The Case for Labour Supply Incentives: A Comparison of Family Policies in Australia and Norway*

by

Guyonne Kalb, Melbourne Institute of Applied Economic and Social Research, University of Melbourne

and

Thor O. Thoresen, Research Department, Statistics Norway

Abstract

Whereas many of the Australian family support schemes are income-tested transfers, targeted towards the lower end of the income distribution, the Norwegian approach is to provide subsidised non-parental care services for families and universal family payments. Using microsimulation models developed in Australia and Norway, we discuss the scope for introducing policy changes to encourage parents' labour supply within these two types of family transfer designs. High labour force participation rates of parents are desirable, for instance due to population ageing. The analysis highlights that the case for labour supply encouraging policy changes is restricted by the economic environment and the role that has been given to family policies in the two countries. Whereas there is considerable potential for increased labour supply of Australian mothers, improving labour supply incentives, for example through a move towards a Nordic style family policy design, may have detrimental distributional effects and is likely to be costly. The Norwegian situation is different: mothers already have high labour supply and any adverse distributional effects of further labour supply incentives occur in an economy with low initial income dispersion. However, the large amount of resources already used for family support in the Norwegian case, does not promote further initiatives towards this part of the population.

Keywords: family policy, female labour supply, microsimulation
JEL classification: D1, H24, H31, H53

* This paper was written when the second author visited the Department of Economics and the Melbourne Institute of Applied Economic and Social Research, the University of Melbourne. Both institutions are gratefully acknowledged for their hospitality. A previous version of this paper was presented at the Australian Labour Market Research Workshop, 8-9 February 2007, and we thank Prem Thapa for his comments on this earlier version.

1. Introduction

There is substantial variation among countries in how family support schemes are designed. The effects of the "in-work" benefit systems of the UK and the US, the Working Families' Tax Credit and the Earned Income Tax Credit, have received considerable attention, see e.g., Blundell *et al.* (2000), Brewer *et al.* (2006), Hotz and Scholz (2003), Eissa and Hoynes (2004). In this paper we focus on policy changes within two other types of support schemes: the Nordic model of subsidised non-parental care and universal family income support, and support schemes based on means-tested or income-tested transfers.

The Norwegian family transfer system is used as an example of the first type of family support scheme. Provision of low-fee centre-based care options for families with two working parents has been a key component of Norwegian family policy over several decades. Income-tested family support schemes and childcare subsidies are discussed with reference to the Australian family transfer programmes. The Australian system differs from the Working Families' Tax Credit and the Earned Income Tax Credit of the UK and the US, which also are income-tested transfers, in that qualification for the latter schedules requires parents' employment; thus they are "in-work" benefits. Therefore, in terms of the relationship between support schemes and parents' labour supply, Norwegian and Australian programmes represent two alternatives to the Working Families Tax Credit and the Earned Income Tax Credit, which are conditional on the parents' labour supply and household income. Norway has implemented a system which supports both parents to participate in market work, largely independent of household income, and Australia's system aims to help families with greater needs, unconditional on parents' labour supply.

The main purpose of this paper is to discuss effects of labour supply stimulating changes in the Australian and Norwegian support schemes. There is a growing awareness of the need for labour supply in a situation of population ageing where a large proportion of the population may be unavailable for work in the future. Through the use of microsimulation models, which have been developed independently for Australia and Norway (Kornstad and Thoresen, 2007; Doiron and Kalb, 2005; Kalb and Lee, 2007a), we describe the female labour supply effects, the distributional effects and costs to the government of changing transfer schemes to improve labour supply incentives. More specifically, we show the effects of two changes in the Norwegian and Australian systems: a move towards lower fees for care in childcare centres in Norway and Australia, and replacing the current income-tested Australian Family Tax Benefit by a universal schedule.

By focusing on results from policy changes in two different countries, we highlight that the scope for labour supply encouraging policy changes cannot be understood in isolation to the economic environment they are set to operate within. It is therefore important to situate the policies of interest in the economic and institutional frameworks of Norway and Australia. There are many similarities between Australia and Norway. Both countries are rich in natural resources and have managed to develop relatively ambitious welfare states along with upholding substantial economic growth. However, the objectives of family policies are fundamentally different in the two countries. Australian family policies are primarily designed to redistribute income between families through income testing of transfers, whereas the Norwegian approach is to facilitate both parents to participate in the labour market by providing subsidised childcare, more or less independent of household income. There are reasons to associate the vastly different labour supply of mothers in the two countries to this difference: a large proportion of Norwegian mothers participate in market work, whereas in Australia, mothers are much more inclined to work at home. Thus, the potential for increased labour supply of mothers is large in Australia. However, the benefit of changing family policies in order to provide better labour supply incentives must be balanced against increased government expenditure and adverse effects on the distribution of income. Thus, there is no

obvious conclusion that Australia should copy the "Nordic-style" of family policies; particularly given the fact that over the past two decades an increase in the labour supply of Australian mothers can be observed even without strong policy incentives. This is not to say that governments should not facilitate or even encourage this "natural" increase in labour force participation by supporting families who need to make additional costs to be in the labour force.

