

Labour Supply, Fertility and Childcare Decisions - a Structural Analysis of Fiscal Stimuli for Working Mothers.

Jan Kabátek*

October 29, 2014

Preliminary work – do not quote

Abstract

This paper develops a dynamic structural model of labor supply, fertility and childcare demand of married and cohabiting women in the Netherlands. The model is estimated using a rich administrative panel covering 2001 through 2009, which provides high-quality information about individual labor market histories and childcare expenditures. Identification is aided by exploiting two large-scale reforms of Dutch family policy which raised the government spending on in-work tax credits (IWTC), and childcare subsidies, respectively. Resulting variation in the tax and subsidy rates is explicitly incorporated in the budget constraint. The estimated structural parameters are used for a counterfactual analysis, comparing predicted outcomes of several reform scenarios, including the two manifested reforms of Dutch family policy. Both IWTC and childcare subsidies are shown to induce similar changes in the maternal labor supply, but the fertility and childcare demand is stimulated more by the childcare reform. Furthermore, changes in fertility patterns raise the budgetary costs of the childcare subsidies, as more children become eligible for subsidized childcare in the years after the implementation.

JEL classification codes: C25, C52, H31, J22

Keywords: Maternal labor supply, fertility, childcare subsidies, in-work tax credits

*Tilburg University, IZA and Netspar. Email: j.kabatek@uvt.nl, Phone: +31 13 466 2134. This research is supported under the Netherlands Organisation for Scientific Research (NWO) funding scheme (Proj. No. 407-110-23). I have benefited from comments and suggestions by Jaap Abbring, Flavio Cunha, Eric French, David Green, Peter Haan, Egbert Jongen, Janneke Plantenga, Martin Salm, Andrew Shephard, Arthur van Soest, Petra Todd and Ken Wolpin. Remaining errors are my own.

1 Introduction

This paper focuses on two long-standing challenges faced by many developed countries. The first is to increase labor participation of women, which is advocated as an important step towards narrowing the gender wage gap (Blau, 2012). The second is to promote fertility of the population, and thereby counteract the steadily falling birthrates. To meet these challenges, the governments are introducing public policies specifically tailored to increasing female labor participation (in-work tax credits, childcare subsidies, *etc.*), and others focused on raising fertility rates (universal child benefits, extension of maternity leave). However, this approach considers each of the goals in isolation, disregarding the fact that woman's choices to work and to have children are fundamentally intertwined. As discussed in Apps and Rees (2009), childbearing has far-reaching consequences for mother's labor market attainment and *vice versa*, suggesting that a policy focused on only one of the two challenges is still likely to have non-trivial spillover effects in the other domain as well.¹ Some policies/fiscal stimuli are therefore bound to prove more (or less) desirable when investigated with both policy goals in mind.

In this paper, I develop a dynamic structural model of labor supply, fertility and childcare demand of married and cohabiting women. The model is intended for comparative analysis of labor-enhancing policies in light of the dichotomous policy goals presented above. The women are assumed to be faced with the interdependent choices of working and having children. Furthermore, those opting to have children must also consider if formal childcare is a necessity. Inclusion of childcare choice is motivated by significant differences in parental attitudes towards formal childcare (See Apps et al. 2012), which can prove particularly important for evaluation of the effects of childcare subsidies.

The literature provides ample empirical evidence that the choices considered by the model are amenable to public policy interventions. The parental employment decisions have been shown to be responsive to a multitude of policy reforms, many of them being either in-work tax credits (IWTC) or childcare subsidy reforms. The debate over relative efficiency of these fiscal stimuli is however by no means settled. The effects of childcare subsidies on labor supply vary widely², whereas studies on in-work tax credits typically

¹A prominent example of such a policy is Earned Income Tax Credit (EITC) in the United States, which is a means-tested transfer for working families with children. Baughman and Dickert-Conlin (2003) find that the introduction of EITC indeed increased fertility levels, acknowledging that this was an unintended consequence of the labor-stimulating policy.

²E.g. Lundin et al. (2008), Fitzpatrick (2010) and Havnes and Mogstad (2011) find no effect, Bettendorf et al. (2012) find small effects, and Berlinski and Galiani (2007) and Lefebvre and Merrigan (2008) find large effects.

find sizable positive employment effects.³ The fertility patterns are also generally found to be responsive to the financial incentives. Milligan (2005) shows that introduction of universal child benefits in Quebec had a large impact on fertility, leading to a 25% increase in fertility among women targeted for the full benefit. Similarly, Brewer et al. (2012) show positive response of fertility to an increase of WFTC in the UK. Del Bono et al. (2012) show that job displacement and the subsequent loss of income stream significantly reduces fertility. Blau and Robbins (1989) find a negative link between fertility and childcare costs faced by the US families. The childcare demand is found to be responsive as well, increasing with more generous childcare subsidies and higher incomes (Apps et al. 2012 and de Boer et al. 2014).

In terms of dynamic structural models, there are two strands of literature with focus similar to this paper: models that explore female labor supply and fertility, and those that explore female labor supply and childcare demand. Francesconi (2002) estimates a dynamic model of female labour supply and fertility. He shows that self-selection into fertility plays an important role for female labor supply, as he identifies negative links between maternal work ability and preference for children. Similar issues are investigated by Haan and Wrohlich (2011) who evaluate labor supply and fertility decisions of German women. In their paper, the dependency between maternal work and fertility is captured by allowing lagged choices to enter the contemporaneous utility function. The second strand of literature is represented by Bernal (2008) and Griffen (2014) who develop dynamic models of female labor supply and childcare demand. Apart from analyzing the substitution patterns of maternal and non-maternal care, they also explore what are the effects of different types of childcare on the children's cognitive traits and later life outcomes. This modeling aspect is however, due to the data limitations, beyond the scope of my study. From the modeling perspective, it is interesting to note that both the works focused on fertility and the works focused on childcare are using bivariate choice models. The underlying emphasis is that the joint nature of work and the other decision considered is fundamental for sound policy analysis, whereas the third (omitted) choice variable is of secondary importance. And since both strands of literature show strong ties between the choices, it seems to be natural to resort to a tri-variate choice model, accounting for labor supply, fertility and childcare in one joint framework.

The model presented here is estimated using a unique Dutch panel dataset which contains administrative records on earnings, childcare expenditures and other employment-

³For an overview of studies analyzing the impact of the EITC in the US see Hotz and Scholz (2003), and for an overview of studies into the impact of the Working Families Tax Credit (WFTC) in the UK see Brewer and Browne (2006).

related information for a large sample of Dutch population. The records observed span the years 2001 to 2009, covering a large reform of family fiscal policy targeted at working parents. The reform started in 2004 and within following five years it gradually raised public spending on in-work tax credits and childcare subsidies. This led to substantial shifts in the labor market behavior of Dutch women (see Bettendorf et al., 2012). Such policy variation is convenient for analysis since the reforms were strictly targeted at families with young children, and changed the incentive structure underlying fertility, childcare demand and labor participation of (prospective) mothers.

The counterfactual analysis focuses on the fiscal stimuli which were introduced in the Netherlands within the observed period - the increase of in-work tax credits and childcare subsidies. The results of the analysis show that the two policy reforms induce similarly strong changes in terms of maternal labor supply as well as short-run government revenue. This means that according to the traditional labor supply metric, the policy makers could choose either policy without compromising budgetary efficiency. On the other hand, the response of fertility rates is less uniform. The fertility rates are more pronounced under the childcare subsidy reform, which may change the resulting policy recommendations. If the government wants to introduce a pro-natalist policy, then the childcare subsidies are the desirable fiscal instruments. However, an increase in fertility patterns also raises the costs of the childcare reform, as more children become eligible for subsidized childcare in the years after the implementation. This finding should be of particular interest for policy evaluation, since the costs of reform related to fertility cannot be fully realized until several years after the implementation. This extra burden on government budget is therefore likely to be overlooked by analyses which focus only on the changes in maternal labor supply.

The rest of the paper is organized as follows. Section 2 presents the structural model and the estimation strategy. Section 3 documents the institutional background and the two policy reforms which are exploited by the model. Section 4 describes the data and addresses some modeling choices which were adopted in Section 2. Section 5 presents the model fit, the estimation results and the outcomes of counterfactual simulations. Section 6 concludes.

2 Structural model

2.1 Setup of the model

The model evaluates households in a unitary framework, focusing on the decisions related to the wife and children. Husband's work allocation and disposable income are taken as

given.⁴ I further abstract from modeling marriage decisions, taking them as exogenous in the context of the model. I do allow for accumulation and depreciation of mothers' human capital, which is argued to play a crucial role in mother's decisions to return into the labor force after taking maternity leave (Apps and Rees, 2009).

Timing of events starts with formation of the household (*i.e.*, the year when the couple starts living together) and ends when the woman reaches the retirement age of 65. The mothers start making decisions as of period $t=1$. In each period, the mothers are assumed to choose their labor supply, which will generate income for their current consumption. Up to the age of 45 they also make a choice whether to have a child in the next period. After the childbirth, the mothers also choose whether to use formal childcare or not. This choice is applicable for all children up to 11 years of age. The informal childcare provided by relatives and friends is also accounted for (see below).

The fertility decision is restricted in a way that families are assumed to have at most two children.⁵ Mothers are assumed to cease working when they reach the retirement age. In terms of the choice sets, I allow for three intensity levels of labour supply attainment (full-time (FT), part-time (PT) and zero hours), four intensity levels of formal childcare use (0 - 3 week days), and a binary fertility decision.

