# The equity-efficiency tradeoff: A welfare analysis of Swedish child-care fee reform*

Anna Brink, Katarina Nordblom and Roger Wahlberg

Department of Economics
Göteborg University

June 19, 2006

**Abstract**

The effects of a recent Swedish child-care fee are compared with those of an alternative reform, a general increase of child benefits. The fee reform implied considerably decreased fees and was intended to increase labor supply among parents. We estimate labor supply effects using a discrete choice labor supply model, and simulate behavioral responses to the changes in child-care fees. We find positive, but rather small, effects on labor supply from the fee reform, while increased child benefits would result in decreased labor supply among lone mothers. The former reform is preferable from an efficiency point of view, but increases income inequality. Increased child benefits, on the other hand, would make the net income distribution more equal. We make a social welfare comparison and conclude under what circumstances each of the reforms are preferable.

*Keywords:* Labor supply, Redistribution, Reform, Child care, Fees

*JEL classification:* H31, I38, J22

---

*Correspondence to: Katarina Nordblom or Roger Wahlberg, Department of Economics, Göteborg University, Box 640, SE-405 30 Göteborg, Sweden. e-mail: katarina.nordblom@economics.gu.se, roger.wahlberg@economics.gu.se. This research was financially supported by the Swedish Research Council, the Malmsten Foundation, and the Jan Wallander Foundation.

# 1 Introduction

In the year 2002, the Swedish child-care fee system was reformed by the introduction of the so called *max fee*. The reform implied substantially reduced child-care fees, thereby decreasing the cost of market work for parents with pre-school children. In this paper, we analyze this reform's effects on equity and efficiency.

The decreased cost of market work makes the reform similar to in-work benefit programs in other countries that aim to reduce poverty and promote employment. These programs typically include tax deductions or tax credits, and in some cases subsidized child care. They are mostly targeted towards low-income families with children and do usually require some minimum hours of market work for eligibility. Some examples are the Earned Income Tax Credit (EITC) and Temporary Assistance for Needy Families (TANF) in the U.S., the Self Sufficiency Project (SSP) in Canada, the Working Families Tax Credit (WFTC) in the U.K., the Back to Work Allowance (BWA) and Family Income Supplement (FIS) in Ireland, and the Mini-Jobs reform in Germany.[1] The *max fee* reform has the labor supply incentive in common with these in-work benefit programs, but in contrast to them the *max fee* reform has favored high income earners to a larger extent than low income earners.

The *max fee* reform aimed at improving the economic situation for families with young children and to increase labor supply among parents by introducing a new fee structure for publicly subsidized child care. At the time of the reform 80 percent of all children aged 1–5 were enrolled in public child care, a share that increased to 83 percent in 2003. A large majority of families with pre-school children has accordingly been affected by the reform. Before the reform, fees varied widely across municipalities, and were in most cases based on parental income as well as on time spent in child care. Since fees were based on both income and time spent in child care, longer working hours, as well as a better paid job resulted in increased fees. The new *max fee* is also based on family income, but only up to a rather low ceiling after which the fee is constant. For the first child the fee is 3 percent, for the second child 2 percent, and for the third child 1 percent of gross family income. No fees

[1] See Blank (2002) and Moffitt (2002) for reviews of welfare programs in the U.S. Blundell (2000) reviews the EITC in the U.S., the SSP in Canada, and evaluates the WFTC in the U.K. Ochel (2001) discusses the SSP in Canada, WFTC in the U.K., and BWA and FIS in Ireland, and examines whether they can be transplanted to continental Europe. Steiner and Wrohlich (2004) analyze the work incentives and labor supply effects of the German Mini-Jobs reform.

are charged for further children. The ceiling is set fairly low – in 2003, incomes exceeding SEK 38,000 (EUR 4,000) per month were excluded from the fee base. As a result most families paid the maximum amount SEK 1,140 (EUR 120) per month for the first child in child care. Since many households reach the ceiling, they pay no extra fee if they work more. We show, however, that this improved incentive has rather modest, or even nonexisting, effects on labor supply for most categories of parents.

In Sweden, subsidized child care is provided by the municipalities.[2] Parental fees contribute to a small part of total child-care costs: 16 percent in 1999 (before the reform), and 10 percent in 2003 (after the reform). Remaining costs are covered by municipal subsidies and by conditional grants from the central government. These grants are part of the *max fee* reform. Since child care is a municipal matter the fee reform had to be accompanied by a grant scheme that made it possible for a general reduction of child-care fees. The *max fee* is voluntary to the municipalities, but all municipalities have nevertheless adhered to the reform. However, the general implementation of the *max fee* reform does not imply that all municipalities have identical fee structures. The *max fee* does only define the upper limit of the fees. Variations in fee design still exist, but are now considerably smaller and within the scope of the *max fee* reform.

The *max fee* has undoubtedly improved the financial situation for most families with pre-school children. The reason is twofold: First and foremost, child-care fees have in general been decreased. In 1999 the average monthly fee for an average income family with two children was SEK 2,800 (EUR 294). The *max fee* for this family was in 2003 SEK 1,900 (EUR 200) – a reduction by 32 percent.

Second, the marginal fee – the fee increase of an additional hour of child care – has drastically decreased for most families. As many as 98 percent of the municipalities had time-based fees and 90 percent had income-based fees in 1999. In 2002, after the implementation of the *max fee*, only 42 percent of municipalities apply time-based fees to some extent.

Since the *max fee* has decreased marginal child-care fees, incentives for market work have been strengthened. The reform's effect on labor supply has been analyzed in two previous studies, Flood and Wahlberg (1999) and Mörk et al. (2006). Their

[2]Also private child care givers are subsidized by municipalities if they meet certain requirements and are therefore also affected by the *max fee* reform.

results suggest rather modest effects on labor supply from the *max fee* reform.

In this paper, we take a different approach and focus on welfare effects. By simulations, we compare the effects of the *max fee* reform to those of a possible policy alternative: increased child benefits. The question we ask is whether the *max fee* in comparison to increased child benefits performs better in terms of social welfare. Net public costs are the same for both hypothetical reforms and the same group of households is targeted: families with children aged 1–5. There are two differences between these reforms: all families and not only those utilizing child care are entitled to the increased child benefits, and the size of the benefit is independent of labor market activity.