It is also important to note that in addition to effects on income distribution and labour supply incentives, family policies are concerned with other important issues, such as quality of care. Therefore, in Section 2, we first provide a brief introduction to economic motivations of family transfers. The remainder of the paper is organised as follows. In Section 3 we describe features of the Australian and Norwegian economies. This constitutes the background for the discussion of the policy changes aimed at encouraging labour supply and assists the interpretation of results. It includes descriptions of children-related transfer programmes, labour market participation rates and income distributions. The labour supply effects and distributional effects from the microsimulations of the proposed policy changes are presented and discussed in Section 4. The changes analysed here are lower fees for centre-based care in Norway and Australia and abolition of the income-testing feature of the Australian family support system. Section 5 concludes the paper.

2. The economics of transfers to families with children

From an economic point of view, family transfers can be justified by the argument that parents with pre-school children do not only face disincentives to work through direct taxation of their incomes, but must also take into consideration that market work for both parents implies additional expenditure in terms of childcare costs. It can then be shown that public provision of private services, such as childcare, can improve efficiency, because it alleviates the self-selection of high-income households making use of those services (Blomquist and Christiansen, 1995). In line with this, Håkonsen (2003) denotes specialisation gains in non-parental care, since the labour requirement per child is lower in centres compared to most families, and the efficiency gains by intervention through subsidised care come from the disincentives already created by the tax system. His calculations (for Norway) indicate that the optimal subsidy level is quite high; around 60 percent of gross costs of the services. As a counter argument, Rosen (1996) suggests that too many subsidies lead to excessive consumption of (tax-financed) care, which results in too much employment in care sectors and too little work in material goods sectors, resulting in what Rosen characterised as cross-hauling; that is, that the women work for each other.

Another economic argument for intervention, noted by Jaumotte (2003), is excessively compressed wage distributions. Under such circumstances, the wages of carers (presumably at the low end of the distribution) may be too high compared to the wages of mothers. Childcare subsidies may ease the problem, when the compression is difficult to counteract for other reasons. A third argument is that credit market restrictions may prevent low-income families to finance childcare and to get out of welfare dependency (Walker, 1996). Further, Bergstrøm and Blomquist (1996) argue that tax-payers without children will choose a subsidy level that minimizes taxes, suggesting that there might be substantial Laffer-type revenue counteracting effects from subsidising childcare. Graafland (2000) does not rule out such effects, as government deficits are approximately unchanged by increased expenditures on subsidies, when using a general equilibrium framework (the Dutch model MIMIC). Increased subsidies reduce wages and increase human capital investments and employment.

However, as noted in the introduction, transfers to families with children also serve other purposes, such as income support for the poor, highlighted by the Earned Income Tax Credit in the US in and the Working Families' Tax Credit in the UK. The two schemes

originate from efforts to make low-income (working) families better off,[1] whereas the labour supply incentives arise from designs that aim at providing support for these families without introducing adverse work incentives. Thus, in the UK-system a family needs to contain an adult who works 16 or more hours per week in order to be eligible, and then the credit is phased out with respect to income. Formal childcare costs are deductible up to 70 percent and the total deductible amount is limited by thresholds. According to Brewer *et al.* (2006), the largest effect of this tax credit scheme is found on lone parents' labour supply, whereas effects on couples are much less pronounced, partly because of counteracting effects on mothers and fathers. The US Earned Income Tax Credit provides labour supply incentives by phasing the tax credit in (with respect to income) up to a maximum credit amount, and then phasing the credit out again with further increasing income. Hotz and Scholz (2003) report favourable effects of this scheme, with its ability to combine desirable labour supply effects and support for the working poor.

However, Kaplow (2007) argues that the family transfer issue should be discussed within an explicit optimal transfer perspective, for instance taking into account that changes in transfers often have revenue effects that have implications for taxation of the rest of the population. Kaplow's analysis is in particular applicable to the Earned Income Tax Credit in the US, but renders general insight. For instance, he finds support for high marginal tax rates on the working poor rather than subsidising earnings. In other words, work subsidies are often inefficient tools to raise incomes of families at the low end of the income distribution. As noted by Acs and Toder (2007), this conclusion may not hold if individuals choose between jobs with fixed working hours and are not able to choose working hours along a continuous scale. A work subsidy may be optimal if the behavioural responses are concentrated on the extensive margin (the participation decision), as also noted by Diamond (1980) and Saez (2002).

The optimal tax literature has also addressed the issue of income testing of categorical transfers, such as Immonen *et al.* (1998). They argue that an optimal scheme involves marginal tax rates that decrease in income within the richer group (families without children in our case), whereas marginal tax rates should increase in income among families with children, while at the same time providing a universal subsidy to this latter group, financed by increasing marginal tax rates over much of the income range. However, Creedy (1998) provides numerical examples and Kornstad and Thoresen (2004) give results from microsimulations which emphasize that income testing has detrimental labour supply effects that may outweigh distributional gains from greater targeting of support to families with children.