The instantaneous utility is derived from household consumption c_t , woman's leisure time l_t , number of children aged less than 18 years N_t , fertility decision n_t (leading to a childbirth in the next period), and demand for non-maternal childcare:

$$\begin{aligned}
U_t = & \frac{c_t^\mu}{\mu} + \alpha_1^l l_t + \alpha_2^l l_t^2 + \alpha_3^l l_t N_t + l_t \varepsilon_t^l \\
& + \alpha_1^c f c_t + \alpha_2^c f c_t^2 + \alpha_3^c f c_t \cdot \mathbf{1}(age_{yng} < 4) \\
& + \alpha_4^c i c_t + \alpha_5^c i c_t^2 + \alpha_6^c i c_t \cdot \mathbf{1}(age_{yng} < 4) + \mathbf{1}(f c_t > 0) \varepsilon_t^c \\
& + \alpha_1^n N_t + \alpha_2^n N_t^2 + \alpha_3^n n_t + \alpha_4^n n_t l_t + n_t \varepsilon_t^n.
\end{aligned} \tag{1}$$

The demand for childcare is expressed by means of two variables, the total hours of childcare provided by formal carers $f c_t$, and by informal carers $i c_t^{ic}$. This distinction in provision is made to account for implicit price of informal childcare, which is unobservable and therefore it cannot be included in the budget constraint. As a result, the informal

⁴This assumption is maintained throughout the literature (Francesconi 2002, Bernal 2008, Griffen 2014) and it is also supported by findings of de Boer et al. (2014), who show that the labor supply elasticity of Dutch men with respect to changes in their spouses' earnings is close to zero.

⁵A restriction of this type is necessary from the computational standpoint. The two-children cap will prevent state space of the dynamic programming problem from getting excessively large, and it is less stringent than the one-child restriction, which is often used in the literature (see *e.g.*, Bernal 2008 or Brill 2013).

childcare parameters in the utility function represent an amalgamation of 1) intrinsic utility derived from this type of care, 2) effort required to find an informal carer, and 3) unobserved costs of informal childcare. The childcare variables are further interacted with an indicator function which attains value one if the youngest child is less than 4 years old. This interaction term accounts for different attitudes towards formal childcare for school-aged children and pre-schoolers. It should be noted that the woman's leisure l_t is defined in very broad terms, accounting for the actual leisure time, but also for housework, and maternal childcare.

The household's consumption c_t is assumed to be equivalent to household's disposable income y_t . I abstract from modeling the savings decision, so that the income has to be consumed in the same period it was earned. The budget constraint takes the following form,

$$y_t = w_t \cdot h_t + y_t^h - T(w_t, h_t, \mathbf{X}_t) - p \cdot f c_t \cdot N_t^c + S(p, f c_t; \mathbf{X}_t). \quad (2)$$

Here, w_t is gross hourly wage, h_t is women's labour supply and y_t^h are earnings of the spouse. $T(w_t, h_t, \mathbf{X}_t)$ denotes taxes and social security contributions. $p \cdot f c_t$ represents the cost of formal childcare. If mother decides to use formal childcare, it is assumed that the service is used by all children below 11 years of age, and therefore the cost is multiplied by the number of children in the appropriate age range, N_t^c .⁶ $S(p, f c_t; \mathbf{X})$ denotes childcare subsidies, which depend on total cost of formal childcare and other household characteristics such as households' taxable income. The women's market wage is specified as follows

$$\log(w_t) = \beta_0 + \beta_1 educ + \beta_2 ex_t + \beta_3 ex_t^2 + \beta_4 educ_t \cdot ex_t + \varepsilon_t^w, \quad (3)$$

so that it explicitly accounts for heterogeneity among earning profiles for different education levels. It further allows for the effects of human capital through the dependence on cumulative experience gathered over the five years preceding the current period,

$$ex_t = \sum_{i=1}^5 \mathbf{1}(h_{t-i} = 1). \quad (4)$$

That way, I account for appreciation/depreciation of skills in the span of years which is likely to be highly relevant for the wage determination process.

⁶There is, however, an important distinction between the type of childcare provided to children aged 0-3 (*daycare*) and to children aged 4-11 (*out-of-school care*). Since the latter group attends school for half of the day, they require half the childcare provision. The daily childcare cost for older children is therefore reduced to 50% of the daily cost for pre-schoolers. Further discussion of the childcare costs will be provided in the Section 4.

Women are assumed to predict evolution of their future earnings according to the equation 3. Furthermore, in order to form expectations about future consumption, each woman is also assumed to predict future realizations of her partner's income. This prediction is based on another Mincer-type equation, estimating the husband's earnings based on his experience and educational attainment,

$$\log(y_t^h) = \gamma_0 + \gamma_1 educ^h + \gamma_2 ex_t^h + \gamma_3 (ex_t^h)^2 + \gamma_4 ex_t^h \cdot educ^h + \varepsilon_t^h. \quad (5)$$

Woman's time allocation comprises of market work h , and leisure l . It is subject to the following constraint:

$$h + l \leq TC_w, \quad (6)$$

where TC_w is a time constraint scaled proportionally to the standard time endowment of 16 hours per day. The full-time and the part-time work allocations take up respectively 8 and 4 hours per day, which leaves at least eight hours per day for the leisure endowment. I also specify a second time constraint which requires the sum of all childcare inputs to exceed minimal time requirement TR .

$$l + fc + ic \geq TR(age_{yng}). \quad (7)$$

The value of TR is dependent on the age of the youngest child, amounting to 16 hours per day for pre-schoolers and 12 hours per day for school-aged children younger than 11 years.⁷ This constraint ensures that the child is not left unattended, avoiding situations where parents are predicted to work full-time without having anyone to look after their offspring. The minimal time requirement also facilitates the incorporation of informal childcare into the structural model. Since the data used for this analysis come from administrative records, I do not observe any information on the provision of informal childcare ic . Therefore, I assume that the informal care supplied to the given family is equal to the difference between the time requirement TR and the sum of formal childcare and maternal leisure,

$$ic = \max(0, TR(age_{yng}) - fc - l). \quad (8)$$

This means that the inequality in equation 7 will be applicable only for those women whose sum of formal childcare and leisure time alone is greater than TR . All the other cases are bound to satisfy the equation with equality.

The stochastic components $\varepsilon_t = (\varepsilon_t^l, \varepsilon_t^c, \varepsilon_t^n, \varepsilon_t^w, \varepsilon_t^h)$ are assumed to be drawn from a multivariate normal distribution with zero mean vector and unrestricted covariance matrix Σ . The errors are drawn independently of their previous realizations. The state space at

⁷Children older than 11 years are assumed not to require any childcare.

time t is defined as a set of all the relevant factors which affect either current or future values of household's utility,

$$\Omega_t = \{ex_t, educ, y_h, p_t, age_{yng}, age_{old}, N_t, \varepsilon_t\} \quad (9)$$

Mother's decision problem can be then written in terms of value functions $V_t(\Omega_t)$, which maximize over expected present value of lifetime utility conditional on the realized state Ω_t ,

$$\begin{aligned} V_t(\Omega_t) &= \max_{k \in K(t)} [V_t^k(\Omega_t)] \\ V_t^k(\Omega_t) &= U_t^k(\Omega_t) + \delta E(V_{t+1}(\Omega_{t+1}) | \Omega_t, d_{kt} = 1), \quad t < 65 \\ &= U_{65}^k(\Omega_{65}), \quad t = 65 \end{aligned}$$

2.2 Solution and estimation of the model

The model is solved numerically, using backward recursion to solve the *Emax* functions $E(V_{t+1}(\Omega_{t+1}) | \Omega_t, d_{kt} = 1)$. The functions are evaluated for every choice k in the choice set K and for every element of Ω_t , starting from the last period T . The solution is conditional on given parameterization of the structural equations, so that the *Emax* functions serve as an input into the model optimization procedure.⁸

The value functions for each alternative are known conditional on the deterministic part of the state space. The stochastic vector ε_t remains unobserved. In order to quantify probability of choosing the observed choice, it is necessary to integrate over the joint distribution of ε_t , isolating the realizations of stochastic shocks which render the observed choice k to be the alternative with the highest value function. To avoid issues with optimization over non-smooth probability spaces, we employ the kernel smoothed frequency simulator proposed by McFadden (1989).

The probability of any sequence of choices made by the woman can be therefore computed as follows,

$$\Pr(k_{A_0}, \dots, k_T | \bar{\Omega}_{A_0}) = \prod_{t=A_0}^T \Pr(k_t | \bar{\Omega}_t) = \prod_{t=A_0}^T \Pr(V_t^k > V_t^j, \forall j \neq k | \bar{\Omega}_t) \quad (10)$$

⁸The state space considered is, however, very large. The decision makers have to be aware of the age structure of children, cumulative experience, and other factors which render computation of entire state space infeasible for practical purposes. To overcome this, I employ estimation strategy developed by Keane and Wolpin (1994), the regression based interpolation. The *emax* functions are evaluated at a random subset of choice and state variable combinations and I interpolate the values of *Emax* functions for the rest of the state space. The interpolation step consists of running a series of regressions with the regressand being *emax* functions which are drawn for the given time period, and the regressors being the variables entering the observable part of the state space.

where the choice probabilities are explicitly conditioned on the observable part of the state space $\bar{\Omega}_t$, disregarding stochastic shocks and unobserved heterogeneity.