The Swedish child benefit is a universal non-taxable benefit dating back to 1948, then introduced to encourage childbirth. It is paid to all mothers with children aged 16 and below, irrespective of the parents' labor market status and income. Between 2001 and September 2005 the amount was SEK 950 (EUR 100) per month and child, and there was a supplementary child benefit from the third child on.

We analyze the two alternative reforms and their effects on equity and efficiency. By simulations we predict labor supply responses to the two reforms. The simulations are based on parameters obtained from the estimations of two discrete structural labor supply models, one for single-mother households and one for two-parent households. The estimations are made using individual pre-reform data, containing detailed information about wage rates, incomes, family structure, and a number of background variables. These data are further combined with a micro simulation model, which includes all rules for taxes, transfers and fees in all Swedish municipalities.

The welfare effects of the two reforms are calculated in terms of equivalent variation, and are based on simulated effects on labor supply and disposable income following from the two reforms. It turns out that the unweighed sum of all households' welfare gains (in terms of equivalent variation) is larger for the *max fee* reform than for the increased child benefit. On the other hand, the *max fee* also implies a higher Gini coefficient than the alternative reform. Taking distributional effects into account, we adopt a welfare analysis allowing for different weights for equality. Which reform to prefer depends on the social welfare function's relative weight given to equality.

A general increase of child benefits would result in a more equally distributed

disposable income than the *max fee* reform. There are two reasons for this. First, also families with children not using subsidized child care receive child benefit. This group of families is characterized by low income and low labor market activity – families who cannot reap the benefits from the *max fee*. Second, pre-reform child-care fees were to a greater extent than the *max fee* based on parental income. High-income families are accordingly the ones gaining the most from the low ceiling of the *max fee*. The families with the lowest incomes were already before the reform charged with very low fees and do therefore not gain very much from a fee reduction.

The rest of the paper is organized as follows: Section 2 specifies the econometric model and Section 3 describes the data. The simulation approach is presented and discussed in Section 4. Sections 5 and 6 present the simulated effects on labor supply and disposable income from the two alternative reforms. Section 7 compares the results and discusses the welfare effects. Section 8 concludes the paper.

# 2 The model

The effects on labor supply and income distribution are obtained by simulating a structural labor supply model. Such a model mimics the actual process of choice by checking the alternative with the highest utility.[3] The benefits of this approach are notable: the resulting models are fully structural and specify a flexible direct utility function to describe the preferences of single individuals or married couples. Moreover, they allow for any type of complexity in the choice set, including quantity constraints and piecewise linearity of the budget constraints. This kind of model is therefore a very useful tool in the evaluation of economic and social policies that affect households' behavior and welfare through complex modifications of households' choice sets.

Hence, we follow the approach of van Soest (1995) and discretize the choice set of working hours. The discrete choice model allows us to let agents make their choice from a set of discrete participation-hours alternatives.[4]

We consider two kinds of families – lone-parent households and two-parent households. In the latter we assume that spouses maximize a joint utility function and

[3]van Soest (1995), Aaberge et al. (1995), and Aaberge et al. (1999) are previous labor supply applications.

[4]Flood and Islam (2005) show that a discrete choice model produces results similar to those obtained from a continuous model.

jointly determine their labor supply $h_m$ and $h_f$.[5] Following van Soest (1995) we adopt the translog utility function, which is assumed to increase in disposable income, and to decrease in hours of work.

$$U(\Gamma) = \Gamma_1' A \Gamma_1 + b' \Gamma_2, \tag{1}$$

where $\Gamma_1 = \{\log y, \log(T - h_m), \log(T - h_f)\}$ is a vector of the logarithm of household disposable income ($y$) and the logarithms of both spouses' leisure.
$\Gamma_2 = \{\log y, \log(T - h_m), \log(T - h_f), \sigma\}$ also includes the binary variable $\sigma$, which takes the value one if the household is a social assistance recipient, and zero otherwise. By including $\sigma$ we follow e.g. Hoynes (1996), Keane and Moffit (1998) and Flood et al. (2004) and allow for possible nonparticipation among eligible households. $T$ is the total amount of time available to each individual (equal to 4,000 hours per year). $A$ is a symmetric $3 \times 3$ matrix with elements $\alpha_{ij}, i, j = 1, 2, 3$, comprising the estimable coefficients to the quadratic and cross-terms in the utility function. (We do not include any quadratic or cross-terms associated with receiving welfare.) $b$ with elements $\beta_i$, $i = 1, 2, 3, 4$, is the $1 \times 4$ vector of the estimable coefficients to the linear terms in the utility function. In order to specify the nature of heterogeneity in household preferences for leisure and for receiving social assistance we further model three of the coefficients as functions of observed and unobserved characteristics:

$$\beta_i = \sum_k \beta_{ik} x_k + \theta_i, \quad i = 2, 3, 4. \tag{2}$$

The vector $x$ contains $k$ observed family characteristics, such as age and number of children, education of spouses, and area of residence.[6] The vector $\theta$ represents unobserved family characteristics that affect household preferences for leisure and welfare participation. We formulate a finite mixture model, which allows for unobserved heterogeneity in a very flexible way, without imposing a parametric structure. We assume that there exist $N = 4$ different sets of $\{\theta_2, \theta_3, \theta_4\}$ that determine a household's preferences, each observed with probability $\pi_n$ (where $\pi_n > 0$ and $\sum \pi_n = 1, n = 1, 2, 3, 4$).

[5] The procedure fore lone mothers is analogous, but with only one labor supply variable.
[6] The summary statistics are presented in Tables 9 and10.