A government's intervening behaviour should ideally also take into account care quality differences between parental and non-parental care, if there are any. The child development literature often refers to cognitive and emotional competence of the child. Results indicate that the effect of a mother's entry into the labour market (and thereby non-maternal care) depends on the age of the child. Negative consequences are often found for cognitive ability when mothers enter market work while the child is still an infant, whereas results for older children (between one and two years of age) of working mothers are mixed (Averett *et al.*, 2005). Similar results are found by other researchers. A UK study by Gregg *et al.* (2005) into the effect of a mother's employment on the cognitive outcomes of her children in early to mid childhood finds that only full-time employment in the first 18 months of her child's life has a negative effect. This is more so for higher educated women and less so for single women. The effect also depends on the type of nonparental childcare used. The negative effect is only evident when care consists largely of unpaid care by a relative, friend

[1] According to Hotz and Scholz (2003), the starting point for the Earned Income Tax Credit in the US was a negative income tax (NIT) as a universal anti-poverty programme.

or neighbour. Furthermore, the results indicate that employment in combination with using centre-based childcare may even have a positive effect on child development. These results are in line with evidence reported by Gregg *et al.* from US studies, where a return to full-time employment in the first year is also found to have some negative effect, but later returns to employment or part-time employment appear to have no effect. For instance, Berger *et al.* (2005) found, using US data, that a return to work within 12 weeks of giving birth negatively affects child development and health, particularly if the return is full-time.

3. Comparisons between Australia and Norway

There are many similarities between Australia and Norway; both countries being rich in natural resources, possessing relatively ambitious welfare states, and belonging to high-growth economies over the last decades (Mehlum *et al.*, 2006). The two countries usually have high scores on many socio-economic indicators, which mean that they are often found among the highest ranked countries according to various indices, such as the Human Development Index from the United Nations. For instance, they have high scores on GDP per capita measures: measured in US dollars and adjusted with respect to purchasing power parities, gross national income per capita was 29,243 in Australia and 37,331 in Norway in 2003 (OECD, 2006a).

However, the two countries differ substantially with regard to the design and generosity of family support schemes. In Jaumotte (2003), who describes family policies in OECD countries, Norway and Australia are often found on opposite ends of the scales of a variety of measures. In this section, we provide descriptions of transfer schemes, families' labour supply and income distribution in the two countries.

3.1 Family support transfers

We compare various components of family support schemes, focusing on transfers directed towards families with children and dividing them into three subgroups: parental leave schemes, cash transfers/tax deductions, and childcare subsidies. We focus on general family policy tools, aimed at two-parent families, which implies that special arrangements for lone parents are not discussed. Education systems are not part of this study.

3.1.1 Parental leave schemes

Fertility rates in Australia and Norway are rather similar, both below reproduction level; in 2005 1.81 for Australia (ABS, 2006c) and 1.84 for Norway (Statistics Norway, 2006), whereas parental leave schemes are rather different. The Norwegian parental leave scheme basically consists of two parts. Firstly, families with both parents in paid employment prior to birth can choose between full compensation (100 percent) over a period of 44 weeks or 80 percent compensation over 54 weeks.[2] Included in this scheme is a quota of 6 weeks which can only be taken by the father of the child. Secondly, mothers with no work experience prior to birth receive a cash transfer, which is equal to NOK33,584 in 2007.[3] The total cost of the parental leave scheme will reach about NOK11 billion in 2007.

In Australia, entitlements at the federal level are very low. Parental leave provisions are legislated to include up to 52 weeks of *unpaid* parental leave (including maternity, paternity and adoption leave) for parents to take on a shared basis to care for their newborn

[2] The payments from the National Insurance Scheme are restricted to 6 times the national insurance base rate, approximately NOK390,000 in 2007. However, the employer may contribute to 100 percent coverage for parents at higher income levels.

[3] For an approximate exchange rate between the Australian and Norwegian currencies, use 1AU$≈5NOK, here and throughout the paper. Comparisons should ideally also take purchasing power differences into account.

child or newly adopted child under the age of five years. After the leave, parents have the right to be returned to the position held immediately before the start of parental leave or a position that has the same terms and conditions of employment as the former position. Other than one week at the time of the birth (or three weeks in the case of adoption), both parents cannot be on parental leave at the same time. In Australia, the parental leave provisions apply to permanent full-time, part-time and eligible casual employees who have had at least 12 months of continuous service with their current employer. In addition to the unpaid leave, there is a one-off payment, a maternity payment (which was called a "baby bonus" up to July 2004), of AU$4,133 per child paid at birth (costing the Government about 0.2 billion dollars in 2003-04).[4] In principle, there is no paid maternity leave, although several individual employers are now offering women (and sometimes men) different periods of time of paid maternity leave, but this is usually linked to tenure and/or returning to work within a certain period.

Obviously, there are strong labour supply reducing effects for women arising from the Norwegian system for parental leave, compared to the Australian system. However, it is worth noting that there is a need for a fine balance between providing incentives to mothers to participate in the paid labour force and allowing women sufficient time to recover from birth and give their babies a good start in life. As already noted, it is found that a quick return to employment negatively affects child development and health, particularly if the return is full time; see for example, Berger *et al.* (2005).

