid formal place p_w (x1000 euro)	17.	17.
Annual full time price of a paid informal place p_b (x1000 euro)	13.	13.
Lower asymptote in preference distribution formal-informal $\underline{q}$	– 8.5	– 13.
Upper asymptote in preference distribution formal-informal $\overline{q}$	17.	26.
Inflection point preference distribution formal-informal x_0	.79	.57
Derivative parameter preference distribution formal-informal ϕ	27.	5.5

olds, and 62% for 4-12 year olds, in 2007. The data from Berden and Kok (2009) suggest that there was a substantial shift from paid informal to paid formal care over the period 2004 and 2008. For 2011, we assume that the shift from paid informal to paid formal care continues, and we assume that another 33% of paid informal care goes to paid formal care by 2011. This gives us a share of paid formal care in total paid care of 90% and 75% respectively for 0-3 year and 4-12 year olds, in 2011.

4.2 Parameters

Next, we need to reproduce these aggregate numbers for paid formal and informal care for the 0-3 year olds and 4-12 year olds using the micro parameters in the model, see Table 4.2.

First, we set the scale parameters γ_3 and γ_{12} that translate a certain overlap in working hours by parents into a total demand for paid child care for 0-3 and 4-12 year olds, so that these total demands are in line with the macro projection in Table 4.1.

Then, we assume that the full price of a formal child care place p_w is 17 thousand euro per year (6 euro 50, for 50 hours per week, for 52 weeks per year),[25] and the full price of paid informal care p_b is assumed to be 75% of the full price of paid formal care, in line with the data in Kok *et al.* (2005).

Next, we need to determine the subsidy rate for 0-3 and 4-12 year olds s_w by household income, to determine the price of formal care for parents.[26] In Section 2 we already discussed

[25] The exact price is not that important. The scale parameter for the use of paid care, and the full price of formal and informal care are interchangeable in the formulae for the use of paid formal care, and we still need to get to the same macro expenditures.

[26] Note that the full price of paid formal (and paid informal) care is assumed to be the same for all households. At least for

the parental share in the full price of formal care, which rises with income due to the drop of the subsidy rate with income, see Figure 2.4. When we look at how the parental share varies with household income we have basically a flat segment for the lowest incomes, then a segment where the fee rises linearly with income, and then another flat segment for the highest incomes. For 2011 we use a table with a contribution rate for parents of 5%[27] up to 25 thousand euro ($\underline{s_w}$), and then a linearly rising rate up to 63% for 0-3 year olds and 35% for 4-12 year olds at 138 thousand euro, beyond which the contribution rate for parents remains constant at $\overline{s_w}$. This contribution rate is a mixture of the table for the `first ´ child and the table for the `second ´ child (`third ´ child *etc.*), where first *etc.* refers to the child for which parents claim the highest expenditures. In the model we can not distinguish between the first and second child. However, we have data from the tax office on the average contribution rate for 0-3 year olds and 4-12 year olds separately. We use this information to reduce the maximum contribution rate in the table for 0-3 year olds and 4-12 year olds separately, up to the point where the average contribution rate matches the data per group. The data indicate that 4-12 year olds are more likely to be a second child than 0-3 year olds. The tax office takes the child that uses the most child care as the first child, and this is more likely to be a 0-3 year old (the 4-12 year olds spend most of the working day at school and hence use less hours). 138 thousand euro is some arbitrary high family income beyond which few people are left, see also Figure 2.4.

Given parental prices for paid formal and paid informal care, the idiosyncratic preference distribution of paid informal over paid formal care determines the share of individuals using paid formal and paid informal care, and together with the labour supply elasticity it determines the price elasticity of formal child care demand. The idiosyncratic preference distribution has four parameters (see equation (3.6)): the lower asymptote, the upper asymptote, the inflection point where the derivative reaches its maximum, and the derivative parameter at the inflection point. We set the inflection point x_0 so that conditional on the other parameters, the share of paid formal care for 0-3 and 4-12 year olds, is line with the projection of Table 4.1. Despite the lower parental fee for 4-12 year olds than for 0-3 year olds, a larger share of parents uses paid informal care for 4-12 year olds than for 0-3 year olds. As a result, the inflection point needs to be higher for 0-3 year olds.

Next, we set the derivative parameter ϕ so that conditional on the other parameters the price elasticity of formal care at a contribution rate of 40% for parents on average, the setup in 2005, is in line with the findings of the meta analysis of Ooms *et al.* (2003). Ooms *et al.* (2003) suggest that the price elasticity for child care use by 0-3 year olds is about -.15 and for guest parent care is about -.7. Unfortunately, they do not study the price elasticity of out-of-school care. We calibrate the derivative parameter for 0-3 and 4-12 year olds so that we arrive at a price

formal care this does not seem to be at odds with the data, *e.g.* the data in De Bruijn *et al.* (2004) suggest that the spread in full prices for formal child care is small.

[27] The average for the first and second child at 25 thousand euro in 2009.

elasticity of .2 for paid formal starting at a contribution rate of 40% for parents (see the simulations below).

We set the upper asymptote $\overline{q}$ at such a level that we get a higher price elasticity of paid formal care when the contribution rate drops below the current level of 22%. Specifically, we assume that the price elasticity of paid formal care goes to .4 once the parental contribution rate drops below 22%. Indeed, the recent data suggests that the price elasticity is much higher at higher subsidy rates. Over the period 2005-2008 the price of paid formal care dropped by some 50%. Over the same period, daycare increased by 55% and out-of-school care increased by 98% per year. Based on the trend growth rates of 9 and 18% over the period 1994-2004 for 0-3 and 4-12 year olds respectively, we would expect 30% growth for 0-3 year olds 64% growth for 4-12 year olds over the period 2005-2008. We are missing 25 and 34% respectively. When we attribute all of this to the 50% drop in the average parental contribution rate, we arrive at a price elasticity of about .6. But, there were some other factors that may have contributed to the higher growth rate in 2005-2008, for example the business cycle upswing and the so-called *Motie Van Aartsen-Bos* that made schools responsible for arranging to out-of-school care from 2007 onwards.[28] For these reasons we take a more conservative value of .4 at the current contribution rate.

Finally, we set the lower asymptote $\underline{q}$ to minus the upper asymptote.[29] This is clearly arbitrary, but note that the far left side of the distribution is not relevant for our simulations. Even in the extreme case where we abolish all subsidies to paid formal care, the price of paid informal care minus the price of paid formal care drops only somewhat below the horizontal axis in Figure 3.2.[30]

4.3 Selected calibration outcomes at the micro level

Table 4.3 gives selected outcomes of the calibration at the micro level, for secondary earners in couples. We give outcomes for 0-3 year olds and 4-12 year olds by skill type and labour supply option. Both the breadwinner and the (potential) secondary earner can be low or high skilled, so we have four skill combinations. Furthermore, (potential) secondary earners can choose from: not working (child care costs are zero), working in a small part-time job (30%), a medium

[28] However, note that this did not change the price of out-of-school care for parents, and the acceleration in the use of paid formal care is present in both daycare and out-of-school care. This casts some doubt on whether the *Motie Van Aartsen-Bos* was a major factor in the growth of paid formal care.

[29] Actually, half of $\overline{q}, \overline{q}$ is minus the lower asymptote plus the upper asymptote.

[30] The calibration procedure is a rather time consuming trial-and-error process. First of all, the share of individuals using paid formal and paid informal care differs over households types and labour supply choices since the subsidy rate depends on household income. The share we present in Table 4.1 is a weighted average of all these different households and household choices. Furthermore, we can not determine the price elasticity of formal care before we run the simulations, the price elasticity is the average response of all the different responses of the different households regarding the choice of formal and informal care and their labour supply choices.