The unobserved heterogeneity is introduced into the estimation in the form of latent types, following the tradition of models initiated by Heckman and Singer (1984). This adjustment renders constant terms of the earnings functions β_0 & γ_0 to be type-specific, accounting for potential differences in attitudes towards working and unobserved ability.

$$\begin{aligned}\beta_0 &= \sum_{m=1}^M \beta_0^m \mathbf{1}(\text{type} = m) \\ \gamma_0 &= \sum_{m=1}^M \gamma_0^m \mathbf{1}(\text{type} = m)\end{aligned}$$

The types are inherently unobserved, and therefore have to be integrated out. The individual likelihood is based on the choice probabilities in equation 10, but it also accounts for type-heterogeneity,

$$\ell_i = \Pr(k_{A_0}, \dots, k_T | \bar{\Omega}_{A_0}) = \sum_{j=1}^J \Pr(\text{type}_i = j | \bar{\Omega}_{it}) \prod_{n=1}^N \Pr(k_{it} | \bar{\Omega}_{it}, \text{type}_i = j), \quad (11)$$

where i is an individual indicator and J is the number of latent types. It is assumed that the initial conditions (ages of starting the relationship) are exogenous on type. The probabilities of belonging to a specific type are derived from the initial state variables using a multinomial logit model.

3 Institutional setting

The Dutch family tax policy has been recently subject to two major reforms: a reform of childcare subsidies and a reform of in-work tax credits for working parents. Both reforms were phased-in during the years 2004 to 2009, and they led to a substantial increase of public spending on families with small children. The changes were promoted as means of increasing the maternal labor participation, whereas the notion of increasing fertility rates was not made explicit. However, since both the childcare subsidies and the tax credits were awarded conditional on having children, the incentives for childbearing got more pronounced as well.

3.1 Childcare subsidy reform

The childcare reform started with the introduction of the Law on Childcare (*Wet kinderopvang*) in 2005. The immediate effect of the law involved changes in the institutional setting

of the childcare subsidies, eliminating regional differences in subsidy rates and other idiosyncrasies present in the old system (see de Boer et al. 2014). As of 2005, all families who use formal childcare (for their children aged 0 to 12) qualify for the same subsidy scheme which is set by the central government.⁹ The institutional changes in 2005 however change little in terms of the effective subsidy rates faced by the majority of Dutch families (see Plantenga et al. 2005 and Ministry of Finance 2010).

More important were the changes that followed in 2006 and 2007. In these years the subsidy rates got substantially higher, with the largest increase taking place in 2007. Figure 1 shows the changes in the parental contribution rate for the ‘first child’.¹⁰ First, note that the parental fee depends on the income of the household. In all years, households with the lowest income receive the highest subsidy (up to 96% of the full price). For the lowest income households the subsidy rate hardly changed. For the middle income households the subsidy rate went up by 20 to 40%-points, whereas the increase in the subsidy for the highest income households was somewhat smaller. On average, the parental cost share in the full price dropped from 37% in 2005 to 18% in 2007 (de Boer et al. 2014). Next to the drop in parental fees, from 2007 onwards schools were obliged to act as an intermediary for parents and childcare institutions to arrange out-of-school care. In 2008 there were virtually no changes in childcare subsidies, but then 2009 witnessed a partial reversal of the policy change, as parental fees were raised somewhat. To illustrate that the parents were responding to the incentives, Table 1 shows descriptive statistics of the use of childcare in the period 2006-2009.

It is also important to discuss the situation on the supply side of the formal childcare provision, which motivates several modeling choices adopted in the empirical analysis. As documented by Akgunduz and Plantenga (2013), the number of childcare centers in the Netherlands, as well as their size, expanded in response to the reform. The authors show that this expansion did not impede quality of the provided care, and it attenuated problems with rationing (which has been observed in other European countries, see Kornstad and Thoresen 2007 or Haan and Wrohlich 2011). Also the prices of formal childcare remained stable throughout the reform period. This contradicts the general equilibrium intuition, which suggests that the price of more subsidized service should increase as the effective price faced by the buyers is falling. The price stability has been achieved by putting a cap on the maximal hourly price of childcare which qualifies for the government subsidies. This cap was initially set to 6.03 Euro, and a large majority of the childcare centers decided

⁹The unification of subsidies also allowed for collection of the data on childcare use which are used in this analysis.

¹⁰The Tax Office defines the first child as the child for which the parents have the highest childcare expenditures.

to set their hourly price equal to the threshold (See Figure 2). In the following years, the cap has been increased somewhat to match the Dutch consumer price index.

3.2 In-work tax credits reform

The reform of in-work tax credits (IWTC) for working parents started one year earlier than the childcare subsidy reform. Under the original system, a uniform tax credit of 220 Euro was provided to every working parent who earned more than 4366 Euro *p.a.* and whose youngest child was up to 12 years old. Throughout the years 2005-2009 this credit was phased out (See Figure 4), and it has been gradually replaced by a more targeted IWTC policy which was introduced in 2004. This new tax credit remained conditional on the child's age, but it was no longer awarded to both spouses. It was provided only to the secondary earner in the household, who is defined as the spouse with the lower income.¹¹ Effectively, this meant that the tax credits became targeted predominantly at women, and the men's part was gradually retracted. Figure 3 shows the changes in the amount of total tax credit applicable to the secondary earners in years 2004-2009. The tax credit started as a flat-rate subsidy amounting to 514 Euro. This rate gradually increased to 858 Euro in 2008, which was followed by a more profound change of the policy in 2009. As of 2009, the amount of tax credit awarded to the secondary earner has been made directly dependent on her earnings. Higher wages result in higher credit, which is intended to promote full-time employment among working mothers. In 2009, the maximum credit of 1,765 Euro was reached at 30,803 Euro of gross individual income (the minimum wage of a fulltime worker during the same period was 16,776 Euro).

3.3 Modeling of the reforms

The policy changes described above show that the Dutch families have been subject to many changes in the structure of incentives underlying employment, childcare demand and fertility. This variation facilitates identification of the model, since it introduces sizable and arguably exogenous variation in costs of the choices considered. The costs of maternal leisure changed in several ways, being affected directly through the targeted IWTCs, and indirectly through the childcare subsidies and the loss of father's tax credits. Also the costs of formal childcare and the costs of childbearing fell considerably due to the reforms.

In the context of the model, it is assumed that women are unaware of the prospective policy changes, assuming that the current policy regime will be maintained indefinitely. During the first reform year, they will update their expectations, replacing the prior policy

¹¹Single parents were treated as secondary earners.

regime by its current variant. This belief-updating process continues until they reach the final reform year, after which the policies are assumed to be kept unchanged.

4 Data

The model is estimated using a unique panel dataset provided by Statistics Netherlands (*CBS*). The dataset is built up from several administrative sources, combining information from the Labour Force Survey (in Dutch: *Enquete Beroepsbevolking*), Social Statistical Panel (*Sociaal Statistisch Bestand*), administrative data from municipalities (*Gemeentelijke Basisadministratie*), and Formal Childcare Database of the Tax Office (in Dutch: *Wet Kinderopvang*). The resulting panel constitutes a comprehensive source of information over a large sample of Dutch population (1.05 million individuals) who were observed in the period 2001-2009¹². The dataset contains detailed information on socio-economic characteristics of the individuals, household structure, labor market outcomes, and childcare utilization for families with young children. The childcare information is however unavailable for years prior to 2006, since there has been no standardized childcare subsidy in place (and the tax office therefore did not collect comprehensive childcare data).

In terms of sample selection, several rules have been applied to extract the sample used for the analysis: Due to the limited availability of childcare information, I restrict myself to years for which all choices are fully observable (2006-2009¹³). The information from prior periods is however not discarded - it serves to determine correct experience levels in the equation 4. In the resulting sample, I keep only women from complete families where I observe both spouses. This restriction follows from the fact that the decision making problem of single parents is likely to be very different from the one of complete families (Blundell and Shephard, 2012). Furthermore, the data on single parents often lacks important sources of non-labor income, such as funds from grandparents, or alimonies. I also exclude families where at least one of the spouses is self-employed, student, or disabled. This is done since I cannot determine either the budget constraint or the choice set corresponding to these household types. I also drop individuals with unemployment benefits, implicitly assuming that they are constrained in their labour supply choices.

Finally, the dynamic model is unlikely to require the full scope of the administrative dataset to provide reliable estimates. In order to make the estimation computationally

¹²In following months, the dataset will be extended by CBS to cover also years 2010-2013. The results will be updated accordingly.

¹³Ibid.

feasible, I restrict the sample to a random subset of the data that remains after applying the selections listed above. This subset is chosen to be sufficiently large to ensure stability of both the estimated structural parameters and the resulting counterfactual simulations.

A set of descriptive statistics corresponding to the final sample is provided in Table 2. The personal characteristics are presented for both genders separately, illustrating the relative roles and traits of spouses in the selected families. These records highlight some important idiosyncrasies of the Dutch data. Firstly, the female labor participation rate of 0.78 is relatively high. In the international context it is slightly below the rates of Nordic countries which are recognized for active engagement of the female workforce, and slightly above the rates of English-speaking countries.¹⁴ The average hours worked show that women, if employed, are working predominantly in part-time arrangements. The Dutch labor market is considered to be highly flexible in accommodating the needs of part-time workers, which is documented by the diversity of observed work hours shown in the Figure 5. The Figure plots a histogram of the contracted work hours expressed as a fraction of full-time work equivalent (fte) which amounts to 40 work hours per week. The spike representing full-time (1 fte) workers accounts for 16% of female workforce.¹⁵ The fact that women are working mostly part-time is also reflected in their annual earnings, which are 40% lower compared to men’s earnings.