For any possible combination of labor supply, the household obtains a certain disposable income level (net of child-care fees). It is composed of post-tax labor income, received benefits and other non-labor income, minus child-care fees:

$$\begin{aligned} y =& w_m h_m + w_f h_f - \tau_m (w_m h_m) - \tau_f (w_f h_f) + \mu (w_m h_m + w_f h_f) \\ & - \varphi (min [h_m, h_f], (w_m h_m + w_f h_f)) + v, \end{aligned} \tag{3}$$

where $w_m$ and $w_f$ denote the spouses' gross wage rates. Labor income taxes, $\tau$ are individual, while means-tested benefits are determined by household income. $\mu$ consists of means-tested, as well as of universal benefits, such as child benefit. If both parents work they use subsidized child care. The child-care fee, $\varphi$, is determined by household labor income and time spent in child care. $v$ is non-labor, non-benefit income.

Each individual can choose between $M$ labor supply alternatives, implying a total number of $M^2$ choice opportunities for a two-parent household. We assume that $M = 5$, implying 25 possible work combinations for a couple.[7] By including disutility from welfare, a two-parent family may face up to $2M^2 = 50$ work and welfare possibilities, each yielding utility

$$U_{l\sigma} = U (\Gamma_{l\sigma}) + \eta_{l\sigma}, \tag{4}$$

where $U (\Gamma_{l\sigma})$, defined in Equation (1), is the deterministic part of the utility associated with labor supply alternative $l$, $l = 1, ..., M^2$, and welfare participation ($\sigma = 1$) or not ($\sigma = 0$). $\eta_{l\sigma}$ is a random term where subscripts denote the labor supply choice $l$ and whether or not the household is a welfare recipient. The error term $\eta$ can be interpreted as an optimization error; thus it has a different interpretation compared to the $\theta's$ introduced in (2), which represent unobserved preferences for leisure and for welfare participation.

The household chooses combination $l = \lambda$ if the utility from $\lambda$ exceeds the utility of any other obtainable combinations, i.e. if

$$U (\Gamma_\lambda) - U (\Gamma_{l\sigma}) > \eta_{l\sigma} - \eta_\lambda \; \forall \; l\sigma \neq \lambda. \tag{5}$$

[7] We set $h_1 = 0$, $h_2 = 750$, $h_3 = 1,500$, $h_4 = 2,250$ and $h_5 = 3000$ hours per year.

We assume that $\eta_{l\sigma}$ follows a type $I$ extreme-value distribution $\forall\ l\sigma$. This assumption is most useful, since it entails the property that the cumulative density of any $\eta_{l\sigma} - \eta_{\lambda}$ is given by the logistic function.

The estimated variables for the structural models are presented in Table 11 in the Appendix.

# 3 Data

The data used for this study come from the Swedish Income distribution Survey (HEK) and from the Swedish Longitudinal Individual Data (LINDA). We use HEK to construct the data for two-parent households, and LINDA for lone-mother households.[8] Our sample includes households that have one to five children, where the youngest child is 1–5 years old. We exclude families where one or both parents were either full-time students, retired or self-employed. After these selections we end up with a sample of 1,209 lone-mother households and 733 two-parent households.

HEK is an annual survey conducted by Statistics Sweden. It contains information on labor market activities, demographic characteristics and incomes for a random sample of 20,000 Swedish households. The survey is a cross-sectional representative of the Swedish population.

LINDA is completely based on register-information, and thus provides high-quality income data. It is a random sample and consists of approximately 300,000 individuals (about 3% of the Swedish population).

The wage data in HEK and LINDA was collected from *The Official Statistics on Wages* produced by Statistics Sweden, and is based on employers' reports of individual wages. These data have the advantage over the usual self-reported wage data of being free from measurement error. We use these data to estimate the wage equations. To account for missing wages among non-workers, log wage equations are estimated accounting for potential sample selection bias. In order to be consistent regarding the stochastic specification, the wage equation estimates are used to predict wages for both workers and non-workers.

The total income of a household consists of both earned and unearned income. Unearned income includes any capital gains, the national child benefit, and child-support payments.

[8] Lone-father households are extremely rare, so we exclude them.

To generate disposable income for various combinations of hours of work, we use precise information on income tax rules, as well as on eligibility rules for a number of welfare programs, such as social assistance and housing allowance. We use the FASIT model from Statistics Sweden, which is a micro simulation model that includes all rules for taxes, transfer and fees in all Swedish municipalities. Moreover, it is linked to the HEK data set initially, but we have made appropriate links to LINDA as well. This enables us to calculate the child-care costs and disposable incomes for all parents. We have no direct information about child-care utilization. For lone mothers we therefore assume that working hours coincide with use of child care, and for couples that time in child care is equal to the working hours of the parent who works the least.

A household is defined as a social assistance recipient if it received some assistance for at least one month during the year.

We use data from the 1999 survey of HEK and the 1999 wave of LINDA. The reason for choosing this year is that the *max fee* was not yet implemented. We therefore use the behavior of parents in the old child-care fee system to predict their responses to the *max fee* reform. The reason for using different data sets for different types of households is that HEK is a smaller data set and does therefore not include a sufficient number of lone mothers whose youngest child is aged 1–5 years. In LINDA, on the other hand, there is wage information for the sampled person only; hence we have no wage information for spouses in that data set. Since LINDA is register based, we treat as lone-mothers those mothers who are not married and who are not cohabiting with the father of their children. We might therefore have women in our lone-mother sample who are actually cohabiting with someone else than the children's father, and the results for this group may be understated.

The variables that determine observed heterogeneity in distaste for work and welfare are age, education, a dummy variable for youngest child being 1 years old, a dummy variable for youngest child being 2 years old, a dummy variable indicating if the individual was born in Sweden, a dummy variable that equals one if the household resides in the largest cities in Sweden (Stockholm).

Descriptive statistics for the two samples used in this study are presented in the Appendix. Of the total 1,209 lone-mother households, 29 percent received social assistance, while 6 percent of the 733 two-parent families received social assistance during 1999. Lone mothers are more likely to be younger, immigrants, to have low

education, lower labor force participation, to work less and to have lower wages than married and cohabiting mothers. In the two-parent households, men have higher labor force participation, work more, and have higher wages than women.