3.1.2 Cash transfers: child benefit /family payments

In almost all industrialised countries some sort of cash support conditional on the presence of children in families exists, such as the Child Benefit in Norway. Australian parents can choose whether they wish to receive family payments through the tax system or prefer to have it paid fortnightly or at the end of the year as a lump sum. A family support system organised through the income tax system as a reduction in tax payment and a cash transfer will have exactly the same effect. The main difference between Norwegian and Australian schedules is that the Australian Family Tax Benefit is income tested partly on the primary carer's income and partly on household income. We discuss the Australian system after presenting the Norwegian tax benefit schedule.

The Child Benefit schedule in Norway has a relatively simple structure. It is paid to mothers of children between 0 and 18 years of age. For 2007, the rate is NOK970 per child per month or NOK11,640 per child per year. There are two exceptions from the standard scheme: lone parents receive (in addition) NOK660 per month (or NOK7,920 per year) for children younger than 3 years, and families in the northern parts of the country are eligible to an additional NOK320 per month (or NOK3,840 per year). The extra support for families in Northern-Norway is motivated by a wish to uphold the population in remote areas. In the past, the tax benefit schedule also included a family size reward, as the amount per child increased with the number of children in the family, but this feature was eliminated in 1998.[5] The total costs of the Child Benefit scheme will exceed NOK14.3 billion in 2007.

There are two types of family payments in Australia. First, Family Tax Benefit part A, which is available to all families with children who have less than a certain amount of income per year. The amount varies with the age and the number of children. A second payment is Family Tax Benefit part B, which is available to all single-earner families in Australia and to

[4] See information in Yearbook Australia, 2005 (ABS, 2006c)

[5] The family size reward might be seen as a measure to increase birth rates. Its disappearance must, however, not be interpreted as a sign of fertility rates having become less important. The Norwegian Government has simply chosen other instruments to achieve their goals; see descriptions of the Home Care Allowance and childcare policies in the following.

two-income families where the secondary income is below a particular threshold. It is paid per family rather than per child. In addition to payments for children, there are specific payments to carers for children under school age (up to July 2006, these payments were available to primary carers of children under 16): Parenting Payment Single and Parenting Payment Partnered. These are income tested on household income, but the carer does not have to fulfil an activity test to receive these payments. They are eligible without having to look for work. We leave these aside in the discussion in this paper.

Although Family Tax Benefit Part A is income tested, it is withdrawn at a more generous rate than most other payments in the Australian transfer system. This means it is paid to families on relatively high incomes, with the minimum rate still being fully paid to families on an income of at least AU$88,620 per year. The payment is per child and depends on the age and number of children. It can be paid on a fortnightly basis except for the supplement of AU$646.05 per child, which can only be paid at the end of the year.[6] Details are provided in Table 1, together with the Norwegian arrangements.

Table 1. Family payments per year per child

For all families with dependent children	Australia, Family Tax Benefit Part A (2006/2007 financial year values)	Norway, Child Benefit (2007 values)
Base (or minimum) rate		
Base rate (0-2 yr old) for single parents	AU$1828.65	NOK19,560
Base rate (0-2 yr old) for couple families	AU$1828.65	NOK11,640
Base rate (3-18 yr old)	AU$1828.65	NOK11,640
Base rate (18 to 24 yr old)	AU$2237.45	
Large family supplement for fourth and each subsequent child	AU$255.50	Nil
Remote area supplement	Nil	NOK3,840
Maximum rate		
For 0-2 yr old	AU$4317.95	NOK11,640/NOK19,560
For 3-12 yr old	AU$4317.95	NOK11,640
For 13-15 yr old	AU$5332.65	NOK11,640
For 16-17 yr old	AU$1828.65	NOK11,640
For 18-24 yr old	AU$2237.45	
Minimum rate payable for annual income below	AU$88,620 + AU$3504 × (number of children – 1)	No income test
Maximum rate payable for annual income below	AU$40,000	No income test
Taper rate for minimum rate	0.30	No income test
Taper rate for more-than-minimum rate	0.20	No income test

Family Tax Benefit Part B is only income tested on the income of the secondary earner (or primary carer), see Table 2.[7] The primary earner's income is not taken into account. The payment depends on the age of the youngest child but not on the number of children. In couple families, the secondary earner can earn up to AU$4234 per year without a reduction in this family payment. Over this threshold, the payment is reduced with 20 cents for every

[6] The supplement was introduced to avoid overpayment due to underestimation of the yearly family income, which would mean part of the Family Tax Benefit would have to be paid back at the end of the financial year.
[7] We also include the rate for the Norwegian Home Care Allowance in Table 2, even though the structure of this scheme is rather different from the Family Tax Benefit Part B.

additional dollar of earnings. The total cost of the two types of Family Tax Benefit payments was AU$12.9 billion in 2003-04.