Table 2 further shows how many families are actively using formal childcare. As noted in the Section 2, a distinction is made between daycare (children 0–3 years of age¹⁶) and out-of-school care (children 4–11 years of age).¹⁷ According to the statistics, the daycare services are used much more than the out-of-school care. This difference in attitudes towards childcare motivates the inclusion of age-dependent childcare parameters in the utility function (equation 1). Indeed, many modeling assumptions about childcare are closely related to the idiosyncrasies observed in the data. My treatment of formal childcare choice can be traced back to histograms of childcare demand plotted in Figures 6 and 7. The Tax Office reports a very precise breakdown of annual childcare hours, separating each type of childcare used for each child in the household. Here, these quantities were

¹⁴In 2006, the aggregate female participation rate was 0.68 in the Netherlands, 0.72 in Norway and Denmark, and 0.66 in the US and the UK. The EU-wide average was 0.57 (OECD, 2014)

¹⁵For the analysis, I use a broader definition of full-time work. Full-time workers are defined as those women who work 0.8–1.0 fte. Part-time work is equivalent to 0.2–0.799 fte and the remaining women are coded as working 0 hours.

¹⁶Maternity leave in the Netherlands is rather short, 3 months after the birth of the child, which can be supplemented with 3 months of parental leave for which the replacement rate is however rather low (OECD, 2007).

¹⁷Children in the Netherlands go to school when they turn 4, and are typically in secondary school when they are 12 years of age.

re-scaled to represent weekly demands for daycare and out-of school care for every child in the respective services. Figure 6 shows that the vast majority of families are choosing to use less than 4 days of daycare per week. Furthermore, the spikes of the distribution illustrate that it is commonplace to use full-days of daycare (rather than half-days or other quantities). Similar picture emerges also for the out-of-school care demand in Figure 7. The reported hours are around 50% lower compared to daycare, which follows from the fact that school-aged children do not need more than half-days of childcare. But also in this case, the histogram indicates that families tend to use out-of-school care for less than four days per week (which is equivalent to two full-days of childcare), and the demand bunches around rounded half-days of care. These findings lend credibility to the modeling assumption that women are choosing among four formal childcare alternatives, corresponding to 0–3 days of formal childcare per week. The data also support the hypothesis that the childcare choice applies equally to all children in the household. In 91% of the cases, families use overlapping childcare arrangements for each of their children aged less than 12.

In the context of the model, the observed demands for formal childcare are translated into corresponding discrete choices by taking weekly household averages¹⁸ and rounding them to the nearest integer. This rounded value represents the number of days the family has decided to use.

The observed patterns of formal childcare highlight another important fact about Dutch families. That is, they are rarely fully reliant on the services of childcare centers. The informal childcare is an important source of childcare provision and it is expected to be used by majority of the families. The informal providers are often family relatives, friends, neighbors, and to a lesser extent husbands (men in the sample are not observed to change their work arrangements after a child is born). In order to get more concrete grasp on the extent of informal childcare use, I employ the equation 8 and compute the informal childcare proxy ic from observed maternal work intensities and formal childcare demands.¹⁹ Figure 8 presents the results. 26.7% of households are considered to use no informal childcare at all, relying only on combination of formal childcare and mother’s leisure time. The histogram of non-zero hours peaks firstly around 2.5 days and then

¹⁸I am averaging individual formal childcare demands over all children in the household who are less than 12 years old. The childcare demand of school-aged children is multiplied by two, so that the resulting average could be interpreted as a number of days during which the children were taken care of by formal childcare providers, instead of mother or other carers.

¹⁹For modeling purposes, I replace the observed quantities by values representing the corresponding discrete choice. This is a necessary step in order to assign standardized values of informal care to the choices which are not directly observed.

again at 5 days, accounting for those women who work full-time and do not use formal childcare.

The price of informal childcare is not observed and therefore it is not explicitly incorporated into the model. The utility parameters of informal childcare reflect both preferences for the service and its unobserved cost. However, the assumption that every family is subject to identical preferences and prices for informal childcare is a stringent one. To address this concern, the informal childcare indicators in the utility function can be further interacted with variables which may well influence price of the service. These variables include presence of grandparents and adult children in the household, and number of other adults living in the same household. These interaction terms will be used in a robustness check to assess the importance of the heterogeneity of informal childcare prices.

5 Results

5.1 Reduced form analysis

The policy reforms of 2004-2009 were associated with a profound change of incentives underlying work, childcare and fertility decisions of the Dutch households. Under the assumption that families do respond to pecuniary incentives, it should be possible to get some insight about the reform effects by looking into aggregate dynamics of the variables of interest.

Table 3 presents estimated parameters of four household-level Random-Effects models, each focusing on one of the variables of interest. The dependent variables are binary indicators representing incidence of specific events during the given year. These are: 1) realized marriages within the sample of non-married individuals, 2) childbirths among the child-less couples, 3) use of formal childcare among the parents with children younger than 12 years, and 4) labor participation of women aged 18 - 65. The independent variables include a set of socio-economic characteristics, education level dummies and yearly dummies.²⁰

In the following discussion, I focus on the coefficients corresponding to year dummies. The results in the first column show that the propensity to get married in the given period stayed largely stable throughout the whole span of eight years. We observe the propensity

²⁰It should be noted that since this analysis is purely reduced-form, the size of the estimated effects may be confounded by interdependencies of the considered choice variables, and also by their relation to other factors which are not accounted for here (*e.g.*, business cycle or local unemployment rates). Nevertheless, it can still give us valuable insights about general direction of the reform effects.

to peak around 2003 and then decrease within the main reform period 2005-2009. However the year-specific effects, although significant, are small. The second column corresponds to the incidence of births among previously childless couples. This subsample was chosen for the sake of exposition. The patterns observed among the first-time parents illustrate the development of childbearing without confounding effects of birth spacing and other issues related to higher-order births. Within the span of our data, we can see steady rise of childbirth incidence, which mimics the gradual introduction of childcare subsidies and in-work tax credits. The spike in 2004 can be potentially attributed to the preceding peak of marriage rates in 2003. It is worth noting that the number of childbirths kept on growing throughout the whole reform period, despite the coinciding fall in marriage rates.

Time dummy coefficients in the third column lead to the same conclusion as the statistics presented in Table 2 - raising childcare subsidies spurred the demand for formal childcare. Since I observe the childcare demand only for years 2006-2009, the regression is restricted to this period, with year 2006 being the baseline. The last column documents that the women also increased their labor supply attainment throughout the reform period. According to the results, the female labor participation began to grow in 2005 and by the end of the reforms it was almost four percentage points higher, compared to the 2001 levels. Similar picture emerges if we plot the results graphically. Figure 9 shows the development of the analyzed variables throughout the span of the data.

It remains to be added that the apparent stability of marriage rates lends credibility to the maintained assumptions about timing of the model. The timing starts with formation of the household, which means that the model takes this decision as given. It could be argued that the household formation is also an economic decision and should be treated as such. However, the observed stability of marriage rates suggests that even though the choices within the family have been altered, the decision to form a household remains unaffected, and it seems to be of little harm to abstract from extending the model in this direction.

This preliminary analysis, however descriptive, leads to several important findings. Within the reform period, the households do exhibit changes in their allocations which are endogenous to the structural model. The changes are also in line with the economic theory (rising female labour participation, childcare demand and fertility). Furthermore, the households do not exhibit changes in the decisions which are taken as given by the model (stable marriage formation). Such outcomes are supportive of the assumptions underlying the structural model and the results presented in the next section.

5.2 Structural analysis

The current set of results corresponds to a model which is a simplified version of the full specification. The model is parameterized according to the equations presented in the Section 2, but it does not contain several modeling features presented therein. Firstly, the earnings equations are currently estimated without accounting for the unobserved types. Secondly, I only estimate diagonal elements of the error matrix Σ . The off-diagonal elements are assumed to be zero, maintaining the assumption of contemporaneously uncorrelated error terms.

An overview of estimated parameters and their standard errors is given in Table 4. The signs of parameter estimates confirm previous findings and standard economic rationale underlying individual decision making. The linear coefficients are positive, implying that mothers do derive utility from initial consumption, leisure, childcare, and fertility. The negative signs of quadratic coefficients show that the utility gains are decreasing in scale. The parameter for interaction of formal childcare and leisure is negative, reflecting the fact that formal childcare is usually used as a substitute for maternal time with the children.

The data sample which was used to derive this set of parameters contains 5000 women followed over the span of years 2006 to 2009. This sample is considerably smaller than the actual administrative dataset from which it was randomly drawn. The current number of observations ensures qualitative stability of the coefficients²¹, without requiring prohibitively long time to reach convergence.