Table 4.3 Calibration outcomes at the micro level in 2011: partners in couples[a]

	0-3 Year olds			4-12 Year olds		
Working hours (as a % of full time)	30	50	80	30	50	80
Annual parental fee formal full time place						
- High skilled breadwinner, high skilled partner	4.257	4.834	5.499	2.772	3.098	3.473
- High skilled breadwinner, low skilled partner	3.932	4.334	4.876	2.589	2.816	3.122
- Low skilled breadwinner, high skilled partner	3.127	3.705	4.369	2.135	2.461	2.836
- Low skilled breadwinner, low skilled partner	2.799	3.201	3.743	1.950	2.177	2.482
Share paid care in total paid care						
- High skilled breadwinner, high skilled partner	.990	.846	.833	.746	.735	.724
- High skilled breadwinner, low skilled partner	.990	.880	.845	.752	.744	.735
- Low skilled breadwinner, high skilled partner	.990	.990	.874	.770	.757	.744
- Low skilled breadwinner, low skilled partner	.990	.990	.990	.778	.768	.756
Annual parental cost of a full time place						
- High skilled breadwinner, high skilled partner	4.257	4.755	5.312	2.299	2.540	2.814
- High skilled breadwinner, low skilled partner	3.936	4.326	4.790	2.162	2.332	2.558
- Low skilled breadwinner, high skilled partner	3.138	3.710	4.357	1.817	2.065	2.346
- Low skilled breadwinner, low skilled partner	2.814	3.212	3.748	1.673	1.849	2.081
Demand for child care in full time equivalents						
- High skilled breadwinner, high skilled partner	.058	.098	.158	.028	.047	.076
- High skilled breadwinner, low skilled partner	.070	.106	.161	.034	.051	.078
- Low skilled breadwinner, high skilled partner	.038	.078	.138	.019	.038	.066
- Low skilled breadwinner, low skilled partner	.050	.086	.141	.024	.042	.068
	0-12 Year olds					
Total annual child care costs per labour supply option						
- High skilled breadwinner, high skilled partner	.313	.587	1.052			
- High skilled breadwinner, low skilled partner	.346	.579	.972			
- Low skilled breadwinner, high skilled partner	.154	.368	.757			
- Low skilled breadwinner, low skilled partner	.180	.354	.672			

[a] In thousands of euro.

part-time job (50%) and a large part-time job (80%). Table 4.3 gives the corresponding prices of child care and the resulting choices over paid formal and paid informal care for the options where the parents use child care.

The top four rows give the annual parental fee for a full time formal place. More skills imply a higher gross wage, which implies more family income. Hence the subsidy rate is lower for high skilled and the parental fee is higher. Here we also see the implicit marginal tax in the parental fee per hour. Working more hours increases household income, which reduces the subsidy per hour and increases the price of formal care for parents. We further see that parents pay less for 4-12 year olds than for 0-3 year olds, because 4-12 year olds are more often the `second ´ child, parents receive a higher subsidy for the second child.

The next four rows give the shares of paid formal care in total paid care. The individual

preference distribution is the same over skill groups and labour supply options, what differs is the parental fee for formal care. Low incomes receive more subsidy per hour, and hence use more formal care. Indeed, families with a low skilled breadwinner and a low skilled partner always choose paid formal care in the calibration.[31] Furthermore, individuals working more hours are less likely to use paid formal care, the have more income and hence a lower subsidy rate per hour formal care. We further see how the different preference distributions for paid informal over paid formal care for 0-3 and 4-12 year olds results in lower shares of paid formal care for 4-12 year olds, despite the lower parental fee for parents, in line with the data.

Then we have the four rows that show the full time price of total paid formal care, which is the weighted average of formal and informal paid care corrected for the compensating differential, see equation (3.10). What is important here is that this price rises less with hours worked than the price for a formal place. Indeed, the option to choose paid informal care gives parents a way to insulate themselves from a higher parental fee. We see this effect in operation when we go from lower to higher skills and from less to more working hours. In both cases the increase in the price of paid care including the compensating differential is less than the increase in the price of paid formal care. Note that the resulting price of a full time place still rises with skill and working hours though.

The next four rows show the use of paid child care in full time equivalents per labour supply option. Working more hours results in more demand for paid child care. But the demand for care for 4-12 year olds is lower, in part because they only need to go to paid care after school hours.

At the bottom of the table we have the average annual child care costs over all couples with dependent children, per labour supply option; the product of the use of paid formal care in full time equivalents for 0-3 and 4-12 year olds and the respective parental prices. Working more hours implies more child care costs because i) this increases the required number of child care hours, and ii) because of the drop in the subsidy per hour resulting from the higher household income. Note that effect i) is quantitatively more important than effect ii).

4.4 Labour supply and wage formation

Finally, we briefly discuss the calibration of labour supply and wage formation. The calibration of labour supply and wage formation are taken from the original MIMIC model.[32]

We calibrate the labour supply elasticity in MIMIC to the findings of the meta analysis of Evers *et al.* (2008). They suggest a (uncompensated) labour supply elasticity for secondary earners of .5, and a labour supply elasticity for breadwinners of .1 for the Netherlands. For single parents we also take the larger value of .5 (also supported by Meghir and Phillips, 2008).

[31] We restrict the maximum share of parents using paid formal care to .99, to prevent numerical problems.

[32] See De Mooij *et al.* (2006) and Graafland *et al.* (2001) for an elaborate discussion of the calibration of labour supply and wage formation.

For singles we take an intermediate value of .25. The high labour supply elasticity of secondary earners and single parents makes child care subsidies an interesting policy option to stimulate labour supply, even if we have to finance these subsidies with taxes.

The calibration of wage formation in MIMIC is based on the time series estimates of Graafland and Huizinga (1999). They find an elasticity of labour costs (gross wages plus employers premiums) with respect to the average tax rate of .6, and to the replacement rate of .3. Hence, not all taxes are borne by labour in the form of lower net wages (and hence not all subsidies go to labour). Furthermore, when we increase income in work relative to income out of work via child care subsidies, wages will fall due to the drop in the replacement rate.

5 Simulations

We consider three sets of simulations. First we consider the effects of relatively small changes in the subsidy rate across-the-board. Then we consider the effects of a change in the subsidy rate targeted at the bottom or the top of the income distribution. We conclude with the effects of more radical policy options; `free´ child care for parents and abolishing child care subsidies altogether. In all the simulations we keep the aggregate contribution by employers constant, so that all budgetary savings or costs are for the government. Furthermore, we balance the government budget by an across-the-board reduction or increase in income tax rates.

5.1 Small changes in parental contribution rates

We start with the effects of relatively small changes in the subsidy rate. Specifically, we consider pro rata changes in the parental contribution rates across household incomes, ranging from -25% to +25%. As the lower incomes pay much less initially in percentage terms, their contribution rate in percentage points rises less than the higher incomes. The pro rata changes are motivated by the pro rata policy changes in recent years. We also consider the effects of a rise in the parental contribution rate by +50 and +100%, to check the price elasticity of formal care for the change in the subsidy rate from the much lower level in 2005 to the much higher level in the current setup. Table 5.1 gives the results for the child care market, Table 5.2 gives the results for labour participation.

5.1.1 Simulation results child care market

First consider the outcomes for the child care market. From the top rows in Table 5.1 we see that the total parental fee changes less than the parental fee for formal care. This is a result of the option of parents to choose between paid formal and paid informal care. When we *e.g.* increase the parental fee for parents, some parents will switch from paid formal to paid informal care. In this way parents partly insulate themselves from the price increase.

The next rows give the changes in the use of paid care. When we decrease the parental fee for formal care, the use of formal care increases. We can also see the increasing price elasticity of formal care when the subsidy rate drops. When we drop the parental fee 25% the sum of formal care for 0-3 and 4-12 year olds increases by 9%, an elasticity of .4. Now consider the initial setup in 2005 when the parental fee was almost double the fee it is now, which we illustrate using the simulations with +100% and +50%. At +100% formal care is 13% less, and at +50% it is 8.2% less. When we go from the simulation of +100% (reflecting 2005) to +50% (a `marginal´ change starting from 2005), the parental fee drops by 25% (from `200´to `150´). Formal care increases by (100-8.2)/(100-12.4)*100%= 5%. Hence, starting at a parental +100% of the current level the price elasticity of formal care is .2, in line with the meta analysis of Ooms *et al.* (2003).

Table 5.1 Small changes in the parental fee: long run effects on the child care market

Change in parental fee formal care	– 25%	– 10%	– 5%	+ 5%	+ 10%	+ 25%	+ 50%	+ 100%
	Percentage changes							
Parental fee								
– 0-3 Total	– 23	– 9	– 5	5	9	22	43	85
– – Formal	– 23	– 9	– 5	5	10	24	49	99
– 4-12 Total	– 23	– 9	– 5	5	9	22	44	85
– – Formal	– 25	– 10	– 5	5	10	25	50	99
Child care places								
– 0-3 Total paid	1.9	.7	.3	– .4	– .7	– 1.7	– 3.2	– 6.1
– – Formal	11	4.0	1.1	– 1.0	– 2.7	– 4.7	– 8.2	– 12
– – Share formal in total paid (level)	.99	.94	.92	.91	.89	.88	.86	.85
– 4-12 Total paid	1.9	.7	.3	– .4	– .7	– 1.7	– 3.2	– 6.1
– – Formal	5.4	2.0	.9	– .9	– 1.9	– 4.4	– 8.1	– 15
– – Share formal in total paid (level)	.78	.77	.76	.75	.75	.74	.72	.69
– Total formal	9.2	3.4	1.0	– 1.0	– 2.4	– 4.6	– 8.2	– 13
Macro expenditures on formal child care	9.2	3.4	1.0	– 1.0	– 2.4	– 4.6	– 8.1	– 13
– Parents	– 16	– 6.2	– 3.9	3.9	7.0	19	37	73
– Firms	0	0	0	0	0	0	0	0
– Government	24	9.1	3.5	– 3.4	– 7.4	– 16	– 30	– 54
Macro share in formal expenditures (level)								
– Parents	.16	.18	.19	.21	.22	.25	.30	.40
– Firms	.26	.27	.28	.28	.29	.29	.31	.32
– Government	.59	.55	.53	.51	.49	.45	.39	.28