Table 2. The Australian Family Tax Benefit Part B (2006/2007 financial year values) and Norwegian Home Care Allowance (2007 values)

	Australia	Norway
For single income families with children	Per year per family	Per year per child
Maximum rate if youngest child is		
0 years old	AU$3467.50	
1-2 years old	AU$3467.50	NOK39,636
3-4 years old	AU$3467.50	
5-18 years old	AU$2511.20	
Maximum rate payable to all sole parents or second earners with annual income of less than	AU$4234.00	
Maximum rate payable if		no centre-based care is used
Taper rate	0.20	

3.1.3 Childcare support schemes

Norwegian politicians have shown a remarkable willingness to reform care support schedules over the last decade. This reflects substantial political controversy with respect to the organisation of support for care. The background for this can be found in the history of care for preschoolers in Norway. When mothers of preschoolers started entering market work and demand for non-parental care alternatives increased, support was provided through establishing day care centres, either privately owned or owned by local authorities.[8] These centres are financed through three sources: national level governmental subsidies paid directly to the centres, the level of which depends on the number of children in care and their ages; support from local governments; and parental fees. The activities of childcare centres are regulated through legislation. However, the supply of centre-based care was too low compared to the demand, and as a result, another type of non-parental care has developed: care for a smaller group of children in care providers' own houses. These care alternatives do not receive any public subsidies, and are not controlled by public regulations. Their unofficial character is emphasised by the fact that only approximately one-third of these childminders report their incomes to the tax authorities (Løyland and Thoresen, 2004). Thus, we can distinguish between three types of care for preschool children in Norway: parents' own care and two types of non-parental care, consisting of centre-based care and childminders.

The fact that there were waiting lists for access to subsidised centre-based care was the main argument for the introduction of the Home Care Allowance in 1998 (which was fully phased in from 1999). As shown in Table 2, this scheme gives all parents of preschool children aged 1 or 2 a tax-free transfer in cash, depending only on utilization of public or private day care centres. Non-users of day care centres are eligible to a benefit of NOK39,636 in 2007. This benefit is reduced to nil for users of full-time centre-based care. The reform was introduced in order to make transfers across different modes of care more equal.[9] In 2005, families received Home Care Allowance for a total of 74,326 children (on average), which

[8] This market has been dominated by various private organisations and local governments, and has been seen to a lesser degree as a market for private investors.

[9] The main intention was to make this transfer equal to (national level) subsidies to centres, but this has not been the case in recent years.

corresponds to 64.2 percent of the children in the target group. However, according to the Ministry of Children and Equality (2006) this figure is expected to be lower in 2007 (55,500 children), because more families will obtain access to centre-based care for their young children. The allowance is expected to cost approximately NOK2 billion in 2007.

The introduction of the Home Care Allowance was controversial, because the transfer provides incentives to withdraw from the labour market and care for children at home; see Kornstad and Thoresen (2007) for estimates of effects on labour supply.[10] The response from the parties in Parliament who opposed the Home Care Allowance was the so-called "childcare compromise", introduced in 2004. The "childcare compromise" implies increased efforts to abolish queues for centre-based care and a substantial reduction in parental fees through introduction of maximum prices, applicable both for the private and the public sections of the market for centre-based care. Initially, the intention was that prices should not exceed NOK1,750 per month in terms of 2005 prices (or NOK19,250 per year). However, the politicians have not yet managed to reach the intended maximum parental fee levels, and for 2007 the maximum fees are set at NOK2,330 (or NOK25,630 per year). In contrast, parents paid on average NOK2,800 per month before the reform, in centres run by local authorities.[11] In addition, there is an income deduction scheme for childcare expenses through the tax system, which means that 28 percent of the expenses are paid by the government.[12]

In effect, this latest reform implies a substantial increase in childcare subsidies. Prior to the reform, in centres owned by municipalities, parents paid about 28 percent of the costs, while state level subsidies covered approximately 38 percent and local authorities paid the majority of the remaining costs, approximately 32 percent (The Ministry of Education and Research, 2005).[13] The local governments to a much lesser degree provided financial support to centres not owned by them (8 percent of total costs), which meant that privately owned centres had higher parental payments, 37 percent of costs, whereas governmental subsidies cover approximately 47 percent of the costs. The introduction of maximum prices also implies that centres are being equally treated in terms of public transfers, independent of ownership.

For 2007, the government plans to transfer approximately NOK13.7 billion to childcare centres. Costs of the various financial programmes to increase the supply of centre-based care are not included in that measure. As can be seen in Figure 1, the increased efforts to reduce waiting lists for centre-based care seem to have had an effect on the proportion of children attending childcare centres (even after taking into account that attendance ratios have increased in most years since 1990). The current Norwegian government plans to introduce a guaranteed right for access to centre-based care for every pre-school child once the full coverage level is reached.

In Australia, Child Care Benefit is available to parents who have non-parental care expenditures. This payment depends on the number of children, the type of childcare and household income. However, a (small) minimum amount is payable to everyone independent of household income. In addition, since the 2004-05 financial year, Child Care Tax Rebate is available to families who after deducting Child Care Benefit from their childcare costs are still left with positive net childcare costs. They can receive a percentage of these remaining

[10] The Home Care Allowance is more general than the Family Tax Benefit Part B in Australia, which can only be received if the primary carer earns a limited amount of income. However, the two payments have in common that they both can discourage secondary earners from entering paid employment, even though the Home Care Allowance is not directly linked to non-participation in paid employment by primary carers.