Table 5 presents an assessment of goodness of fit of the model. I use the estimates of structural parameters to simulate choice paths and earnings trajectories for the given sample of women, starting from the observed initial conditions. The simulated paths and earnings are used to derive a set of sample moments corresponding to the artificial data. The simulated moments are compared with their observed counterparts. The results in Table 5 show that the simulated and observed moments are matched very well. To account for the fact that the variables of interest evolve over time, Figure 10 shows their observed and simulated averages for all years considered. The plots show that the model prediction closely matches the observed patterns. This means that the model is capable of replicating the effects induced by the two policy reforms, which validates the estimated parameters.

Another potential concern is the behavior of predicted earnings over time. It is often found in the literature that the dispersion of earnings increases as the workers grow older (Haan and Wrohlich, 2011), which is often considered as an argument for modeling wages as a Markov process. I argue that substantial part of this dispersion can be captured by

²¹A robustness check based on sample of 10000 women confirmed stability of estimated parameters.

the specification of the two earnings functions, 3 and 5. The dependence of predicted wage on cumulated experience allows for higher earnings in the later periods, but it also allows for larger variance of earnings since some people will accumulate less experience than others. Furthermore, since the earnings functions are specified in logarithmic form, higher nominal wages are bound to exhibit higher variance as well. Figure 11 shows gender-specific plots of wage dispersion against worker's age. The two trajectories present in the plots correspond to the dispersion observed in the data and the dispersion predicted by the model. The gap between observed and predicted dispersion is attributed to the error terms, since the observables can predict only a part of the variance. Both trajectories are shown to follow similar patterns until the age of 50, when the observed dispersion starts to diverge. This divergence is most likely driven by early retirement decisions which could influence the composition of the older workforce and lead to higher wage dispersion.

5.3 Counterfactual simulations

I use the obtained estimates of structural parameters to study effectiveness of the different types of fiscal stimuli for working mothers. I focus on two policy proposals in particular—the reform of childcare subsidies and the reform of in-work tax credits. The effectiveness is evaluated in terms of the reform's effects on labour participation, hours worked and government finances. The analysis is conducted by performing counterfactual simulations, letting an artificial sample of women be subject to changes in the one of the two policy regimes. I quantify women's response to the policy change relative to the baseline scenario, and calculate the corresponding effect on government budget.

The baseline scenario mimics the tax & subsidy system which was in place in 2009.²² The childcare reform scenario takes the baseline childcare subsidy system and lowers the parental contribution rate by 12 percentage points. The IWTC reform scenario increases the 2009 levels of credit by 318 Euro for all workers above the minimal income threshold. I assume that the policy changes are unexpected, and the women assume that the new policy regime will remain in place. The baseline and resulting policy rates for both reforms are presented in the Figure 12. The reformed policy rates are chosen to satisfy ex-ante cost equivalence - under the assumption that childcare use and labor participation remains at the 2009 levels, both reforms would lead to an increase in public spending of 100 million Euro. This cost equivalence is bound to be broken by behavioral shifts induced by the policy changes, but it serves as a good reference point for counterfactual simulations of reforms with costs of similar magnitude.

²²I have also performed policy simulations with alternative baseline tax systems, but the results remained stable.

Table 6 shows the impact of the two policy reforms on women's choices. The results documented in the table represent 'short-run' effects, corresponding to the impact in period immediately following the policy change. They are expressed as percentage point changes in the variables of interest.

In all accounts, the reforms are shown to have a positive effect on the choice variables. The female labor supply is enhanced more by the childcare subsidy reform, but this advantage is counterbalanced by steep increase of demand for formal childcare. The additional childcare demand drives up the realized costs of childcare reform, because new childcare users were not accounted for in the initial cost projection. The spike of childcare costs is not observed in the case of IWTC reform, where childcare demand stays relatively low. The forgone maternal time spent with children is substituted to a large extent by informal childcare sources. Therefore, the realized costs of the reform stay near the initial target. In this case, the costs prove to be lower than expected due to the additional revenue from income tax receipts filed by the new entrants to the labor market.

Last row of Table 6 shows interesting feature of the results - if I quantify costs of raising labour supply by ten basis points, the two reforms will exhibit almost exactly the same effectiveness. This equivalence however holds only in the short run. Since childcare benefits enhance fertility among young mothers, the pool of children will steadily grow as the cohorts of post-reform babies grow older. This is important, since the Dutch children remain eligible for childcare subsidies until the age of twelve. This will considerably increase long-run costs of the reform, which will level off around the annual cost of 14.4 million Euro. The long-term effects on labour supply are also larger than the immediate changes, since the immediate effect on labour supply is propagated through the human capital channel to the later periods, rendering the employment better appraised and therefore also more desirable than before.

The reform comparison above exposes hidden costs of the childcare subsidy reform, which are not to be realized in the initial post-reform years. These costs correspond to reform-induced fertility increase, an impact which is most likely unintended by the policy makers. For that reason, it may well escape their awareness, and therefore also their cost projections. As I have shown, such costs are non-trivial. They are capable of erasing significant portion of costs presumably saved compared to the other reforms, and they can potentially reverse a policy recommendation which is seemingly optimal in the short run. This finding bolsters the presumption that a sound policy analysis should look beyond the traditional metric of key variable of interest, but also scrutinize the second-order effects which are likely to be induced by the policy change, and which have the potential to

influence government's budget.

6 Conclusion

This paper develops a dynamic structural model of decision making of married and cohabiting women in the Netherlands. The unique feature of the model is that it combines three interdependent choices: the women are assumed to choose their labor supply, fertility and (conditional on having children) childcare demand. Each of the choices considered has been found to be responsive to the changes in underlying financial incentives, and it has been repeatedly argued (Bernal (2008), Francesconi (2002)) that their joint nature mandates the use of unified modeling framework. The model is estimated using a rich administrative panel covering years 2001-2009, which provides high-quality information about individual labour market histories and childcare expenditures. Identification is aided by exploiting two large-scale reforms of Dutch family policy which raised the government spending on In-Work Tax Credits (EITC), and Childcare subsidies. Resulting variation in the tax and subsidy rates is explicitly incorporated in the budget constraint.

The model fits the data well, and is capable of replicating the observed responses to the realized policy changes. The optimized structural parameters are used for comparative analysis of the childcare subsidy reform and the IWTC reform. The results show that the two policy reforms induce similarly strong changes in terms of maternal labor supply, as well as short-run government revenue. The fertility is stimulated more by the childcare subsidy reform. However, the equivalence of budgetary costs is broken in the long run. Reform-induced increase in fertility rates raises the costs of the childcare reform above its short-run projection, as more children become eligible for subsidized childcare in the years after the implementation. This finding should be of particular interest for policy makers, since the costs of reform related to the fertility are not to be fully realized sooner than several years after the implementation.

The question which remains to be answered is which of the policies fares better in terms of reaching the two policy goals - to promote female labor participation, and to increase fertility rates. I have shown that the IWTC reform proves to be more cost-efficient in terms of labor supply stimulation, however it falls short of the fertility effect of childcare subsidy reform. The two policies should be therefore evaluated with these limitations in mind, and the policy makers should decide for one or another, depending on their priorities - be it budgetary temperance, or fertility of the populace.

References

- Akgunduz, Y. E. and Plantenga, J. (2013). Competition for a better future? Effects of competition on child care quality. Working Papers, Utrecht School of Economics 13-14, Utrecht School of Economics.
- Apps, P., Kabátek, J., Rees, R., and Van Soest, A. (2012). Labor supply heterogeneity and demand for child care of mothers with young children. IZA Discussion Paper 7007, Bonn.
- Apps, P. and Rees, R. (2009). *Public Economics and the Household*. Cambridge University Press, Cambridge.
- Baughman, R. and Dickert-Conlin, S. (2003). Did expanding the eic promote motherhood? *American Economic Review*, 93(2):247–251.
- Berlinski, S. and Galiani, S. (2007). The effect of a large expansion of pre-primary facilities on preschool attendance and maternal employment. *Labour Economics*, 14:665–680.
- Bernal, R. (2008). The effect of maternal employment and child care on children’s cognitive development. *International Economic Review*, 49(4):1173–1209.
- Bettendorf, L., Jongen, E., and Muller, P. (2012). Childcare subsidies and labour supply: evidence from a large Dutch reform. CPB Discussion Paper 217, The Hague.
- Blau, F. D. (2012). *Gender, Inequality, and Wages*. Number 9780199665853 in OUP Catalogue, Oxford University Press. Oxford University Press.
- Blundell, R. and Shephard, A. (2012). Employment, Hours of Work and the Optimal Taxation of Low-Income Families. *Review of Economic Studies*, 79(2):481–510.
- Brewer, M. and Browne, J. (2006). The effect of the working families’ tax credit on labour market participation. IFS Briefing Note no. 69.
- Brewer, M., Ratcliffe, A., and dSmith, S. (2012). Does welfare reform affect fertility? Evidence from the UK. *Journal of Population Economics*, 25(1):245–266.
- de Boer, H.-W., Jongen, E., and Kabátek, J. (2014). The effectiveness of fiscal stimuli for working parents. CPB Working Paper 116.
- Del Bono, E., Weber, A., and Winter-Ebmer, R. (2012). Clash of career and family: Fertility decisions after job displacement. *Journal of the European Economic Association*, 10(4):659–683.