From Table 5.1 we also see that the changes in total paid child care are less than the changes in formal child care. Again, this is the result of parents switching between paid formal and paid informal care in response to the change in the parental fee for formal care. Furthermore, the extent of substitution of paid formal for paid informal care rises when the parental fee becomes lower. The initial share of formal care in total paid care is .85. When we drop the parental fee by 25%, formal care rises by 9.2%. But total paid care rises only by 1.9%. Hence, (.092 * .85 - .019)/(.092*.85) * 100% = 75% of the rise in formal care is substitution for paid informal care. When we increase the parental fee by 25%, formal care drops by 4.6% and total care by 1.7%. Substitution drops to (.046 * .85-.017)/(.046 * .85) * 100% = 57%. When we increase the price by 100%, substitution is even less, (.13 * .85-.061)/(.13 * .85) * 100% = 45%. This is the logistic distribution for idiosyncratic preferences at work (see Figure 3.2).[33]

[33] Table 5.1 also shows that the percentage change in the use of total paid formal care is the same for 0-3 and 4-12 year olds. This reflects the same underlying change in labour supply. Note that for a given labour supply choice, parents can only choose whether they want to use paid formal or paid informal care, the total demand for paid care in a particular labour supply is given.

Table 5.2 Small changes in the parental fee: long run effects on participation and production

Change in parental fee formal care	– 25%	– 10%	– 5%	5%	10%	25%	50%	100%
	Percentage changes							
Labour supply in hours	.05	.02	.01	– .01	– .02	– .05	– .11	– .21
– Breadwinners	.07	.03	.01	– .01	– .02	– .06	– .12	– .24
– – With children < 17	.11	.04	.02	– .02	– .04	– .10	– .20	– .38
– Secondary earners	.10	.04	.02	– .02	– .04	– .09	– .19	– .36
– – With children < 17	.16	.06	.03	– .03	– .06	– .15	– .29	– .56
– Single parents	.50	.20	.11	– .10	– .20	– .52	– 1.0	– 2.0
– Singles	– .02	– .01	.00	.00	.01	.01	.02	.03
Labour supply in persons	.02	.01	.00	.00	– .01	– .01	– .03	– .05
Unemployment rate (absolute changes)	– .01	.00	.00	.00	.01	.01	.02	.03
Employment in hours[a]	.07	.03	.01	– .02	– .03	– .08	– .15	– .29
Budgetary shift ex ante[b] (million euro)	393	119	66	– 59	– 111	– 269	– 480	– 885

[a] Private sector employment.
[b] Budgetary shift for given levels of participation, but with substitution of formal for informal child care.

When we look at the share of formal care in total paid care, Table 5.1 shows that when the parental fee drops by 25%, we end up with 99% of parents using formal care for 0-3 year olds when they use paid care. This is the upper limit in the model (to prevent numerical problems). This is the inevitable result when we want the share of paid informal care and the price elasticity of paid formal care to be in line with the data in our model. The question is what happens if the formal parental fee drops even further, in particular when it drops to zero. This is the question we take up in Section 5.3 below. There we consider some scenarios where parents not only substitute paid informal care for paid formal care, but also unpaid informal care for paid formal care, if the price is low enough. Indeed, substitution of unpaid informal care is another candidate for the observed higher price elasticity of formal care at higher subsidy rates.

Turning to the aggregate expenditures on formal child care, we see that parents spend less on formal child care when the price drops. The price elasticity of formal care is less than one, so the drop in the price dominates the rise in demand. We fix the aggregate contribution of firms, so the additional expenditures are covered by the government. The government has to pay more because of the higher subsidy rate and because of the higher use of formal child care.[34]

5.1.2 Simulation results participation

Table 5.2 gives the resulting changes in participation. When the parental fee of formal child care drops participation goes up. Participation rises both on the intensive and the extensive margin. On the intensive margin, parents with young children will work more hours, in particular single

[34] Table 5.1 also gives the shares in total expenditures.

parents who rely heavily on paid care since there is no partner who can look after the children. On the extensive margin, labour supply in persons goes up, some parents will join the labour force, and unemployment drops, subsidies for formal care make working more attractive than being unemployed. Households without children will work a bit less, due to the financing of the subsidies with higher tax rates, consider *e.g.* the group of singles.

Overall, employment goes up by .07% when the parental fee drops by 25%. The associated budgetary shift (rise in government expenditures on child care) is some 393 million euro ex ante, where we define ex ante as the budgetary costs of the increase in the subsidy for a given level of participation (in line with *e.g.* De Mooij *et al.*, 2006). .07% corresponds to 4150 full time equivalents (FTE) in the model in 2011. Hence, the impulse implies a budgetary shift of 95 thousand euro per FTE. This is substantially more per FTE than when we increase the subsidy rate. When we increase the parental fee by 25%, the budgetary savings are 269 million euro, and we lose .08% of employment, or a budgetary shift of 57 thousand euro per FTE. When we increase the parental fee by 100%, we get to a budgetary shift of 52 thousand euro per FTE. Hence, the effectiveness of child care subsidies drops off significantly in the model when we increase the subsidy rate to current levels. This is the result of the increased substitution of paid formal for paid informal care as the fee for parents drops. This pushes expenditures up but has little effect on participation, parents give up compensating differentials by switching to formal care. Indeed, the labour supply effect on the last person to switch is zero.

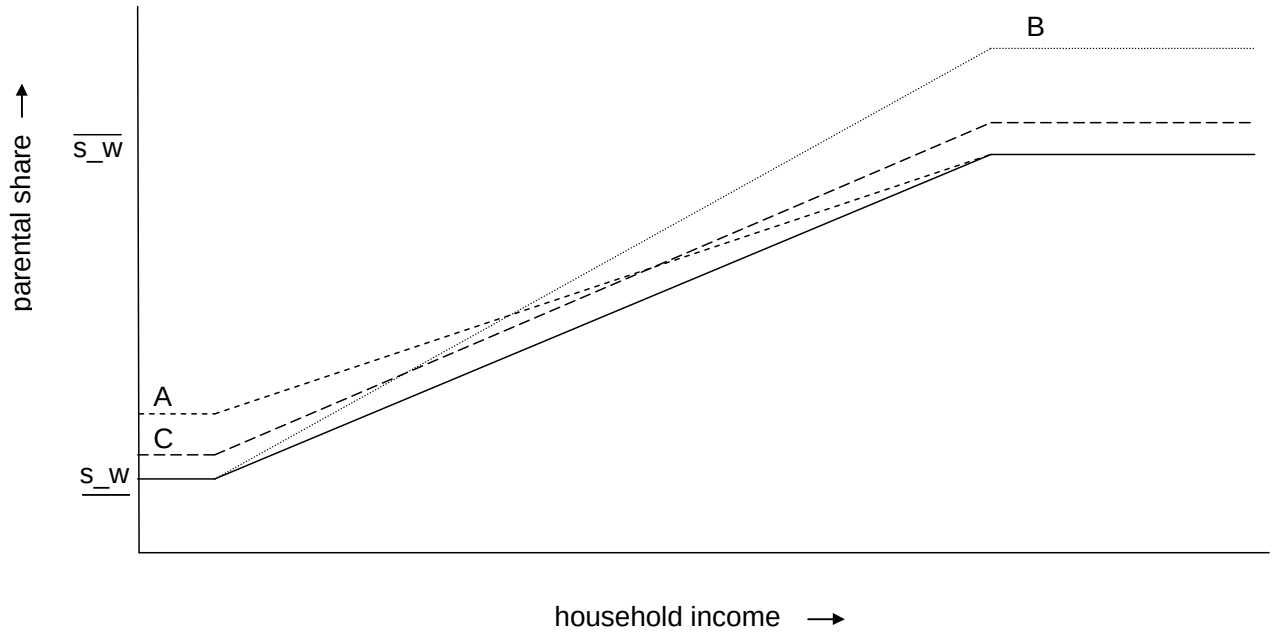
5.2 Changes in the parental fee for low and high incomes

Next, we consider whether targeting changes in the parental fee at low or high income families makes a difference in terms of aggregate outcomes. It is important to note that we start from a situation where the lowest incomes pay only 5% of the full price of formal child care. Since we can not go much lower, we will consider an increase in the parental contribution rate. We consider three simulations, see Figure 5.1 below. The solid line is the initial relation between household income and the parental share in the full price of child care. In the first simulation we raise the minimum parental share, locus A. In the second simulation we raise the maximum parental share, locus B. In the third simulation we increase both the minimum and the maximum parental share, locus C. In all simulations the ex ante budgetary savings on formal child care are 300 million euro. Table 5.3 gives the resulting effects on the child care market variables, and Table 5.4 gives the effects on participation.