# 4 The Approach

We estimate the two discrete structural labor supply models in Section 2, one for couples and one for lone mothers. The estimated parameters of the models are used to predict pre-reform labor supply and disposable income, and are presented in Table 11 in the Appendix. In Table 12 the predicted uncompensated wage elasticities are presented. We find that labor supply is rather inelastic, and for men the result is quite similar to findings in other studies. For women, both single and married, we predict lower elasticities than those found in other studies.[9]

The estimated utility functions are then used for simulations of the *max fee* reform by applying the *max fee* to all municipalities. The simulations thus provide us with post-reform labor supply and disposable income, which we compare to the pre-reform ones.

The *max fee* reform has financial consequences for the public sector. There is a direct cost of decreased child-care fees, but there are also indirect effects caused by altered labor supply and disposable income. These effects include tax revenues (labor income taxes, payroll taxes, and VAT), child-care costs (when child-care utilization changes), and expenses for housing allowance and social assistance. We take all these effects into account by using weights to aggregate the simulation results from our samples to hold for the total populations of two-parent and lone-mother households with their youngest child aged 1–5. This enables the calculation of the aggregate net cost of the *max fee* reform to the Swedish public sector.

We compare the effects of the *max fee* reform with an alternative reform, a reform with an income effect only. Therefore, we next calculate the child-benefit increase that gives the same budgetary implications as the *max fee* reform. The aggregate net cost of the *max fee* reform gives a rough indication of the amount by which the child benefit could be increased. However, also this reform have indirect effects on

[9]We think of two different explanations for this. When we have a discrete choice, a tiny increase in preferred labor supply may result in no change at all because of the discrete choice. Our sample of women consists of a very specific group, namely mothers with pre-school children. Their labor supply is likely to be less elastic than other women's.

public sector finances. We simulate the effects of increased child benefits, analogous to the simulations of the *max fee* reform. By fine-tuning the size of the child benefit, we find an increase that yields approximately the same aggregate net cost.

The two reforms have different effects on labor supply and disposable income, thereby affecting household utility differently, although both reforms make all households better off.[10] As a means of comparison, we use equivalent variation ($EV$), a monetary value of the total utility change from each reform, defined as

$$U\left(h_0, c_0 + EV\right) = U\left(h_1, c_1\right), \tag{6}$$

where $h_0$, $c_0$ represent pre-reform labor supply and consumption, and $h_1$, $c_1$ represent the post-reform ditto. $EV$ is thus the pre-reform amount of money that has to be given to the household in order to bring it to the same utility level as after the reform. We can then compare $EV$ from the two reform to conclude which reform that yields the highest utility for a specific household.

If one of the reforms yields higher utility to all households than the other reform, the former Pareto dominates the latter. However, if one reform is preferred by some households and the other reform is preferred by others, then the reform yielding the highest aggregate $EV$ ($\sum EV$) is dominant according to the Potential Pareto criterion; if the dominant reform is implemented, the households preferring that reform could compensate the households preferring the dominated reform.

When we compare aggregate $EV$, we regard one additional krona in a poor household equivalent to one additional krona in a rich household, which strongly can be questioned. A poor household has higher marginal utility of the extra income than a rich household. Many authors have argued that instead of comparing aggregate monetary effects of reforms the weighted sums should be compared, where the weights are given by the social marginal utility of income (see e.g. Christiansen and Jansen (1978) and Johansson-Stenman (2005)). This means that also a utilitarian social planner should weight the $EV$s of different households differently, depending on the households' marginal utility of income.

Following e.g. Christiansen and Jansen (1978) we attach to household $j$ the weight $\omega_j = y_j^{-\varepsilon}$, where $\varepsilon$ reflects the inequality aversion in society and $y_j$ is the household income adjusted by household composition according to an appropriate

[10] At least weakly better off. Households who do not utilize child care neither before nor after the *max fee* reform get no utility change from that reform.

equivalence scale. Hence, the social value of household $j$'s $EV$ is

$$EV_j^{\text{social}} = \omega_j EV_j = y_j^{-\varepsilon} EV_j \tag{7}$$

where a poorer household is given a stronger weight than a richer household. How much stronger depends on the inequality aversion parameter $\varepsilon$. $\varepsilon = 0$ implies that only efficiency matters (equivalent to our previous sum of $EV$). The higher the value of $\varepsilon$, the stronger is inequality aversion in society. Keeping these figures in mind, we make welfare comparisons of the two reforms for different strength of inequality aversion (different values of $\varepsilon$). We compare the sums of weighted $EV$s for both reforms, where

$$\sum_j EV_j^{\text{social}} = \sum_j y_j^{-\varepsilon} EV_j \tag{8}$$

The reform for which this sum is greatest is regarded as the preferred reform from a social welfare perspective given a certain value of $\varepsilon$.

The welfare analysis is concluded by a discussion about the two alternative reforms' effects on equity and efficiency.

# 5 Results of the *max fee* reform

In this section we present the simulation results of the *max fee* reform. We first estimate a discrete structural labor supply model, as described in Section 2, to get the pre-reform benchmark. When doing so, we apply the pre-reform child-care fee structures that were valid in each municipality. The estimated parameters are presented in Table 11 in the Appendix.

In our simulation we then apply the *max fee* to all municipalities. How different families would react to such a change is shown in Tables 1 and 2 where both lone-mother and two-parent households are categorized according to their income.

According to the simulation results in Tables 1 and 2 there are no strong reactions in labor supply after the reform. Lone mothers in the lower quartile are the exception as they increase their labor supply by 6.6 %. The other categories increase labor supply negligibly and married high-income women even decrease it. Married and cohabiting mothers in the lower half of the income distribution are the ones whose

Table 1: Simulation results for the *max fee* reform. Lone-mother households

| | Average | Lower quartile | Median | Upper quartile |
|---|---|---|---|---|
| Working hours before reform (per year) | 990 | 243 | 457 | 1,808 |
| Working hours after reform (per year) | 999 | 259 | 474 | 1,808 |
| | | | | |
| Disposable income before reform (SEK per year) | 125,100 | 74,430 | 94,659 | 173,884 |
| Disposable income after reform (SEK per year) | 129,467 | 76,367 | 97,523 | 180,967 |
| | | | | |
| Equivalent variation (SEK per year) | 4,192 | 1,515 | 2,548 | 7,083 |
| Equivalent variation (% of pre-reform disposable income) | 3.4 | 2.0 | 2.7 | 4.1 |