- Fitzpatrick, M. (2010). Preschoolers enrolled and mothers at work? The effects of universal prekindergarten. *Journal of Labor Economics*, 28(1):51–85.
- Francesconi, M. (2002). A Joint Dynamic Model of Fertility and Work of Married Women. *Journal of Labor Economics*, 20(2):336–380.
- Haan, P. and Wrohlich, K. (2011). Can child care policy encourage employment and fertility?: Evidence from a structural model. *Labour Economics, Elsevier*, 18(4):498–512.
- Havnes, T. and Mogstad, M. (2011). Money for nothing? Universal child care and maternal employment. *Journal of Public Economics*, 95:1455–1465.
- Heckman, J. and Singer, B. (1984). A Method for Minimizing the Impact of Distributional Assumptions in Econometric Models for Duration Data. *Econometrica*, 52(2):271–320.
- Hotz, V. and Scholz, J. (2003). The earned income tax credit. In Moffitt, R., editor, *Means-Tested Transfer Programs in the U.S.* . University of Chicago Press.
- Keane, M. P. and Wolpin, K. I. (1994). The Solution and Estimation of Discrete Choice Dynamic Programming Models by Simulation and Interpolation: Monte Carlo Evidence. *The Review of Economics and Statistics*, 76(4):648–72.
- Kornstad, T. and Thoresen, T. (2007). A discrete choice model for labor supply and childcare. *Journal of Population Economics*, 20:781–803.
- Lefebvre, P. and Merrigan, P. (2008). Child-care policy and the labor supply of mothers with young children: a natural experiment from Canada. *Journal of Labor Economics*, 26(3):519–48.
- Lundin, D., Mörk, E., and Öckert, B. (2008). How far can reduced childcare prices push female labour supply? *Labour Economics*, 15:647–659.
- McFadden, D. (1989). A Method of Simulated Moments for Estimation of Discrete Response Models without Numerical Integration. *Econometrica*, 57(5):995–1026.
- Milligan, K. (2005). Subsidizing the Stork: New Evidence on Tax Incentives and Fertility. *The Review of Economics and Statistics*, 87(3):539–555.
- Ministry of Finance (2010). Het kind van de regeling, rapport brede heroverwegingen 5. Ministry of Finance, The Hague.

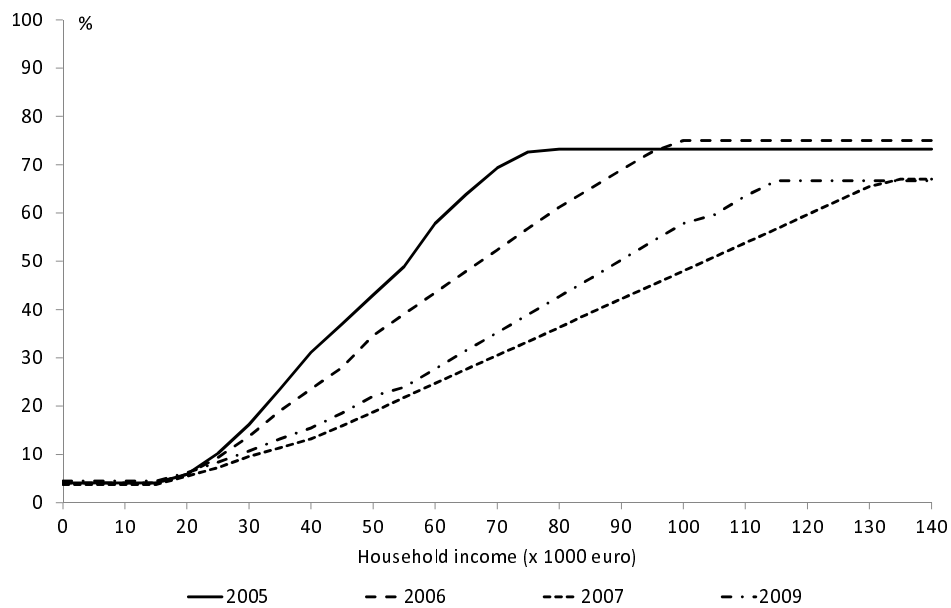
OECD (2007). *Babies and Bosses, Reconciling Work and Family Life: A Synthesis of Findings for OECD Countries*. OECD, Paris.

OECD (2014). *Labour Force Statistics*. Paris.

Plantenga, J., Wever, Y., Rijkers, B., and de Haan, P. (2005). Arbeidsmarktparticipatie en de kosten van kinderopvang. *Economisch Statistische Berichten*, 4455:115.

7 Figures and Tables

Figure 1: Parental contribution rate to the childcare costs for the first child



Source: own calculations using publicly available subsidy tables.

Figure 2: Histogram of hourly prices of formal childcare in the Netherlands, 2006-2009, in Euros

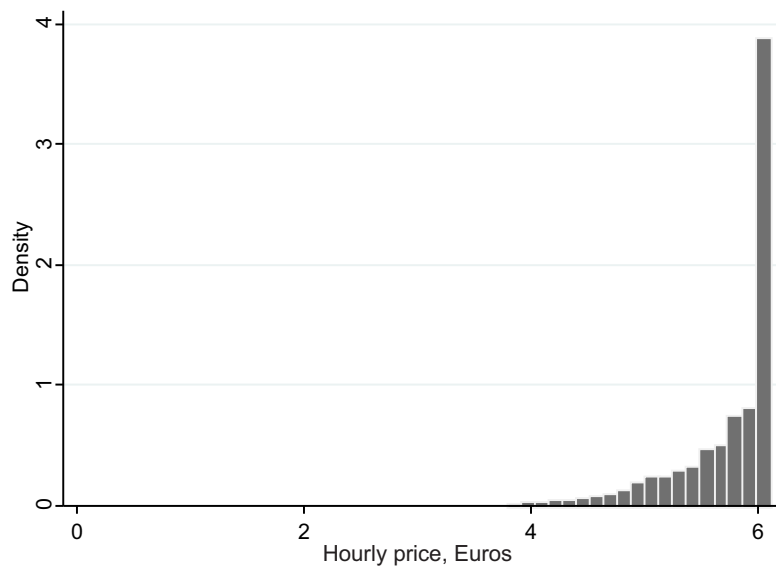
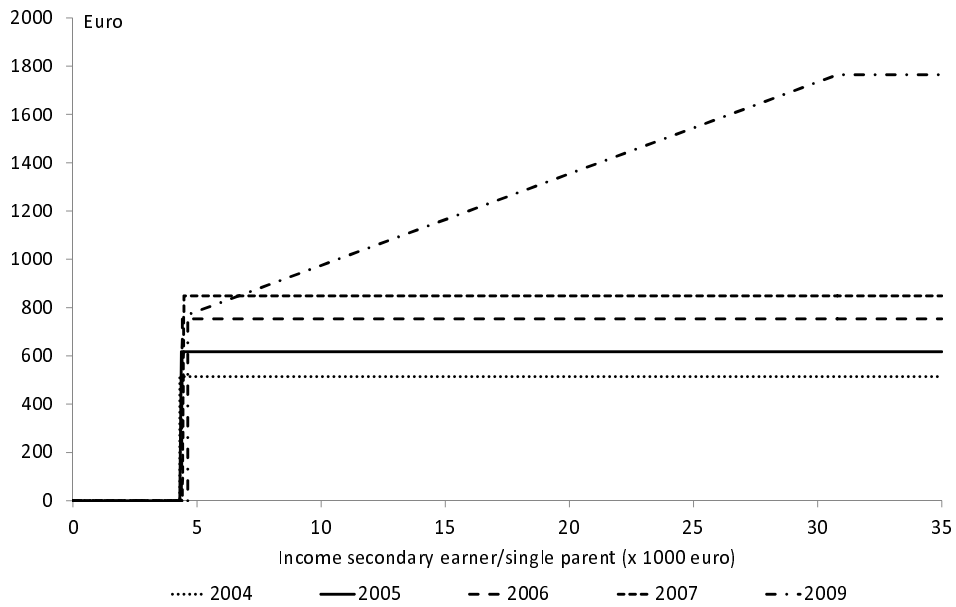
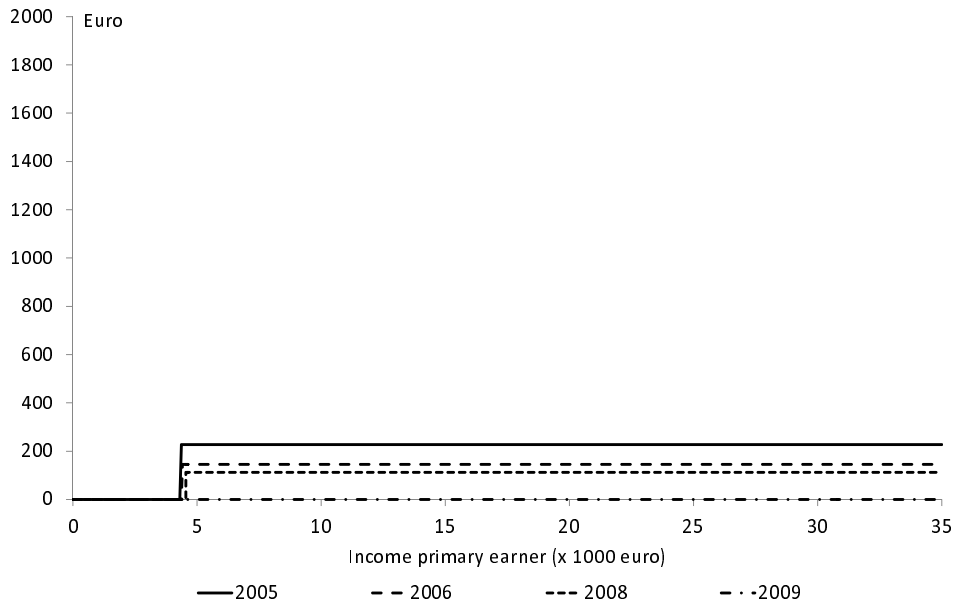


Figure 3: EITC for secondary earners with children and single parents



Source: Tax Office.