5.2.1 Simulation results child care market

From Table 5.3 we see that when we increase the minimum contribution rate, the higher parental fee falls mostly on the low-skilled. When we increase the maximum contribution rate, the increase is more evenly spread across skill types. When we increase both the minimum and

Figure 5.1 Changes in parental fee targeted at different groups



maximum contribution rate, we get values in between these two cases.

When we look at the effects on the use of total paid child care, we see only minor differences, but there is a somewhat larger response in formal child care when we raise the minimum contribution rate. The latter is the result of the logistic distribution of idiosyncratic preferences for paid informal over paid formal care (again, see Figure 3.2). Raising the minimum contribution rate mostly affects households that have a very low contribution rate. Hence, we start in the more elastic top part of the preference distribution when it comes to using formal care.

For completeness, we also report the changes in aggregate expenditures on formal child care in response to the targeted changes in the parental contribution rate. The change in aggregate expenditures follows the change in the volume of formal care.

5.2.2 Simulation results participation

Table 5.4 gives the resulting changes in participation. The simulation results suggest that targeting the increase in the parental fee at low or high incomes makes little difference for the macro effect on participation. To understand why it is important to realize that there are two effects of the current child care subsidy system on the incentives for parents to work more or less.

First, the child care subsidy per hour is regressive in household income (drops with income). This is a disincentive for parents to work more. But second, when parents work more hours, they use more child care hours. Since parents receive a subsidy per hour, this is an incentive for parents to work more hours. In the current system, the net effect is that parents who work more

Table 5.3 Targeted changes in the parental fee: long run effects on the child care market

Change in parental fee formal care	Low incomes	High incomes	Across-the-board
	Percentage changes		
Parental fee			
– 0-3 Total	25	22	24
– – High-skilled[a]	16	22	18
– – Low-skilled[b]	32	23	29
– – Formal	28	24	27
– 4-12 Total	37	33	36
– – High-skilled[a]	26	36	30
– – Low-skilled[b]	45	31	40
– – Formal	43	37	42
Child care places			
– 0-3 Total	– 1.8	– 1.9	– 1.9
– – Formal	– 5.8	– 4.9	– 5.7
– 4-12 Total	– 1.8	– 1.9	– 1.9
– – Formal	– 6.6	– 5.5	– 6.4
– Total formal	– 6.0	– 5.1	– 5.9
Macro expenditures on formal child care	– 6.0	– 5.1	– 5.9
- Parents	24	20	23
- Firms	0	0	0
- Government	– 21	– 18	– 20

[a] Couples with a high-skilled breadwinner.
[b] Couples with a low-skilled breadwinner.

receive more subsidies, and the system promotes labour supply.

Now consider the two simulations where we increase the minimum and maximum contribution rate respectively. When we increase the minimum contribution rate, we make the system less regressive. Via the first channel this promotes labour supply, as the subsidy per hour drops off at a slower pace with income. However, at the same time we reduce the subsidy per hour. Via the second channel this discourages labour supply as individuals that work more hours also use more child care. We can see that the second effect dominates the first effect, and overall labour supply drops. What is particularly problematic with the second effect is that the decrease in the subsidy hits a rather elastic group, single parents, when we increase the minimum contribution rate, see Table 5.4. When we increase the maximum contribution rate, we make the system more regressive. Via the first channel this damages labour supply. Furthermore, the drop in the subsidy per hour also discourages labour supply. But in this case we target less of the drop in the subsidy at the elastic group of single parents. The overall result is that increasing the parental contribution for high incomes is only slightly more damaging to labour supply than increasing the parental contribution for low incomes.

Let us conclude the analysis of targeted changes in the subsidy rate with an important but. The

Table 5.4 Targeted changes in the parental fee: long run effects on participation

Change in parental fee formal care	Low incomes	High incomes	Across-the-board
	Percentage changes		
Labour supply in hours	– .05	– .06	– .05
– Breadwinners	– .04	– .07	– .05
– – With children < 17	– .07	– .12	– .09
– Secondary earners	– .08	– .11	– .09
– – With children < 17	– .13	– .17	– .15
– Single parents	– .78	– .54	– .70
– Singles	.01	.01	.01
– Low-skilled	– .05	– .05	– .05
– High-skilled	– .05	– .06	– .06
Labour supply in persons	– .02	– .02	– .02
Unemployment rate (absolute changes)	.01	.01	.01
- Low-skilled	.04	.02	.03
- High-skilled	.01	.00	.01
Employment in hours[a]	– .08	– .09	– .08
- Low-skilled	– .10	– .09	– .10
- High-skilled	– .08	– .09	– .08
Budgetary costs ex ante[b] (million euro)	– 300	– 300	– 300

[a] Private sector employment.
[b] Budgetary shift for given levels of participation, but with substitution of formal for informal child care.

parental fee for low incomes is very low indeed. At 5% of the full price per hour they pay less than 35 cents per hour of child care. One may wonder if this influences the choice over paid formal and *unpaid* informal care as well. Indeed, the low price for low income households may have led them to substitute almost free formal care for almost free informal care. In this case, we may expect the reverse to happen when we increase the parental fee for low incomes. This would lead to an additional reduction in child care subsidies, whereas the labour supply effect would perhaps not be different (parents switch from one type of care which is almost for free to another type of care which is almost for free). For the same revenue, we would then lose less labour supply, when we target low income households.

5.3 Large rise in parental contribution rates

Next we consider the effect of major changes in the parental fee. Specifically, we consider the case of substantial reductions in the child care subsidy rate, even close to zero, so as to study the question what subsidies for formal child care have brought us in terms of participation. In the subsequent section we consider the other extreme case of making child care `free´ for (working) parents, and whether this is an effective policy from a labour supply perspective.

Table 5.5 Major increase in the parental fee: long run effects on the child care market

Change in parental fee formal care	+.6 bln	+1.2 bln	+1.8 bln	+2.4 bln
	Percentage changes			
Parental fee				
– 0-3 Total	50	112	182	268
– – Formal	58	137	224	336
– 4-12 Total	80	181	285	406
– – Formal	95	223	368	552
Child care places				
– 0-3 Total paid	– 3.7	– 7.9	– 12	– 17
– – Formal	– 10	– 19	– 24	– 30
– 4-12 Total paid	– 3.7	– 7.9	– 12	– 17
– – Formal	– 12	– 23	– 33	– 43
– Total formal	– 11	– 20	– 26	– 34
Macro expenditures on formal child care	– 11	– 20	– 26	– 33
– Parents	48	105	162	220
– Firms	0	0	0	0
– Government	– 40	– 79	– 114	-151

5.3.1 Simulation results child care market

In the calibration, government subsidies to formal child care amount to 2.58 billion euro, of which .93 billion euro is collected via an employers premium. We consider cutting subsidies back to almost zero, in steps of 600 million euro at a time. In these simulations, we cut the subsidy rate pro rata, so in terms of percentage points the contribution rate per hour for low income parents rises faster than for high income parents. In this way we can gradually phase out the subsidies in a consistent manner. The effects on the child care market are given in Table 5.5, and the effects on participation are given in Table 5.6.

Table 5.5 shows the substantial rise in the formal parental fee.[35] However, also note that total parental fee changes much less. Indeed, in the extreme case where subsidies are reduced by 2.4 billion euro, the formal parental fee goes up by 336 and 552% for 0-3 and 4-12 year olds respectively, but the overall parental fee goes up by `only´ 268 and 406% respectively. By switching from formal to informal care, parents can mitigate the rise in their parental fee.

The changes in child care places show the substantial drop in formal care, – 30 and – 43% for 0-3 and 4-12 year olds, respectively. But the overall drop in paid care is much less, again reflecting the substitution of formal for informal care.

Table 5.5 also gives the effects on aggregate expenditures. Again, we assume that the premium for employers does not change, so we only see changes for parents and the government. Given that the government pays 1.65 billion euro initially, they start getting more

[35] Note that parents initially pay on average 25 and 16% of the full price per hour for 0-3 and 4-12 year olds respectively.