Table 2: Simulation results for the *max fee* reform. Two-parent households

| | Average | Lower quartile | Median | Upper quartile |
|---|---|---|---|---|
| Husband's working hours before reform (per year) | 1,825 | 1,375 | 1,624 | 2,055 |
| Husband's working hours after reform (per year) | 1,825 | 1,379 | 1,624 | 2,059 |
| | | | | |
| Wife's working hours before reform (per year) | 1,392 | 580 | 1,061 | 1,748 |
| Wife's working hours after reform (per year) | 1,404 | 607 | 1,083 | 1,736 |
| | | | | |
| Disposable income before reform (SEK per year) | 342,477 | 211,652 | 253,400 | 519,351 |
| Disposable income after reform (SEK per year) | 353,056 | 216,975 | 262,085 | 531,392 |
| | | | | |
| Equivalent variation (SEK per year) | 10,497 | 4,296 | 8,505 | 11,380 |
| Equivalent variation (% of pre-reform disposable income) | 3.1 | 2.0 | 3.4 | 2.2 |

effect on labor-force participation is the strongest; about 3 % of these mothers enter the labor market as a consequence of the *max fee* reform.[11] Due to decreased child-care fees, all families have received higher disposable income, and because of the former fee structure high-income families gained more from the reform than low-income families. This is true also for the gain in utility terms, which is measured in terms of equivalent variation.[12]

[11]These findings are also consistent with those of Mörk et al. (2006). They find relatively small effects on labor supply from the *max fee*. The changes they find are among mothers who actually start to work as a consequence of the lower child-care fee.

[12]One could of course think that the relative changes in labor supply also give rise to changes in relative wages. Since labor supply is mostly stimulated among low income women, this could imply excess supply of unskilled labor, which in turn implies unemployment or decreased wages for

Table 3: Aggregate public sector revenues and expenditures before and after the *max fee* reform (million SEK)

| | Before | After |
|---|---|---|
| **Revenues** | | |
| Income tax | 24,492 | 24,532 |
| Payroll tax | 20,853 | 20,926 |
| VAT | 9,408 | 9,707 |
| Child-care fees | 3,996 | 2,223 |
| | | |
| **Expenditures** | | |
| Housing allowance | 712 | 702 |
| Social assistance | 458 | 414 |
| Child-care costs | 18,144 | 18,165 |
| Revenues – expenditures | 36,740 | 35,398 |
| | | |
| Aggregate net cost of the *max fee* reform | 1,342 | |
| Aggregate equivalent variation | 1,880 | |

*Note*: The payroll tax is 33.06% of the wage rate net of payroll taxes; for the VAT we applied a rate of 17.6% on 90 % of disposable income, see Government Proposition 2002/03:1, p. 137.

The results of the calculations of the aggregate costs for the public sector, taking into account all aspects, including indirect effects, are presented in Table 3. When the *max fee* is introduced revenues decrease radically due to decreased child-care fees simultaneously with a small increase in costs to provide child care due to slightly increased labor supply. However, the increased income also implies increased tax revenues, both directly and indirectly through increased consumption. The *max fee* reform would not imply very much higher child-care costs to the public sector. The reason for this is that the effects on labor supply are modest and that we assume that child care is only utilized during working hours. There are indications, however, that the *max fee* would imply that child care to a larger extent is also utilized during leisure hours, (see Brink and Nordblom (2005)). This would mean that our simulated net costs are underestimated.

Less people also need social assistance and housing allowances after the reform, leaving the public sector with a net cost of the *max fee* reform of SEK 1,342 millions.

this category of workers. Then the welfare gain would be less for low income earners than those we have calculated.

# 6 Results of the child benefit reform

When we choose how much to increase the child benefit, we want an increase that has the same net aggregate cost as the *max fee* reform, i.e. we simulate changes and compare all direct and indirect effects. The net aggregate cost for the *max fee* reform is SEK 1,342 millions. If the child benefit would increase by SEK 5,000 per year and child aged 1–5 years the net cost would be SEK 1,355 millions, which can be seen from Table 6. This is approximately the same cost, and we simulate the responses to such a reform. The results for lone mothers and for two-parent households are presented in Table 4 and 5 respectively.

Table 4: Simulation results for the child benefit reform. Lone-mother households

| | Average | Lower quartile | Median | Upper quartile |
|---|---|---|---|---|
| Working hours before reform (per year) | 990 | 243 | 460 | 1,808 |
| Working hours after reform (per year) | 970 | 240 | 454 | 1,750 |
| | | | | |
| Disposable income before reform (SEK per year) | 125,100 | 74,430 | 94,659 | 173,884 |
| Disposable income after reform (SEK per year) | 130,856 | 79,316 | 99,685 | 180,255 |
| | | | | |
| Equivalent variation (SEK per year) | 6,188 | 4,905 | 5,071 | 7,818 |
| Equivalent variation (% of pre-reform disposable income) | 4.9 | 6.6 | 5.4 | 4.5 |

Table 4 shows that all quartiles of lone mothers decrease their labor supply, i.e. the income effect is strong enough to actually affect their behavior. Lone mothers in all quartiles are better off after this reform than after the *max fee* reform.

The increase in child benefit is not sufficiently large to affect two-parent households' labor supply. For most two-parent households this reform is less favorable than the *max fee* reform. Only those in the lowest quartile would actually be better off after the increased child benefit than after the *max fee*.