Figure 4: EITC for primary earners with children



Source: Tax Office.

Figure 5: Histogram of contracted work hours per week, expressed as shares of the full-time work equivalent, women aged 18-65

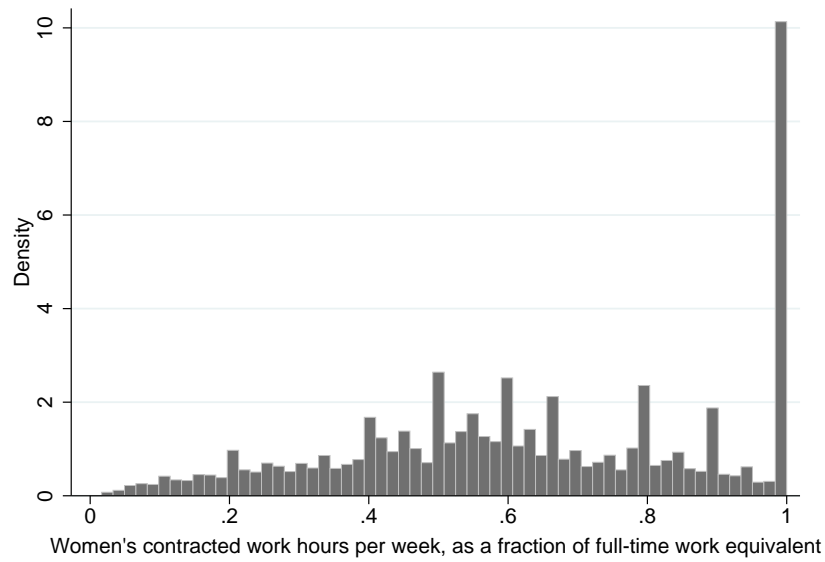


Figure 6: Histogram of household's demand for daycare per week, expressed in full-day childcare equivalents per week, active users only

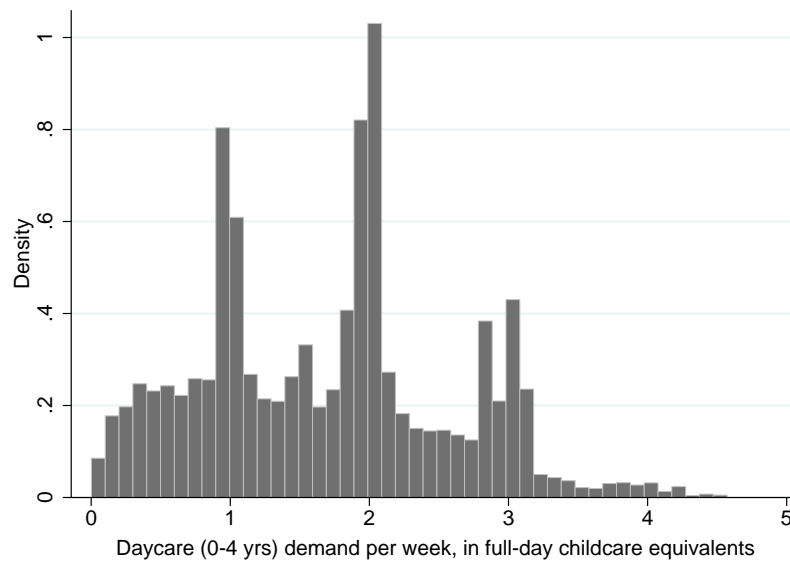


Figure 7: Histogram of household's demand for out-of-school care, expressed in full-day childcare equivalents per week, active users only

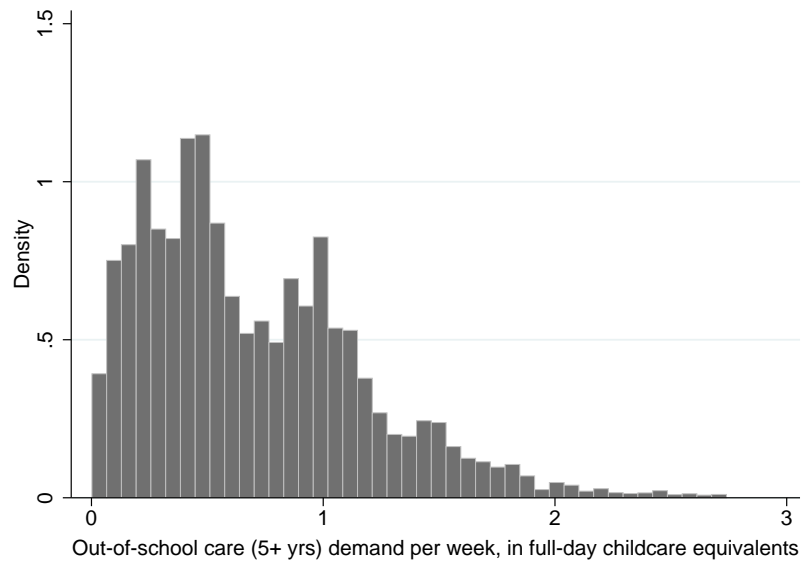


Figure 8: Histogram of household's demand for informal childcare, proxied, expressed in full-day childcare equivalents per week

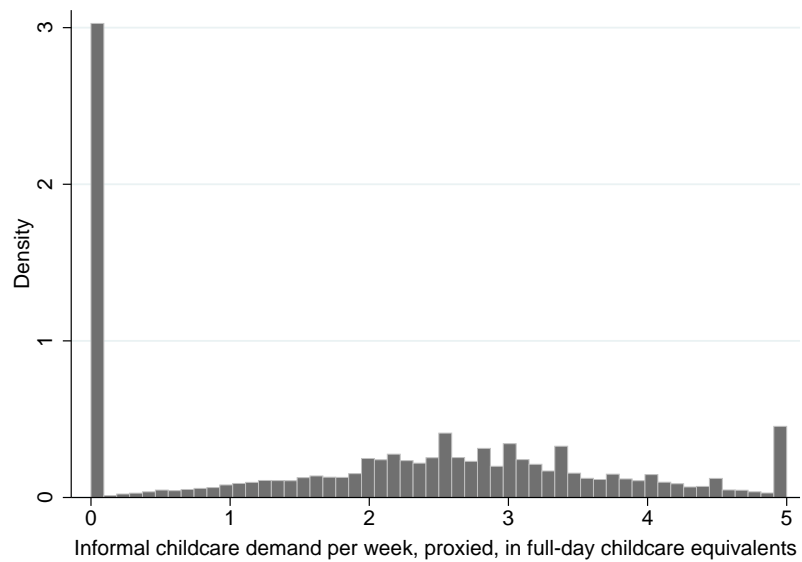


Figure 9: Dynamics of the main variables of interest over the period 2002-2009, plots of initial levels and subsequent changes



Table 1: Use of childcare 2006-2009

	Daycare				Out-of-school care			
	<i>2006</i>	<i>2007</i>	<i>2008</i>	<i>2009</i>	<i>2006</i>	<i>2007</i>	<i>2008</i>	<i>2009</i>
Share households	29.8	40.6	49.8	53.8	7.1	11.3	15.2	18.4
Average number of children	1.3	1.3	1.3	1.3	1.4	1.4	1.5	1.5
	(0.5)	(0.5)	(0.5)	(0.5)	(0.6)	(0.6)	(0.6)	(0.6)
Average number of hours per child	19.5	18.7	19.5	20.0	9.6	8.7	9.4	9.9
	(9.3)	(10.4)	(10.3)	(10.4)	(6.4)	(6.3)	(6.8)	(7.6)

Figure 10: Comparison of observed and predicted dynamics within the main variables of interest over the period 2002-2009, plots of initial levels and subsequent changes