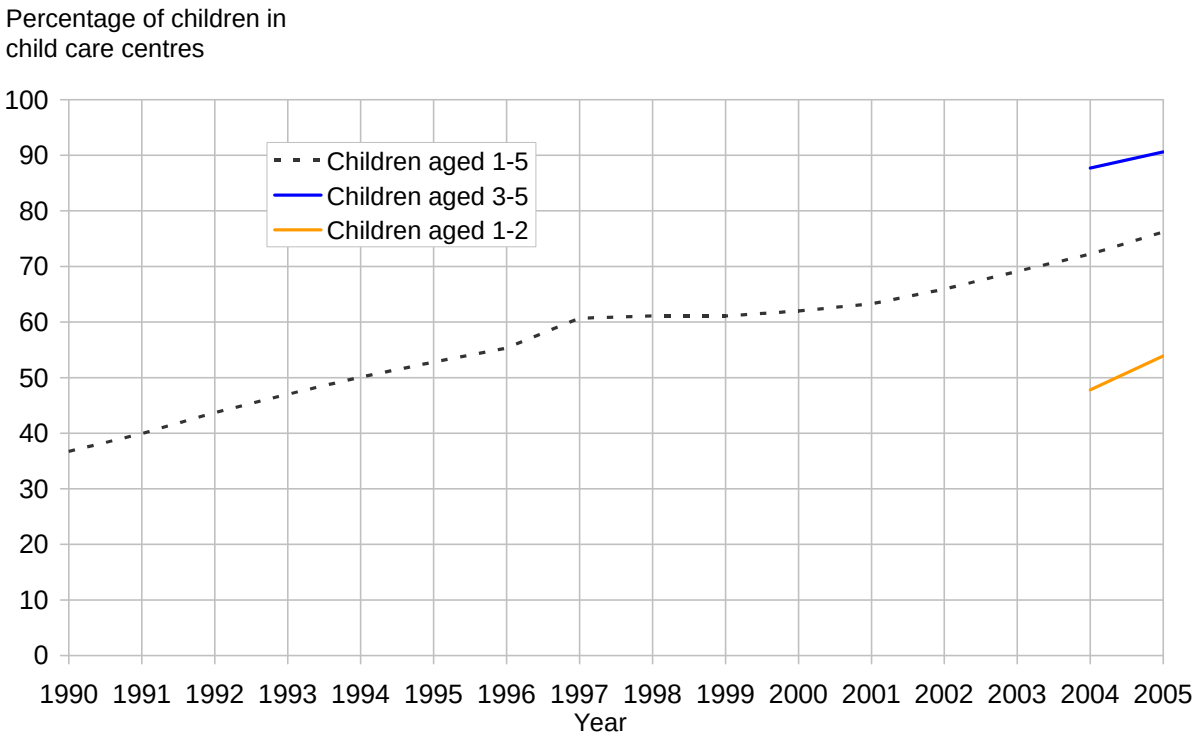
[11] Fees in privately owned centres are usually somewhat above that level.

[12] The Norwegian dual income tax system involves a flat tax rate at 28 percent for incomes after deductions for childcare expenses, where expenses are limited by an upper threshold; in 2007 this is set at NOK25,000 for the first child, to which NOK5,000 is added for each additional child.

[13] The category "other sources" is the fourth financial source which is larger among private centres then among publicly owned centres.

costs, up to a maximum amount, as a tax rebate to be deducted from their payable income tax. In 2004, an estimated 752,800 children in Australia, from all age groups, made use of childcare services, compared to about 577,500 children in 1999 (Department of Families, Community Services and Indigenous Affairs, 2005).

Figure 1. Percentage of children attending childcare centres in Norway, pre-school children in different age groups



Child Care Benefit payments can be deducted directly from the fees to be paid by the parents to the childcare provider. There are several different weekly and hourly childcare subsidy rates, which depend on the number and age of children, the parents' incomes and labour market status, the type of childcare that is used and the number of hours of childcare that is used; see Table 3. The maximum weekly rate of subsidy is based on 50 hours of childcare, which is the maximum that can be claimed. There are loadings available for less than full-time use of childcare depending on the type of childcare service used. For school-age children, the subsidy is reduced by 15 percent. In 2005-06 the Australian government spent about AU$1.5 billion on the Child Care Benefit, slightly up from AU$1.4 billion in 2003-04; see ABS (2006c).

A second source of assistance to parents who require childcare is the Child Care Tax Rebate. If the work/study test of working at least 15 hours per week is passed and the family has received Child Care Benefit, any costs remaining after deducting the Child Care Benefit from childcare costs from approved care can be partly rebated after 1 to 2 years of making the cost. For example, childcare costs made in the financial year of 2004-05 can be claimed as a Child Care Tax Rebate in the tax return for the financial year of 2005-06, which is usually prepared between July and October 2006. The costs are rebated at 30 percent and a maximum amount of AU$4,211 per child is available in tax rebates for formal childcare costs. The

rebate can be claimed by either parent, as long as they pay a sufficient amount of tax to offset the rebate against.[14] There is no income test for this rebate.