Table 5.6 Major increase in the parental fee: long run effects on participation

Change in parental fee formal care	+.6 bln	+1.2 bln	+1.8 bln	+2.4 bln
	Percentage changes			
Labour supply in hours	– .11	– .25	– .39	– .55
– Breadwinners	– .10	– .23	– .37	– .52
– – With children < 17	– .16	– .37	– .58	– .81
– Secondary earners	– .18	– .41	– .64	– .90
– – With children < 17	– .29	– .65	– 1.0	– 1.4
– Single parents	– 1.5	– 3.1	– 4.9	– 6.8
– Singles	.03	.05	.06	.07
Labour supply in persons	– .04	– .09	– .14	– .19
Unemployment rate (absolute changes)	.02	.04	.06	.08
Employment in hours[a]	– .17	– .36	– .56	– .78
Budgetary shift ex ante[b] (million euro)	– 600	– 1200	– 1600	– 2400

[a] Private sector employment.
[b] Budgetary shift for given levels of participation, but with substitution of formal for informal child care.

money from employers premiums than they pay out in subsidies once we get to a reduction of 1.8 billion euro in subsidies. Hence the negative numbers for the government in the bottom row.

5.3.2 Simulation results participation

Table 5.6 gives the corresponding changes in participation. The lower subsidy rate discourages participation by parents. Indeed, increasingly so. For the first 600 million euro overall participation drops by .11%, but when we move from 1.8 to 2.4 billion euro the marginal drop in participation rises to .16%.[36] We further see that unemployment rises as well. The overall effect of cutting subsidies by 2.4 billion euro, almost all of the 2.58 billion euro in subsidies initially, is a drop in (private sector) employment of almost .8%. Hence, all subsidies for formal child care have increased employment by some .8%, taking into account the adverse effect of financing these subsidies with an (across-the-board) increase in income tax rates.

5.4 Free child care

Finally, we consider the other extreme, when formal child care becomes free for parents. The subsidy rate for formal care goes to 100% for both 0-3 year olds, and 4-12 year olds. What happens depends crucially on what we assume will happen with unpaid informal care, and some other additional factors that played no role in the previous analyses by assumption. We consider three scenarios. In the first scenario, we just follow the same methodology as above and set the

[36] Singles work a bit more, because the government uses the savings on child care subsidies to lower income tax rates.

Table 5.7 Free child care: long run effects on the child care market

Change in parental fee formal care	Free child care	Free c.c. plus 1 bln euro	Free c.c. plus 2 bln euro
	Percentage changes		
Formal child care places	24	54	85
Macro expenditures on formal child care	24	54	85
– Parents	– 100	– 100	– 100
– Firms	0	0	0
– Government	85	146	206

subsidy rate to 100%. In the second scenario we assume that at a price of zero, there are additional costs for the government that do not directly affect the labour supply decision of parents. The third scenario is like the second scenario, but then assuming even more additional costs for the government that do not directly affect the labour supply decision of parents. The long run effects on the child care market are given in Table 5.7, and the effects on participation are given in Table 5.8.

5.4.1 Scenario 1: no additional budgetary costs

Formal child care becomes free for parents. The budgetary shift is 1265 million euro. 730 million euro comes from the remaining parental fee of current users, the rest comes from parents who substitute paid informal care for paid formal care. From our logistic distribution of preferences of paid informal over paid formal care it follows that at a price of zero all parents use paid formal care, and no parent uses paid informal care when formal care is for free.

The substitution of paid informal care for formal care, and the rise in participation (see below), cause a rise in the use of formal child care, by 24%. Government expenditures on formal child care rise by 85%.

Under this scenario, the effect on participation is only slightly less effective than (minus) the symmetric case, where we reduce subsidies by 1200 million euro (see Table 5.6, second column). Employment goes up by .35%. Indeed, we enter a region in the model where parents no longer substitute paid informal for formal care. This implies that they no longer give up a compensating differential, and the impulse becomes more effective in stimulating labour supply.

5.4.2 Scenarios 2 and 3: additional budgetary costs

However, there are a number of reasons why we think this is too optimistic. First, once the price drops to zero, parents and their informal caregivers (family and friends) may decide to substitute part of unpaid informal care for free formal care. In 2007, according to the *Monitor Arbeid en Zorg Module Kinderopvang*, parents using unpaid informal care as a percentage of parents using formal care was 84% for 0-3 year olds, and 259% (!) for 4-12 year olds. 135% for 0-12 year olds

Table 5.8 Free child care: long run effects on participation

Change in parental fee formal care	Free child care	Free c.c. plus 1 bln euro	Free c.c. plus 2 bln euro
	Percentage changes		
Labour supply in hours	.25	.16	.07
– Breadwinners	.31	.28	.24
– – With children < 17	.50	.46	.42
– Secondary earners	.46	.34	.22
– – With children < 17	.73	.64	.56
– Single parents	.23	1.8	1.3
– Singles	– .05	– .15	– .24
Labour supply in persons	.07	.05	.02
Unemployment rate (absolute changes)	– .04	– .01	.01
Employment in hours[a]	.35	.22	.08
Budgetary shift ex ante[b] (million euro)	1265	2265	3265

[a] Private sector employment.
[b] Budgetary shift for given levels of participation, but with substitution of formal for informal child care.

if we weigh the numbers per group by the aggregate outlays per group. Presumably part of unpaid informal care has since then been substituted for formal care, and more of it will in the coming period, but still a sizeable part of unpaid informal care is expected to remain. Indeed, given these numbers overall unpaid informal care seems to remain in the same order of magnitude as overall formal care. Hence, there is still a lot of informal care that could potentially be substituted for formal care.

In this context, note that 98% of children that reach the age of 4 years go to school in the Netherlands,[37] which is also (basically) for free, but school is not mandatory before children turn 5. Although school is not directly comparable, *e.g.* primary school teachers are higher educated than caregivers in child care centres and the first year is part of a longer curriculum, parents may not be reluctant to hand over their children to formal care once the price drops to zero. Second, existing users may start using formal care for other reasons than participation, for example to educate themselves, do some sports or other leisure activities. Also, they may decide to reserve care for school holidays, just in case, without actually using it. Third, all child care centres will charge the maximum price for which parents can still get a subsidy, under the heading of *e.g.* quality improvement. Currently, a significant number of child care places charges less than the maximum. Fourth, a large number of children goes to so-called *peuterspeelzaalwerk* (play groups),[38] which is part time care for small children, which is used not for participation by parents, but for children to develop social skills. The subsidy rate is some 33% (Van Kampen, 2005). With formal care subsidized at 100% it will become interesting to reform themselves into

[37] See OECD (2006).

[38] 190 thousand in 2007 (Statistics Netherlands).

formal child care.

Because of all of these reasons, we may expect additional budgetary costs once child care becomes free. However, we do not get additional participation for this money, parents exchange one type of free care for another, get no additional subsidies for leisure activities if they work more hours, *etc.* We model this as a rise in government consumption. The additional government consumption needs to be financed. The resulting additional rise in the income tax rates discourages formal participation by parents.

The question is how much the budgetary costs for the government will rise. It is hard to put a number on this, but the considerations above suggest it could be sizeable. As an illustration we consider a scenario where the budgetary costs rise by an additional 1 billion euro (scenario 2), and a scenario where the budgetary costs rise by an additional 2 billion euro (scenario 3). The first is equivalent to an additional 30% increase in formal care, and the second to an additional 60% increase in formal care. But then even in scenario 3, the rise is still substantially less than *e.g.* the full potential of the remaining 135% of unpaid informal care.

Table 5.7 and 5.8 we illustrate the outcomes under these two alternative assumptions. Table 5.7 shows the additional rise in formal care, which goes up to 54 and 85% under scenario 2 and 3 respectively. All of this comes at the expense of the government, expenditures rise to 2265 and 3265 million euro under scenario 2 and 3 respectively. The associated rise in income tax rates discourages participation. Both the effect on labour supply and unemployment are less favourable. The employment effect drops to .22% under scenario 2. Under scenario 3 the employment effect drops to .08%, or 692 thousand euro per additional FTE. Under this scenario, free child care is a very poor policy to stimulate participation.

6 Sensitivity analysis

In this section we consider how sensitive the results are to key parameters. Specifically, we consider how the results change when i) we assume a higher labour supply elasticity, and ii) we assume a lower price elasticity.

6.1 Labour supply elasticity of partners and single parents

First we consider how the results change when we increase the labour supply elasticity of partners and single parents from .50 to .85. .35 is one standard deviation of the variation in labour supply elasticities of women in Evers *et al.* (2008), the basis for the calibration of labour supply in MIMIC. Table 6.1 gives the results for a selected number of simulations: i) a decrease in the parental fee for formal child care by 25%, ii) an increase in the parental fee for formal child care by 100%, iii) abolishing most of the subsidies for formal child, 2.4 bln euro, by increasing the parental fee, and iv) free child care for parents, where we assume there is an additional budgetary cost of 1 billion euro resulting from *e.g.* substitution of unpaid informal care for formal care (Scenario 2 above). As before, we assume that the government maintains a balanced budget by increasing or decreasing income tax rates across-the-board. The columns with `base´ are the base results with a labour supply elasticity of .50, `alt´ gives the results with the alternative labour supply elasticity of .85.