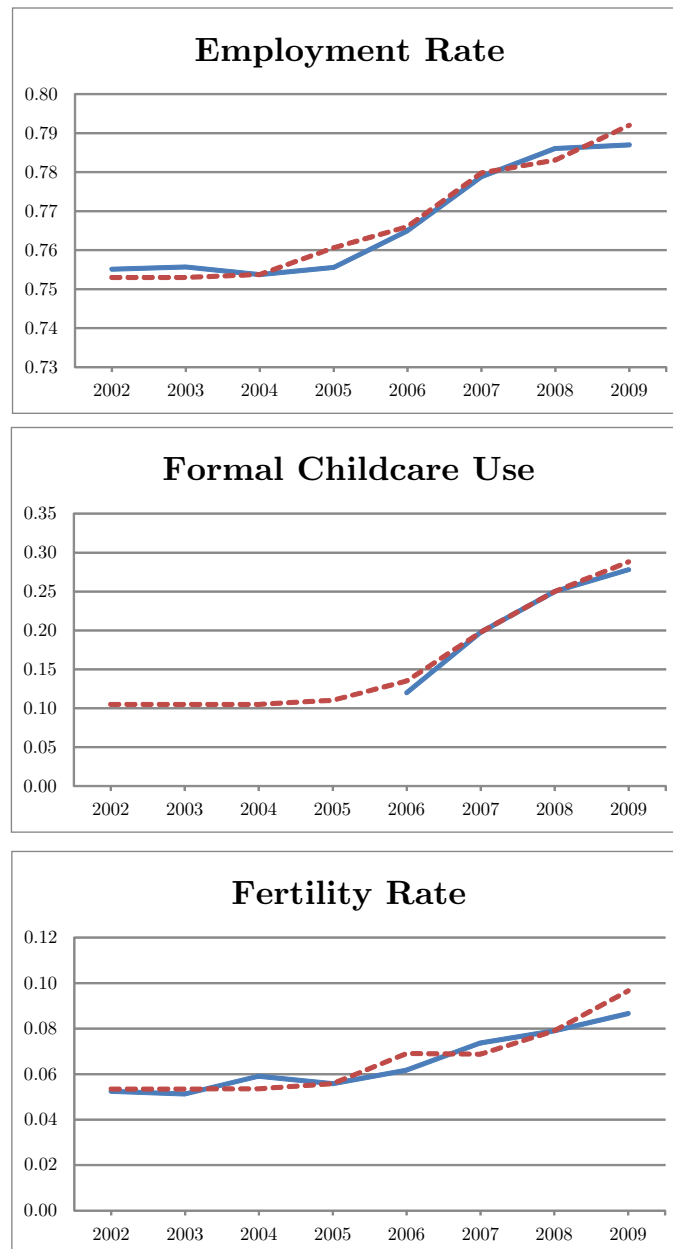


Figure 11: Comparison of observed and predicted earnings spreads for women and men living with a partner, breakdown by age of the worker

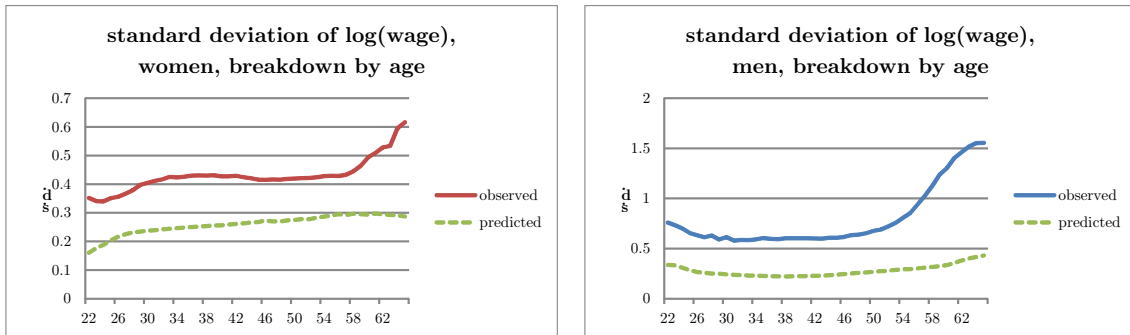


Figure 12: The effects of simulated reforms on the corresponding policy rates

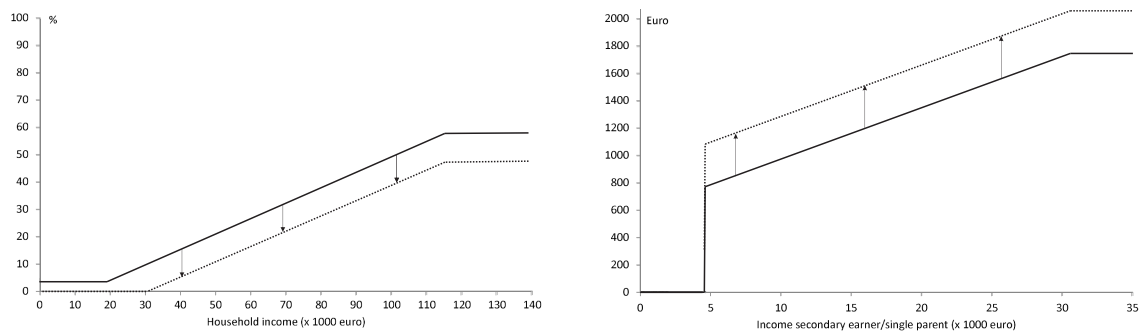


Table 2: Descriptive statistics stratified by gender

	Men	Women
Age	40.4	38.0
Labor participation rate	0.96	0.78
Hourly wage	21.3	16.2
Hours worked per week ^a	38.9	22.1
Native	0.84	0.83
Western immigrant	0.08	0.09
Non-western immigrant	0.08	0.08
Lower educated ^b	0.21	0.18
Middle educated ^b	0.42	0.50
Higher educated ^b	0.37	0.32
Between 4 and 12 years	0.54	0.54
Urban area (share) ^c	0.17	0.17
Non-urban area (share) ^c	0.83	0.83
Daycare use (share) ^d	0.31	0.31
Out-of school care use (share) ^e	0.13	0.13
Number of observations	913236	913236

^aHours worked per week by the employed. ^bEducation is classified as follows (using the Dutch abbreviations): i) lower educated = BO and VMBO, ii) middle educated = MBO, HAVO and VWO, iii) higher education = HBO and WO. ^cAn urban is defined as large (small) when it has 150,000 inhabitants or more. ^dDaycare use among families with at least one child aged 0–3. ^eOut-of school care use among families with at least one child aged 4–12 years.

Table 3: Dynamics of the main variables of interest over the period 2001-2009, Random-Effects Regression

	(1) Marriage	(2) Fertility (1st time parents)	(3) Childcare Use	(4) Market Work
Husband's earnings (log)	0.00123***	0.0232***	0.0153***	0.00164***
PT work	0.00317***	-0.0460***	0.221***	
FT work	0.0206***	-0.397***	0.0126***	
Age	-0.00567***	0.193***	0.143***	-0.0425***
Age ²	0.00003***	-0.00299***	-0.00215***	0.000533***
Immigrant	-0.00495***	0.00836***	-0.0172***	-0.0727***
Grandparents in the h'hold	0.00373***	0.566***	0.166***	-0.0510***
No. of adults in the h'hold	-0.00302***	-0.00871***	-0.00118	-0.00629***
Year: 2002	0.00124***	0.00239		0.00713***
Year: 2003	0.00224***	0.00121		0.00770***
Year: 2004	0.00126**	0.00910***		0.00573***
Year: 2005	-0.000161	0.00578**		0.00760***
Year: 2006	-0.000234	0.0117***		0.0170***
Year: 2007	-0.00131**	0.0237***	0.0776***	0.0308***
Year: 2008	-0.00101	0.0290***	0.130***	0.0381***
Year: 2009	-0.000178	0.0366***	0.158***	0.0390***
Education dummies	yes	yes	yes	yes
Constant	-0.201***	-2.749***	-2.591***	1.787***
Observations	913236	334380	117112	913236

*** p<0.01, ** p<0.05, * p<0.1

Table 4: Parameterization and Parameter Estimates

	Value	St.dev.
<i>utility function</i>		
CRRA parameter (μ)	0.7146	(0.0311)
leisure (linear)	1.771	(0.0237)
leisure (quadratic)	-0.1634	(0.0509)
formal childcare (linear)	1.9411	(0.1479)
formal childcare (quadratic)	-0.4128	(0.1542)
formal childcare * preschool	0.1301	(0.0671)
formal childcare * leisure	-0.0622	(0.0092)
informal childcare (linear)	1.0832	(0.6276)
informal childcare (quadratic)	-0.0127	(0.0043)
number of children	0.5622	(0.0092)
number of children (quadratic)	-0.1496	(0.0762)
birth in the curr. period	-0.3346	(0.0966)
<i>female wage</i>		
wage intercept	2.8585	(0.0153)
returns to schooling (linear)	-0.2003	(0.0116)
returns to schooling (quadratic)	0.1944	(0.0057)
returns to experience (linear)	-0.0372	(0.0097)
returns to experience (quad)	0.0244	(0.0018)
<i>male earnings</i>		
wage intercept	2.7403	(0.0174)
returns to schooling (linear)	-0.0303	(0.0011)
returns to schooling (quadratic)	0.0029	(0.0000)
returns to experience (linear)	0.0495	(0.0014)
returns to experience (quad)	-0.0007	(0.0000)

parameter estimates - cont'd	Value	St.dev.
<i>error structure</i>		
$\sigma_{leisure}$	0.9581	(0.0113)
$\sigma_{fertility}$	2.8378	(3.4351)
$\sigma_{childcare}$	2.2825	(0.9763)
$\sigma_{wage.wife}$	0.2487	(0.0068)
$\sigma_{wage.wife.meas.error}$	0.1841	(0.0075)
$\sigma_{wage.husband}$	0.218	(0.0011)
number of observations		5000
LL :		6104.2246

Table 5: Comparison of observed and predicted moments

	observed moments	baseline prediction
employment rate	0.835	0.829
fertility rate per period	0.067	0.068
childcare use rate	0.326	0.384
women's earnings - mean	21.767	22.936
- st. dev.	6.311	7.188
men's earnings - mean	36.92	36.231
- st. dev.	9.724	11.698

Table 6: Effectiveness of fiscal stimuli of 100 million Euro

	Childcare subsidy	EITC
Intended costs	100.0	100.0
Realized SR costs	155.6	92.6
Labour supply effect	1.29%	0.72%
Childcare demand	13.95%	1.45%
Fertility	1.85%	1.18%
Cost of raising LS by 0.1%	12.1 mil.	12.8 mil.