Table 3. Child Care Benefit payments in Australia, 2006-07 values[a]

	Per hour per child	Per year per child
Preschool children		
Approved care		
Maximum rate: 1st child	AU$2.96	AU$7696.00
Maximum rate: 2nd child	AU$3.227	AU$8390.20
Maximum rate: 3rd child	AU$3.47	AU$9021.48
Maximum rate: 4th child	AU$3.219	AU$8368.88
Maximum rate: ≥ 5th child	AU$3.219	AU$8369.24
Minimum rate	AU$0.497	AU$1292.20
Rates for registered care		
Maximum rate	AU$0.497	AU$1292.20
Minimum rate	AU$0.497	AU$1292.20
Part-time loading on hourly rate	Percentage loading	Condition of use
in Family Day Care	+33.3%	if hours of use<38
	+((50/(hours of use))-1)×100%	if 38≤hours of use<50
in Long Day Care	+10.0%	if hours of use<34
	+(10-(hours of use-33)×2)%	if 34≤hours of use<38
Rates for school-age child	85% of pre-school children's rates	
		Per year per child
First income threshold for reducing maximum rate		AU$34,310
Second income threshold for reducing maximum rate until minimum rate is reached		AU$80,088

	For 1 child	For 2 children	For 3 children or more
Taper rate between 1st and 2nd threshold	10%	15%	15%
Taper rate over 2nd threshold	10%	25%	35%
Hours limit on non-work-related care, if work/study <15 hours per week	24 hours per week per child at the hourly rates above		

Note a: Maximum weekly values are 50 times the maximum hourly rates.

There are substantial cost variations between private and community long day care centres and even within each group between cities or suburbs, and average childcare costs have increased substantially over the past few years. In 2004, the average weekly fee in private long day care centres was AU$208, an increase from AU$184 in 2002. In community long day care, the average fee increased from AU$188 in 2002 to AU$211 in 2004. In 2004, the average weekly fee in family day care schemes (for 50 hours in care) was AU$185 compared to AU$163 in 2002. The average fee charged per session was AU$6.68 for before school care and AU$10.28 for after school care in 2004. This compares with AU$5.91 and AU$9.34 respectively in 2002.

From June 2004 to September 2006, childcare costs have increased by a further 30.5 percent, see ABS (2006b). Child Care Benefit payments have only been increased with the general CPI, which was far below these increases in childcare costs, causing the subsidy and the actual costs to diverge over time. This divergence may increasingly cause low-wage mothers to withdraw from the labour market or prevent them from entering while their children are of pre-school age.

[14] A change has been announced in the 2007/08 Federal Budget, rebating childcare costs of the most recent financial year and, instead of a rebate, providing a direct payment which is no longer dependent on the amount of tax paid.

3.1.4 Family transfers relative to other economic measures

This section considers costs of transfers in relation to aggregate economic measures such as tax revenues and GDP. According to the OECD (2006b), tax levels are rather different in Australia and Norway. In 2004 the ratio of taxes in terms of GDP was approximately 43 percent for Norway, whereas a similar measure for Australia was only 31 percent. The ratio for Norway has increased over the last years, and is expected to be approximately 45 percent in 2007. However, this reflects the strong influence of the petroleum activities in Norway on taxation. These extra tax revenues are to a large extent saved for future generations through the Government Pension Fund. Excluding oil activities and focusing on tax ratios for mainland Norway, the ratio will be considerably below 45 percent, but still above Australia's 31 percent.

The differences in revenues between Australia and Norway may already reflect different ambitions with regard to family support (and other types of support) in the two countries. If we sum the total costs of the various transfer programmes for families with dependent children, we find that the costs in Norway are expected to be approximately NOK43 billion. This is approximately 7.4 percent of the estimated tax revenue for mainland Norway in 2007, or approximately 2.7 percent of mainland GDP. The average expenditure per number of children under 18 years of age in the population is estimated at NOK39,716.

Summing the costs of the Australian transfer programmes for 2003-04 results in a total cost of AU$14.5 billion (excluding the Child Care Tax Rebate which was not yet introduced at that stage). This is about 6.9 percent of Commonwealth tax revenue (that is, excluding State level tax revenue), given that 2003-04 tax revenue was AU$209 billion.[15] Given the higher tax level in Norway, the difference in family-related expenditure between the two countries is not that large when expenditures are measured relative to tax revenues. However, if we make comparisons in terms of expenditures relative to GDP or the number of children under 18, the differences are larger. In Australia approximately 1.6 percent of GDP is used for family support, whereas approximately AU$2,853 is spent per child under 18 years of age.

Another way to describe the economic impact of transfers is to contrast them to the other income sources of families. This is done in Table 4 for families with preschool children. We focus on this type of family as the support schemes for this group highlight the differences in family-related income support between the two countries. Two types of families within this group are distinguished; one where the father works full time and the mother works at home, looking after the children, and another where both parents work full-time and formal centre-based childcare is used. Australia and Norway are compared for a typical low-, medium- and high-income family with two children under school age.