From Table 6.1 we see that the effects on formal child care are hardly affected when we change the labour supply elasticity. Indeed, the effect on the child care market depend to a large extent on the substitution between formal and informal care.

As for labour supply, we see that the effect on the labour supply effects simply reflects the alternative assumption on the labour supply elasticity. Reducing the parental fee becomes more effective in raising labour supply, and increasing the parental fee becomes more damaging in terms of lower labour supply. Also note that the effects on singles (without children) becomes more favourable when we reduce the parental fee for parents, the policy change is now less costly as the tax base expands, reducing the need for compensating additional income taxation. The effects on unemployment remain largely similar.

6.2 Price elasticity of formal child care

Next we consider how the results change when we decrease the price elasticity of formal child care from .3 to .2 for marginal changes in the parental fee. The alternative choice of .2 comes from the meta analysis of Ooms *et al.* (2003) (which we argue is too low, in the calibration above, given the steep rise in the use of formal care following the drop in the parental fee since 2005). To get a lower price elasticity of formal care we change the idiosyncratic preference

Table 6.1 Sensitivity analysis: labour supply elasticity partners and single parents from .50 to .85[a]

	– 25%		100%		2.4 bln		Free c.c. + 1 bln euro	
	Base	Alt	Base	Alt	Base	Alt	Base	Alt
	Percentage changes							
Formal child care places	9.2	9.6	– 13	– 15	– 34	– 39	54	56
Labour supply in hours	.05	.08	– .21	– .31	– .55	– .82	.16	.27
– Breadwinners	.07	.06	– .24	– .23	– .52	– .48	.28	.27
– – With children < 17	.11	.10	– .38	– .35	– .81	– .71	.46	.43
– Secondary earners	.10	.17	– .36	– .63	– .90	– 1.5	.34	.64
– – With children < 17	.16	.29	– .56	– 1.0	– 1.4	– 2.3	.64	1.2
– Single parents	.50	.91	– 2.0	– 3.6	– 6.8	– 11	1.8	3.2
– Singles	– .02	– .01	.03	.01	.07	.04	– .15	– .13
Labour supply in persons	.02	.03	– .05	– .09	– .19	– .32	.05	.09
Unemployment rate (absolute changes)	– .01	– .01	.03	.02	.08	.06	– .01	– .01
Employment in hours[b]	.07	.11	– .29	– .41	– .78	– 1.1	.22	.35

[a] In the sensitivity we increase the labour supply elasticity of partners and single parents from .50 to .85. .35 is one standard deviation of the variation in labour supply elasticities of women in Evers *et al.* (2008). `Base´ is the base calibration, `alt´ is the sensitivity analysis.
[b] Private sector employment.

Table 6.2 Sensitivity analysis: price elasticity formal child care from .3 to .2[a]

	– 25%		100%		2.4 bln		Free c.c. + 1 bln euro	
	Base	Alt	Base	Alt	Base	Alt	Base	Alt
	Percentage changes							
Formal child care places	9.2	4.6	– 13	– 9.2	– 34	– 26	54	46
Labour supply in hours	.05	.06	– .21	– .22	– .55	– .60	.16	.16
– Breadwinners	.07	.07	– .24	– .26	– .52	– .56	.28	.27
– – With children < 17	.11	.11	– .38	– .41	– .81	– .88	.46	.44
– Secondary earners	.10	.10	– .36	– .39	– .90	– .98	.34	.33
– – With children < 17	.16	.16	– .56	– .60	– 1.4	– 1.5	.64	.62
– Single parents	.50	.51	– 2.0	– 2.0	– 6.8	– 7.3	1.8	1.7
– Singles	– .02	– .01	.03	.02	.07	.06	– .15	– .14
Labour supply in persons	.02	.02	– .05	– .06	– .19	– .21	.05	.04
Unemployment rate (absolute changes)	– .01	– .01	.03	.02	.08	.08	– .01	– .01
Employment in hours[b]	.07	.08	– .29	– .30	– .78	– .85	.22	.21

[a] In the sensitivity we decrease the price elasticity of formal child care from .3 to .2. .2 is the value of the meta analysis of Ooms *et al.* (2003). `Base´ is the base calibration, `alt´ is the sensitivity analysis.
[b] Private sector employment.

distribution. Specifically, we increase the derivative parameter ϕ (see equation (3.6)) to reduce the share of parents that switch from paid informal to paid formal care when the subsidy rate rises, and increase the value of $\overline{x}$ where the distribution crosses zero (see Figure 3.2) so as to keep the initial share of parents use paid formal care the same. Table 6.2 gives the resulting outcomes under this alternative assumption and the base outcomes. We present results for the same selection of simulations as in 6.1 above.

We see that the alternative assumption on the price elasticity of formal care mainly affects the child care variables. With the lower price elasticity, formal child care goes up less when we reduce the parental fee and falls less when we increase the parental fee. The effects on labour supply and unemployment are quite similar, though differences arise when we almost abolish all subsidies on formal care (the third simulation in Table 6.2). We arrive at a lower price elasticity by changing the preference distribution for formal relative to informal care. As a result, less parents will switch from formal to informal care when we increase the parental fee. Hence, less parents will insulate themselves from the rise in the parental fee of formal care. As a result, labour supply is more adversely affected by the steep drop in the subsidies for formal care.

7 Comparison with the findings of other studies

Table 7.1 gives an overview of empirical studies on the effect of child care subsidies on (female) participation. We give the range found in the overview studies of micro econometric studies by Blau and Curie (2004) and Anderson and Levine (2002), and add some recent studies for Europe and the influential cross-country study by Jaumotte (2003).

The overview study of Anderson and Levine (2002) explicitly gives a range for the labour supply elasticity of child care costs, running from -.05 to -.35. The overview study of Blau and Currie (2004) does not give an explicit range for the labour supply elasticity. However, an interesting part of their study is that they spend a section on studies that consider the interaction of formal and informal care, and the range of these studies runs from -.1 to -.2. However, the overview studies by Anderson and Levine (2002) and Blau and Currie (2004) contain mostly studies outside Europe. Recent empirical studies for Europe come to lower labour supply elasticities. Indeed, Lundin *et al.* (2008) even come to an effect of zero for Sweden, using a natural experiment (where most other studies rely on a cross-section). Furthermore, the coefficient is estimated with great precision. Lundin *et al.* (2008) argue that their small effects might be due to the generous initial subsidy rate in the reform they analyse (reminiscent of the current Dutch setup).

Our results seem in line with the European studies, and are on the lower end of the overview studies by Blau and Curie (2004) and Anderson and Levine (2002) which consider mostly studies outside Europe. Let us consider the simulation where we increase the parental price of formal child care by 25 percent from Section 5.1. We only have simulation results for all parents with dependent children (<17 years old). To compare the results with the findings of the micro-econometric studies we have to determine the group that uses paid formal care. When the number of children is constant, some 25 percent of children < 17 years old will be 0-3 year old and some 50 percent of the children will be 4-12 year old. About 50% of children 0-3 year old use formal care and about 20% of children 4-12 year old use formal care. Hence, somewhat less than 25% of parents with dependent children uses paid formal care (where there is probably some overlap in parents that use formal care for 0-3 year olds and for 4-12 year olds). Hence, we need to multiply the effect for parents with dependent children by about 4 to get to the effects for the ones with dependent children using paid formal care alone. This generates an elasticity of -.02 to -.03 for secondary earners and of -.07 for single parents. Note that is also matters how we calculate the elasticity, the change is not that marginal. A rise in the price of 25% is equivalent to a drop in the price of 20% when we take the new situation as our starting point (going from 1.25 to 1 rather than from 1 to 1.25). In this case the elasticities rise to -.03 to -.04 for secondary earners and -.09 for single parents.

Our finding that the labour supply elasticity of child care costs for parents falls when the subsidy rate is higher is in line with the findings of Lundin *et al.* (2008). Furthermore, our

Table 7.1 Empirical studies on the effect of child care costs on labour participation

Study	Country	Period	Participation elasticity	Remarks
Recent micro studies for Europe				
Lundin *et al.* (2008)	Sweden	2002-2003	0.00 (participation and share full time)	Dif-in-dif estimator
Kok *et al.* (2007)	Netherlands	2002	– .06 (hours worked)	Cross-section
Wetzels (2005)	Netherlands	1995	positive (insignificant)	Cross-section
Wrohlich (2004)	Germany	2002	– .04 to – .09 (hours worked)	Cross-section
Andren (2003)	Sweden	1997-1998	– .16 (hours worked)	Cross-section Single mothers
Chone *et al.* (2003)	France	1997	– .02 (hours worked)	Cross-section
Recent overview studies				
Blau and Currie (2004)	Various countries	-	– .1 to – .2	Studies taking into account informal care
Anderson and Levine (2002)	Various countries	-	– .05 to – .35	All studies
A recent macro study				
Jaumotte (2003)	OECD countries	1985-1999	– .05 (participation rate)	Cross-country panel women aged 25-54

finding that single mothers are quite responsive to lower formal child care costs, is in line with the findings of Andren (2003) for Sweden.