# 7 Comparing the reforms

The effects on labor supply from the *max fee* are not very strong, but a majority of parents actually increase their labor supply, at least to some extent. Women,

Table 5: Simulation results for the child benefit reform. Two-parent households

| | Average | Lower quartile | Median | Upper quartile |
|---|---|---|---|---|
| Husband's working hours before reform (per year) | 1,825 | 1,375 | 1,624 | 2,055 |
| Husband's working hours after reform (per year) | 1,825 | 1,375 | 1,624 | 2,055 |
| | | | | |
| Wife's working hours before reform (per year) | 1,392 | 580 | 1,061 | 1,748 |
| Wife's working hours after reform (per year) | 1,392 | 580 | 1,061 | 1,748 |
| | | | | |
| Disposable income before reform (SEK per year) | 342,477 | 211,625 | 253,400 | 519,351 |
| Disposable income after reform (SEK per year) | 348,679 | 217,854 | 259,657 | 525,362 |
| | | | | |
| Equivalent variation (SEK per year) | 6,202 | 6,202 | 6,257 | 6,011 |
| Equivalent variation (% of pre-reform disposable income) | 1.8 | 2.9 | 2.6 | 1.2 |

Table 6: Aggregate public sector revenues and expenditures before and after the child benefit reform (million SEK)

| | Before | After |
|---|---|---|
| **Revenues** | | |
| Income tax | 24,492 | 24,468 |
| Payroll tax | 20,853 | 20,833 |
| VAT | 9,408 | 9,599 |
| Child-care fees | 3,996 | 3,917 |
| | | |
| **Expenditures** | | |
| Housing allowance | 712 | 718 |
| Social assistance | 458 | 408 |
| Child-care costs | 18,144 | 18,137 |
| Child benefits | 2,695 | 4,189 |
| | | |
| Revenues – expenditures | 36,740 | 35,385 |
| | | |
| Aggregate net cost of increased child benefit | 1,355 | |
| Aggregate equivalent variation | 1,228 | |

*Note*: The payroll tax is 33.06% of the wage rate net of payroll taxes; for the VAT we applied a rate of 17.6% on 90 % of disposable income, see Government Proposition 2002/03:1, p. 137.

especially in the lower part of the income distribution, increase their labor supply due to the improved incentive effects of the *max fee* reform. However, the magnitude is very low, less than one percent for both single and married/cohabiting women.

An increased child benefit reverses the result. In absence of a substitution effect, the income effect is strong enough to make single mothers decrease their labor supply, while the labor supply of couples remain unchanged. The single mothers would, on average, reduce their labor supply by 3%. The *max fee* reform is therefore superior if the goal is increased labor supply among parents.

However, the motive for implementing the *max fee* reform was not only to increase labor supply, the reform was also meant to improve the economic well-being for families with children. When we evaluate economic well-being, we do that in terms of the equivalent variation, $EV$, which is the monetary value of the utility gain from the reform, taking into account the effects on both leisure and consumption. The aggregate utility gain for all Swedish households with children aged 1–5 years is obtained from Tables 3 and 6. $\sum EV$ for the *max fee* is 1,880, while $\sum EV$ for increased child benefit is 1,228. When we only make this rough comparison, without any distributional concern, we can conclude that the *max fee* increased utility more than the alternative reform would have done according to the Potential Pareto criterion.

What about distributional effects? We saw that couples gained more from the *max fee* reform than did lone mothers and high-income households gained more than low-income households. For the child-benefit reform the result was the opposite. In Table 7 we present the Gini coefficients and the 90/10 measure for the disposable income of households with children aged 1–5 years before and after the two reforms. The figures are equivalence scale corrected.

Table 7: Distributional effects for Swedish households with children aged 1 – 5 years

| | Before reform | *Max fee* reform | Child benefit reform |
|---|---|---|---|
| Gini coefficient | 0.30 | 0.30 | 0.29 |
| P90/P10 | 3.56 | 3.64 | 3.43 |

We note that the *max fee* reform has actually increased the P90/P10, implying that the reform has enlarged the gap between high- and low-income families with young children. The increased child benefit would on the contrary increase equality in disposable income. Hence, the reform which would be the preferred one from an efficiency point of view is inferior if we instead judge the reforms from an equity point of view.

From a social perspective increased inequality in society is regarded as undesirable, and should be taken into account when analyzing social welfare. We therefore weight each household's $EV$ by a social weight $y_j^{-\varepsilon}$, where $y_j$ is the adjusted household income and $\varepsilon$ is society's inequality aversion. Hence,

$$\sum_i EV_j^{\text{social}} = \sum_j y_j^{-\varepsilon} EV_j. \tag{9}$$

Our benchmark where we just add all the $EV$'s is the case where $\varepsilon = 0$ and it ranks the *max fee* reform higher than the child benefit reform. Next we account for distributional effects and assume that $\varepsilon > 0$. The larger the value of $\varepsilon$, the more concerned one is about inequality. If $\varepsilon = 0$, the only concern is with efficiency and $\varepsilon = \infty$ corresponds to a Rawlsian notion, where only the utility change of the least well off household matters. There have been attempts to estimate plausible values of $\varepsilon$. Christiansen and Jansen (1978) found from Norwegian indirect taxation that the value was about 0.87 (or in some specifications 1.7). More recently, Johansson-Stenman et al. (2002) estimated the median value to be somewhere between 2 and 3 when Swedish students stated their preferences for equality in society.

We calculate $\sum_j EV_j^{\text{social}}$ for the two reforms for different values of $\varepsilon$, including the values 0, 1 and 2. The results for the preferred reform depending on the degree of inequality aversion are reported in Table 8.

Table 8: The preferred reform for different values of $\varepsilon$

| $\varepsilon$ | Preferred reform |
|---|---|
| 0 | *Max fee* reform |
| 1 | *Max fee* reform |
| **1.22** | **Equivalent** |
| 2 | Child benefit reform |

We observe that the degree of inequality aversion is decisive for which reform gives the highest social welfare. For low values of $\varepsilon$, the *max fee* is preferred, but for the not unreasonably high value $\varepsilon = 2$ the increased child benefit is preferred.

Next we calculate a threshold value of $\varepsilon$ to see at what set of distributional weights the two reforms would be equivalent from a social point of view. This value turns out to be $\varepsilon = 1.22$, which is robust to different equivalence scales. Hence, for

values of $\varepsilon < 1.22$ the *max fee* would be the preferred reform and for higher degrees of inequality aversion the child-benefit reform would be preferred.

# 8 Conclusions

The *max fee* reform increased the wellbeing of most families with young children. According to our simulations, two-parent and high-income households were those gaining the most, and income inequality among families with young children actually increased as a consequence of the reform. Lone mothers and low income households gained less from the reform. The *max fee* implied lower indirect costs of increased labor supply. This made many people increase their labor supply (to a rather small extent, though) and as a consequence the public sector got somewhat larger tax revenues, which reduced the net cost of the reform.

The alternative reform studied, the increased child benefit, would have the opposite effect on labor supply of lone mothers. They would decrease their labor supply and couples would not alter their labor supply at all. This means that the child-benefit increase with approximately the same net aggregate cost as the *max fee* reform would imply a less generous total transfer, since tax revenues would rather decrease than increase as a consequence. When comparing the aggregate of $EV$ we find that the unweighed welfare effect from the *max fee* reform would exceed that of the increased child benefit. Hence, with regard to efficiency only, the *max fee* would be the preferred reform. However, those who gained the least from a reduced child-care fee, those who did not utilize subsidized child care or who already paid very low fees due to their low income, would gain more from the child-benefit reform. Income inequality would actually increase with the *max fee* reform. With the child-benefit reform, on the other hand, disposable income would instead be more equally distributed among the families. From an equity point of view, increased child benefits would therefore be preferred.

In a social welfare function one takes both efficiency and equity into account, and we have compared welfare effects for different values of inequality aversion. We find that if inequality aversion $\varepsilon \leq 1.22$ then the *max fee* would actually be preferable from a social welfare point of view. With higher weight on the equity aspect, increased child benefits would instead increase social welfare more. There is no empirical consensus about what the value of $\varepsilon$ really should be, and we cannot say

from our result that one reform or the other should be preferred when considering equity to a reasonable extent. Is $\varepsilon \leq 1.22$ a realistic figure for the Swedish Social Democratic government who is concerned with distributional effects? Lambert et al. (2003) have estimated the inequality aversion for several countries and conclude that Sweden have rather strong inequality aversion compared to other countries. A value of $\varepsilon > 2$ would be considered as reasonable. Also Johansson-Stenman et al. (2002) who estimate $\varepsilon$ to be between 2 and 3 also suggest that 1.22 is probably too low for a Swedish context. Sweden has a high tax-to-GDP ratio and very strong redistribution within the public sector. This would also argue in favor of a relatively high inequality aversion, and a value of $\varepsilon$ higher than 1.22.

On the other hand, one of the main reasons for implementing the *max fee* was to promote labor supply. If increased female labor supply has a value in itself, the *max fee* reform could still be well-founded in spite of the adverse effects on income distribution.

# References


R. Aaberge, J. Dagsvik, and S. Strøm. Labor supply responses and welfare effects of tax reforms. *Scandinavian Journal of Economics*, 97: 635–659, 1995.

R. Aaberge, U. Colombino, and S. Strøm. Labor supply in Italy: An empirical analysis of joint household decisions, with taxes and quantity constraints. *Journal of Applied Econometrics*, 14: 403–422, 1999.

R. M. Blank. Evaluating welfare reform in the United States. *Journal of Economic Literature*, XL(4): 1105–1166, 2002.

R. Blundell. Work incentives and 'in-work' benefit reforms: A review. *Oxford Review of Economic Policy*, 16:1: 27–44, 2000.

A. Brink and K. Nordblom. Child-care quality and fee structure: Effects on labor supply and leisure composition. Working Paper 157, Göteborg University, 2005.

V. Christiansen and E. S. Jansen. Implicit social preferences in the Norwegian system of indirect taxation. *Journal of Public Economics*, 10: 217–245, 1978.

L. Flood and N. Islam. A Monte Carlo evaluation of discrete choice labour supply models. *Applied Economics Letters*, 12: 263–266, 2005.

L. Flood and R. Wahlberg. Maxtaxa i barnomsorgen – en analys av effekter på hushållens arbetsutbud, inkomster och efterfrågan på barnomsorg. (Flat fee in child care – an analysis of the effects on household labour supply, incomes and demand for child care.) Svenska Kommunförbundet, 1999.

L. Flood, J. Hansen, and R. Wahlberg. Household labor supply and welfare participation in Sweden. *The Journal of Human Resources*, 39: 1008–1032, 2004.

H. Hoynes. Welfare transfers in two-parent families: Labor supply and welfare participation under AFDC–UP. *Econometrica*, 64: 295–332, 1996.

O. Johansson-Stenman. Distributional weights in cost-benefit analysis - should we forget about them? *Land Economics*, 81: 337–352, 2005.

O. Johansson-Stenman, F. Carlsson, and D. Daruvala. Measuring future grandparents' preferences equality and relative standing. *The Economic Journal*, 112: 362–383, 2002.

M. Keane and R. Moffit. A structural model of multiple welfare program participation and labor supply. *International Economic Review*, 39: 553–589, 1998.

P. J. Lambert, D. L. Millimet, and D. Slottje. Inequality aversion and the natural rate of subjective inequality. *Journal of Public Economics*, 87: 1061–1090, 2003.

R. Moffitt. Welfare programs and labor supply. NBER Working Paper 9168, 2002.

E. Mörk, L. Lindqvist, and D. Lundin. Påverkar maxtaxan inom barnomsorgen hur mycket föräldrar arbetar? (Does the *max fee* in childcare affect how much parents work?). IFAU Rapport 2006:2, March 2006.

W. Ochel. Financial incentives to work – Conceptions and results in Great Britain, Ireland and Canada. CESifo Working Paper 627, December 2001.

V. Steiner and K. Wrohlich. Work incentives and labor supply effects of the 'minijobs reform' in Germany. DIW Discussion Paper 438, DIW Berlin, September 2004.

A. van Soest. Structural models of family labor supply: A discrete choice approach. *Journal of Human Resources*, 30(1): 63–88, Winter 1995.