8 Child care subsidies versus the secondary earner tax deduction

Child care subsidies are an interesting policy option to stimulate labour market participation because they target the relatively elastic group of secondary earners and single parents. However, they also target the less elastic group of breadwinners with children. Furthermore, child care subsidies not only promote formal participation by parents, but also the use of formal care. Substitution of informal for formal care reduces the effectiveness of child care subsidies in promoting formal participation, in particular when the subsidies have to be financed with higher taxes, and the substitution becomes more important at the current high subsidy rates as we argue above.

There is another policy instrument that does not affect the choice over formal and informal care, and is targeted solely at the elastic group of secondary earners and single parents: the secondary (and single parents) earner tax deduction. Table 8.1 illustrates the different outcomes for labour participation. We consider the impact of reducing the parental fee by 25%, which implies a budgetary impulse of 393 million euro, and introducing a (additional) secondary (and single parents) earner tax deduction, with the same budgetary impulse of 393 million euro. The secondary earner tax deduction is phased in over the trajectory 50-300% of the minimum wage. This implies that secondary earners that work more hours get more subsidies, similar to child care subsidies.

We see that this secondary earner tax deduction is more effective in promoting labour supply than the higher subsidy for formal child care. This is because it is solely targeted at the elastic secondary earners and single parents and not at the less elastic breadwinners, and because less subsidies get `wasted´ on formalising informal care.

In terms of labour supply, therefore, the secondary earner tax deduction seems more effective than additional child care subsidies, in particular when viewed from the current high subsidy rate for formal care for the average parent. However, also here there is a catch. The secondary earner tax deduction goes to both parents that use formal and informal care. Hence, it is less targeted at those households that have to rely on solely formal child care, because *e.g.* their parents live far away.

Table 8.1 Child care versus secondary earner tax deduction: long run effects on participation

	Child care subsidy[a]	Secondary earner tax deduction[b]
	Percentage changes	
Labour supply in hours	.05	.10
– Breadwinners	.07	– .03
– – With children < 17	.11	– .05
– Secondary earners	.10	.30
– – With children < 17	.16	.44
– Single parents	.50	2.1
– Singles	– .02	– .03
Labour supply in persons	.02	.02
Unemployment rate (absolute changes)	– .01	– .01
Employment in hours[c]	.07	.14
Budgetary shift ex ante[d] (million euro)	393	393

[a] Drop in the parental fee by 25%.

[b] Income dependent secondary earner tax deduction, linear phase-in range over the interval 50-300% of the minimum wage.

[c] Private sector employment.

[d] Budgetary shift for given levels of participation, but with substitution of formal for informal child care.

9 Further issues

9.1 Endogenous preferences

The calibration of the model rests for a large part on the meta analyses of Ooms *et al.* (2003) on the price elasticity of formal child care and of Evers *et al.* (2008) on the labour supply elasticity. The empirical studies used in these meta analyses typically distill the effect by comparing individuals. This has the potential risk of ignoring what one could call a `norm effect´ that affects all individuals alike, *e.g.* more parents may decide to use formal care when more other parents do so, or more mothers may decide to work when other mothers do so. If so, we may understate the price elasticity of formal care, and the labour supply effect of child care subsidies.

There are a number of interesting studies that look into endogenous norms, see *e.g.* Lindbeck (1995), Lindbeck and Nyberg (2006) and Vendrik (1993, 2003). However, I am not aware of an empirical study that looks into a norm effect of child care subsidies on the use of formal care or labour supply. This seems an interesting topic for future research.

9.2 Development of the child

An important element missing in the analysis above is the effect on the development of the child. This is not the area of expertise of economists. But because this is might be an important element, below we give a short review of some relevant literature from an interested reader, and some indicators of the quality of child care in the Netherlands.

9.2.1 International literature on child care and child development

There is (virtually[39]) no Dutch empirical study that follows children over time, let alone looks at the impact of different types of care on the development of the child and beyond. However, a number of other countries have collected this type of data and looked at the effect of participation in formal care. In particular, the *National Day Care Study* in the US is an influential study. Some robust findings were that small groups and a higher education level of the caregiver have a positive effect on the development of the child.[40] Also, education programs for caregivers specialized in the care for young children have a positive impact on the development of the child. Recent studies of the National Institute of Child Health and Human Development have shown that participation in formal care is good for the development of cognitive skills like math and language, but may be detrimental for non-cognitive, social skills, in particular for young (<3 year old) children. Also, in terms of hours per week, a lot of child care (>30 hours per

[39] The proverbial exception is the so-called *Proefkreche* (daycare experiment) of the 1970s, see IJzendoorn *et al.* (2005). But the sample size was small, and the attrition rate was high.

[40] See Tavecchio (2002).

week) seems beneficial for disadvantaged children, whereas the reverse is true for children from well-to-do families.[41] The literature gives a mixed picture of the effect of participation in formal child care on the development of the child.

9.2.2 Indicators of quality of daycare in the Netherlands

Although we do not have empirical studies on the impact of the participation in formal (and other) child care in the Netherlands, we do have some indicators of the quality. Unfortunately, we only have indicators of the quality of daycare, not of out-of-school care.

Table 9.1 gives two indicators for the quality of daycare. We see that the Netherlands scores quite good in terms of children per caregiver, though we should note that babies are typically not in daycare in Scandinavia. In terms of the typical education level of caregivers, the Netherlands seems `average´, though we should note that in the ISCED classification 4 is not necessarily higher than 3. The typical education for caregivers in daycare in the Netherlands is post-secondary training for 3 or 4 years, with specialization in children in the last year only. Tertiary educated workers are rare in the child care sector, as opposed to Finland and Sweden, though we should note that children in the Netherlands already start primary school at the age of 4, where the teacher has tertiary education, much sooner than in Scandinavia.

Vermeer *et al.* (2005) and De Kruif *et al.* (2009) use a large number of internationally comparable indicators for the quality of daycare,[42] and find a disturbing trend. On a scale from 1 (bad) to 7 (excellent), their sample scored on average 4.8 in 1995, 4.3 in 2001, 3.2 in 2005 and a meager 2.8 in 2008. Furthermore, in 2008, 49% of daycare centres got a rating of `insufficient´ and 51% got a rating of `poor´, and none of the 200 daycare centres got a rating of `good´. In response to the 2005 results, Bureau Bartels (2006) studied the causes of the drop in the quality of daycare, and suggested that a shortage of qualified personnel, an increased workload and/or a lack of coordination between the training on the one hand and the required skills of caregivers on the other may have been responsible for the drop in quality. Time will tell if these are just temporary problems related to the rapid growth of the sector, or long term challenges that demand further action.

The studies by Vermeer *et al.* (2005) and De Kruif *et al.* (2009) are probably the most objective studies into the quality of daycare in the Netherlands available, and they signal a disturbing trend. However, note that this still does not answer the question of whether a child is better or worse off in formal daycare compared to care by the parents or informal care. Furthermore, survey studies of parents give a more mixed picture when it comes to the perceived quality of formal child care. Parents using formal care give an average score of 8.1 (on a scale from 1 to 10) in Kok *et al.* (2005) for the quality of formal childcare. However, Portegijs *et al.*

[41] See Riksen-Walraven, 2000, Loeb *et al.* (2005) and Baker *et al.* (2005).

[42] Specifically, they use the ITERS-R (Infant/Toddler Environment Rating Scale - Revised) for 0-2.5 year olds, and the ECERS-R (Early Childhood Environment Rating Scale - Revised) for 2.5 to 5 year olds.

Table 9.1 Indicators of child care quality[a]

	Children per caregiver	Education level caregivers (ISCED)[b]
Netherlands	5	4
Denmark	5	3
Finland	5	4– 5
Norway	8	NA
Sweden	6	4-5
Belgium	7	3
Germany	NA	3
France	6	4– 5
Italy	7	3
Portugal	11	5
UK	5	3
US	5	3-5

[a] Source: OECD Family database and Onderwijsraad (2008).
[b] International Standard Classification of Education of Unesco, a higher number indicates a higher education level, except for 3 and 4, where 4 is not necessarily higher than 3.

(2006) find that only 30% of parents in their survey (users and non-users) considers daycare in the Netherlands a good care option.

The short overview above suggests that there is not a strong case for promoting participation in formal child care across-the-board when we consider the development of the child, especially given the trend in the quality. However, for disadvantaged groups it may still be beneficial. But in that case, the price of formal care is probably not the answer, as child care is already very cheap for low income households. Also, a further increase in the subsidy rate would mostly lead higher income groups to participate in formal care, but for children from this group the results seem to be the poorest.

10 Conclusion

In this paper, we present a model that can reconcile the rapid rise in formal child care with small effects on (female) labour supply. The missing element is the substitution of informal for formal care. A higher subsidy rate not only promotes formal participation, but also the use of formal rather than informal care. The substitution of informal for formal care limits the effectiveness of child care subsidies in promoting participation.

The data further suggest that the price elasticity of formal child care becomes higher when the subsidy rate becomes higher, and show a massive shift of informal to formal care in response to the recent drop in the parental fee. In line with these observations in our model parents substitute informal for formal care at an increasing rate when the parental fee drops. This makes child care subsidies less effective when the subsidy rate is already high. As a result, a further increase in child care subsidies is a very costly policy to promote formal participation. Indeed, we show that an (additional) income dependent secondary earner tax deduction is more effective in promoting formal participation than a further increase in subsidies for formal child care.

Next to promoting formal participation, another policy objective of child care subsidies may be the development of the child. However, international empirical studies give a mixed picture. Participation in formal child care can be advantageous for some groups, but can be detrimental for others. We have limited knowledge on the impact of participation in formal child care in the Netherlands, but the indicators of studies by the *Nederlands Consortium Kinderopvang Onderzoek* (Dutch Group for Child Care Research) signal a disturbing trend in the quality of Dutch daycare.

The analysis builds on meta analyses on the elasticity of labour supply and wage formation, and the price elasticity of formal child care. Although the model is calibrated on these meta analyses and the outcomes are consistent with the patterns in the data, our confidence in the simulated effects would benefit from a thorough micro econometric analysis using the recent `natural experiments´. Since 2005 we have good data on the use of formal child care from the tax office. and we can study the impact on labour supply when the recent labour force surveys become available. However, our analysis suggests that the analysis is incomplete when we ignore informal child care, finding good data on informal child care therefore also seems crucial.

References

Anderson, P. and P. Levine, 2002, Childcare and mothers employment' decisions, in: Card, D. en R. Blank (eds.), *Finding jobs*, Russel Sage Foundation, New York, pp. 420-462.

Andren, T., 2003, The choice of paid childcare, welfare, and labor supply of single mothers, *Labour Economics*, 10, pp. 133-147.

Baker, M., Gruber, J. and K. Milligan, 2005, Universal childcare, maternal labor supply and family well-being, NBER Working Paper 11832, Cambridge.

Berden, C. and L. Kok, 2009, Participatie-effect kinderopvangtoeslag, SEO-rapport 2009-73, Amsterdam.

Blau, D. and J. Currie, 2004, Preschool, day care and afterschool care: Who's minding the kids?, NBER Working Paper 10760, Cambridge.

Bruijn, D. de, Peeters-Vergeer, J., Ruiter, M. de, Werf, K. van der and G. Wever, Prijzen in de kinderopvang 2004, Deloitte, The Hague.

Bureau Bartels, 2006, Mogelijkheden voor verbetering van de (proces)kwaliteit in kinderdagverblijven, Bureau Bartels, Amersfoort.

Chone, P., D. Leblanc and I. Robert-Bobee, 2003, Female labour supply and child care in France, CESifo Discussion Paper 1059, München.

Commissie van Rijn, 2009, Van beter subsidiëren naar beter organiseren, Ministry of Education, Culture and Science, The Hague.

CPB, 1998, Macro Economische Verkenning 1999, CPB Netherlands Bureau for Economic Policy Analysis, The Hague.

Euwals, R. and K. Folmer, 2009, Arbeidsaanbod en gewerkte uren tot 2050, CPB Memorandum 225, The Hague.

Evers, M. , Mooij, R. de, D. van Vuuren, 2008, The wage elasticity of labour supply: a synthesis of empirical estimates, *De Economist*, 156(1), pp. 25-43.

Folmer, K., 2009, Why do macro wage elasticities diverge? A meta analysis, CPB Discussion Paper 122, The Hague.

Graafland, J. and F. Huizinga, 1999, Taxes and benefits in a non-linear wage equation, *De Economist*, 147(1), pp. 39-54.

Graafland, J., Mooij, R. de, Nibbelink, A. and A. Nieuwenhuis, 2001, *MIMICing tax policies and the labour market*, North-Holland, Amsterdam.

Groot, W. and H. Maassen van den Brink, 1996, Monitor kinderopvang - Verandering in gebruik van kinderopvang 1991-1995, Amsterdam.

Jaumotte, F., 2003, Female labour force participation: Past trends and main determinants in OECD countries, OECD Working Paper 376, OECD, Paris.

Jongen, E., 2008, Waarheen, waarvoor?, *TPEdigitaal*, 2(4), pp. 27-48.

Kok, L., Groot, I., Mulder, J., Sadiraj, K. and M. van Ham, 2005, De markt voor kinderopvang in 2004, SEO, Amsterdam.

Kok, L., Hop., P. and H. Pott-Buter, 2007, Kosten en baten van participatiebeleid, SEO, Amsterdam.

Kruif, R. de, Riksen-Walraven, M., Gevers Deynoot-Schaub, M., Helmerhorst, K., Tavecchio, L. and R. Fukkink, 2009, Pedagogische kwaliteit van de opvang voor 0- to 4-jarigen in Nederlandse kinderdagverblijven in 2008, NCKO, Amsterdam.

Lindbeck, A., 1995, Hazardous welfare state dynamics, *American Economic Review*, 85(2), pp. 9-15.

Lindbeck, A. and S. Nyberg, 2006, Raising children to work hard: altruism, work norms, and social insurance, *Quarterly Journal of Economics*, 121(4), pp. 1473-1503.

Loeb, S., Bridges, M., Fuller, B., Rumberger, R. and D. Bassok, 2005, How much is too much?, NBER Working Paper 11812, Cambridge.

Lundin, D., Mork, E. and B. Ockert, 2008, How far can reduced childcare prices push female labour supply?, *Labour Economics*, 15, pp. 647-659.

Meghir, C. and D. Phillips, 2008, Labour supply and taxes, mimeo, IFS, London.

Mooij, R. de, Euwals, R., Folmer, K., Jongen, E., Koning, P., Nibbelink, A., Suijker., F. and A. van Vuren, 2006, Reinventing the Welfare State, CPB Netherlands Bureau for Economic Policy Analysis, The Hague.

OECD, 2006, Education at a glance, OECD, Paris.

OECD, 2008, Family database, OECD, Paris.

Onderwijsraad, 2008, Een rijk programma voor ieder kind, Onderwijsraad, The Hague.

Ooms, I., Groot, I., Eggink, E., Janssens, L. en J. van Seters, 2003, Landelijk ramingsmodel kinderopvang 2002-2010, SCP Werkdocument 98, Social and Cultural Office, The Hague.

Portegijs, W., Cloïn, M., Ooms, I. and E. Eggink, 2006, Hoe het werkt met kinderen, moeders over kinderopvang en werk, Social and Cultural Office, The Hague.

Riksen-Walraven, M., 2000, *Tijd voor kwaliteit in de kinderopvang*, Vossiuspers, Amsterdam.

Taskforce Bestrijding Wachtlijsten Buitenschoolse Opvang, 2007, Groeistuipen!, Buitenhek Management and Consult BV, Utrecht.

Tavecchio, L., 2002, *Van opvang naar opvoeding*, Vossiuspers, Amsterdam.

Vendrik, M., 1993, *Collective habits and social norms in labour supply: from micromotives to macrobehaviour*, Universitaire Pers, Maastricht.

Vendrik, M., 2003, Dynamics of a household norm in female labour supply, *Journal of Economic Dynamics and Control*, 27, pp. 823-841.

Vermeer, H., IJzendoorn, R. van, Kruif, R. de, Tavecchio, L., Riksen-Walraven, M. and J. van Zeijl, 2005, Kwaliteit van de Nederlandse kinderdagverblijven: trends in kwaliteit in de jaren 1995-2005, NCKO, Leiden.

Wetzels, C., 2005, Supply and price of childcare and female labour force participation in the Netherlands, *Labour*, 19, pp. 171-209.

Wrohlich, K., 2004, Child care costs and mothers labor supply: An empirical analysis for Germany, DIW Discussion Paper 412, DIW, Berlin.

IJzendoorn, R. van, Tavecchio, L. and M. Riksen-Walraven, 2005, *De kwaliteit van de Nederlandse kinderopvang*, Boom, Amsterdam.