# A Appendix Sample statistics

Table 9: Sample averages for lone-mother households

| Variables | Mean |
|---|---|
| On welfare | 0.29 |
| | |
| Age | 32 |
| | (6) |
| *Education (highest)* | |
| Primary school | 0.33 |
| High school | 0.60 |
| University | 0.07 |
| | |
| Born in Sweden | 0.81 |
| | |
| Resides in Stockholm | 0.23 |
| | |
| Youngest child 1 year old | 0.11 |
| Youngest child 2 years old | 0.16 |
| | |
| Number of children 1–5 years old | 1.14 |
| | (0.35) |
| Working before reform | 0.72 |
| Working hours per year | 950 |
| | (804) |
| Wage per hour (SEK) | 82 |
| | (13) |
| | |
| Number of observations | 1,209 |

Standard deviations within parenthesis

Table 10: Sample averages for two-parent households

| Variables | Husband Mean | Wife Mean |
|---|---|---|
| On welfare | 0.06 | |
| Age | 36 | 33 |
| | (6) | (5) |
| *Education (highest)* | | |
| Primary school | 0.13 | 0.10 |
| High school | 0.70 | 0.71 |
| University | 0.17 | 0.19 |
| Born in Sweden | 0.88 | 0.88 |
| Reside in Stockholm | 0.18 | |
| Youngest child 1 year old | 0.29 | |
| Youngest child 2 years old | 0.22 | |
| Number of children 1–5 years old | 1.60 | |
| | (0.52) | |
| Working before reform | 0.95 | 0.87 |
| Working hours per year | 1,983 | 1,396 |
| | (605) | (756) |
| Wage per hour (SEK) | 126 | 101 |
| | (22) | (13) |
| Number of observations | 733 | |

Standard errors within parenthesis

Table 11: Estimates of the structural labor supply model

| Variables | Two-parent households: Husband | | Two-parent households: Wife | | Lone-mother households | |
|---|---|---|---|---|---|---|
| *Leisure* | | | | | | |
| Child 1 year old | 0.45 | (0.78) | 1.44 | (0.59) | 6.02 | (0.67) |
| Child 2 years old | -0.33 | (0.83) | 0.99 | (0.61) | 0.80 | (0.34) |
| Reside in Stockholm | -0.46 | (0.80) | -0.81 | (0.60) | -0.66 | (0.30) |
| Born in Sweden | -1.60 | (1.38) | -0.82 | (0.71) | -1.91 | (0.41) |
| Primary school | -2.19 | (1.31) | 3.99 | (0.97) | 2.92 | (0.71) |
| High school | -1.90 | (1.01) | -0.48 | (0.62) | 0.83 | (0.65) |
| Age | -1.18 | (0.47) | -0.57 | (0.16) | -0.18 | (0.06) |
| $\text{Age}^2/100$ | 1.62 | (0.62) | 0.85 | (0.26) | 0.27 | (0.09) |
| *Being on welfare* | | | | | | |
| Child 1 year old* | 1.03 | (0.39) | | | 0.56 | (0.61) |
| Child 2 years old* | 0.41 | (0.57) | | | -1.22 | (0.80) |
| Reside in Stockholm* | 0.43 | (0.62) | | | 1.06 | (0.67) |
| Born in Sweden | 2.99 | (0.65) | 0.58 | (0.62) | 4.16 | (1.48) |
| Primary school | -0.03 | (0.96) | -1.75 | (1.04) | -2.71 | (1.14) |
| High school | -0.59 | (0.85) | -0.87 | (0.91) | 0.23 | (0.26) |
| Age | -0.09 | (0.35) | 0.18 | (0.51) | 2.05 | (0.94) |
| $\text{Age}^2/100$ | 0.17 | (0.47) | -0.22 | (0.75) | -2.83 | (1.34) |
| *Utility parameters* | | | | | | |
| $\beta_1{}^*$ | 11.70 | (2.56) | | | 12.76 | (4.16) |
| $\alpha_{11}{}^*$ | -1.49 | (0.28) | | | -2.76 | (0.97) |
| $\alpha_{22}{}^*$ | -16.46 | (1.59) | | | | |
| $\alpha_{33}{}^*$ | -9.46 | (0.86) | | | -3.13 | (0.96) |
| $\alpha_{12}{}^*$ | -2.10 | (0.55) | | | | |
| $\alpha_{13}{}^*$ | -1.39 | (0.54) | | | -0.98 | (0.83) |
| $\alpha_{23}{}^*$ | -4.38 | (1.13) | | | | |
| *Heterogeneity* | | | | | | |
| $\theta_{1L}$ | 52.98 | (10.65) | 32.01 | (1.54) | 69.15 | (14.51) |
| $\theta_{2L}$ | 55.50 | (10.65) | 48.35 | (1.67) | 17.87 | (3.24) |
| $\theta_{3L}$ | -19.80 | (0.06) | 24.50 | (2.16) | 15.09 | (3.11) |
| $\theta_{4L}$ | 85.54 | (11.77) | 45.74 | (2.55) | 12.76 | (3.00) |
| $\theta_{1W}{}^*$ | 0.88 | (6.90) | | | 5.54 | (2.43) |
| $\theta_{2W}{}^*$ | -0.55 | (6.83) | | | -41.84 | (18.31) |
| $\theta_{3W}{}^*$ | 19.74 | (0.06) | | | -36.93 | (16.55) |
| $\theta_{4W}{}^*$ | -2.05 | (6.89) | | | -29.23 | (14.00) |
| *Type probabilities* | | | | | | |
| $\pi_1$ | | 0.68 | | | | 0.10 |
| $\pi_2$ | | 0.16 | | | | 0.05 |
| $\pi_3$ | | 0.09 | | | | 0.39 |
| $\pi_4$ | | 0.07 | | | | 0.46 |
| Log likelihood | | -1,468.93 | | | | -2,079.21 |
| Number of observations | | 733 | | | | 1,209 |

Standard errors within parenthesis

*Only one estimate for the household.

Table 12: Uncompensated wage elasticities

| | Two-parent households | | Lone-mother households |
|---|---|---|---|
| | Husband | Wife | |
| *Labor force participation* | | | |
| Man's wage increases | 0 | 0 | |
| Woman's wage increases | 0 | 0.15 | 0.11 |
| *Hours worked* | | | |
| Man's wage increases | 0.07 | -0.01 | |
| Woman's wage increases | -0.01 | 0.10 | 0.18 |