Table 4 illustrates the different redistributional ambitions with respect to family support schemes in the two countries. However, when taking the effects from the tax system into account (which shows more progressivity in the case of Norway), the overall tax/transfer progressivity of the two systems appear to be rather similar.[16] The table also shows that for the two family types and at each income level, the net amount of taxes paid (that is tax paid minus income transfers), as a proportion of gross family income, is lower in Norway, indicating a higher level of support for families with young children in Norway.

[15] From Taxation Revenue, Australia (reissue), 2003-04 (ABS, 2005), catalogue no. 5506.0

[16] Somewhat simplified, this comparison can be made by comparing figures in the last column for each country in Table 5 for different income levels. More detailed descriptions of post-tax income inequality are provided in Section 3.3.

Table 4. Estimates of taxes and transfers, conditional on labour market participation, wage income levels, and types of care

Types of families	Gross family income (h)[a]	Australia (AU$)			Norway(NOK)		
		Taxes (t)	Transfers (s)	(t-s)/h	Taxes (t)[b]	Transfers (s)	(t-s)/h
Full-time working father, mother at home: two children, 2 and 4 years of age, in home care	NOK200,000 AU$40,000	7,588	12,104	-0.11	15,600	62,916	-0.24
	NOK400,000 AU$80,000	21,049	7,125	0.17	82,680	62,916	0.05
	NOK600,000 AU$120,000	38,848	3,467	0.29	172,280	62,916	0.18
Full-time working father and mother: two children, 2 and 4 years of age, in centre-based care[c]	NOK375,000 AU$75,000	14,127	19,236	-0.07	56,090	163,008	-0.29
	NOK750,000 AU$150,000	39,147	11,006	0.19	190,116	163,008	0.04
	NOK1,125,000 AU$225,000	71,323	11,006	0.27	353,616	163,008	0.17

Notes: a) The Norwegian and Australian incomes are designed to be roughly comparable, by using an exchange rate corresponding to 1AU$=5NOK.

b) The tax payments for a Norwegian family will depend on the level of income-deductible interest rate expenses. We use the same estimate of average expenditures for families with pre-school children in all calculations.

c) It is assumed that parents need to purchase 50 hours of care in a Long Day Care centre at an average fee of AU$275.36 per week for each child.

3.2 Parents' attachment to the labour market

There are striking differences between the two countries with respect to mothers' participation in the labour market. While the Norwegian mothers' labour market participation ratio is very high, the presence of children appears to have a substantial dampening effect on this ratio for Australian mothers. According to the OECD (2006c), overall participation rates for females aged 25 to 54 years were 70.7 and 79.9 percent for Australia and Norway respectively, in 2005. However, this gap has decreased lately, as the corresponding measures were 66.8 and 81.5 percent in 2000 (OECD, 2002). In OECD (2002), employment rate measures for mothers having one child and two children under 15 years of age in 2000 were also reported. [17] The employment rate was 55.3 percent in Australia and 83.3 percent in Norway for mothers with one child, while for females with two or more children the employment rates were 43.2 and 78.0 percent respectively. Taking differences in part-time work into account does not reduce this difference, but rather increases it, as part-time work rates[18] for Australian mothers were 54.1 and 63.1 percent for mothers with one child and two or more children respectively, while the same measures for Norway were 33.5 and 41.1 percent. However, controlling for differences in working hours is likely to reduce the difference, as average working hours for a full-time job in Norway are lower than comparable average hours in Australia.[19]

Comparing Australian women now with Australian women twenty years ago, it is clear that the labour force participation of women (including mothers of younger children) has

[17] Persons not in employment include those seeking employment and persons that have left the labour force for various reasons, such as care for pre-school children.

[18] This is defined as the percentage of persons working part-time out of all employed persons.

[19] Estimates of yearly working hours produced by OECD support such a view, but the OECD generally warns against such cross-country comparisons because of data source differences. However, measures of usual weekly working hours (for males) were 40 hours for Australia and 38 hours for Norway in 2002 (OECD, 2006d) and the estimates in Figure 2 (see below) also appear to support this view.

increased substantially. Jaumotte (2003) compared female labour force participation in 1981 with female labour force participation in 2001. Australia's participation rate of women aged between 25 and 54 increased from just over 50 percent to just over 70 percent, whereas this rate increased from just over 70 percent to just over 80 percent in Norway. Jaumotte's graph of these rates for a range of OECD countries shows that the Nordic countries were already at a high female participation level in 1981 and that most other countries are now catching up to their level, showing less variation in 2001 than in 1981.

Figure 2 provides further detail on the effect of children on mothers' labour supply in Australia and Norway by providing measures for mothers' participation in market work depending on the age of the youngest child, and comparing them to females without children in the same age group (20-45). All women are married or in a de facto relationship. Figure 2 includes measures for participation, part-time ratios and average working hours. We also present figures for males in the same age group. However, we see that Australian and Norwegian fathers follow a very similar pattern with respect to work and are hardly affected by the presence of young children.

With respect to mothers of pre-schoolers[20], Figure 2 confirms that Norwegian mothers of pre-school children have higher participation rates and work less often part-time, compared to Australian mothers. For instance, we see that approximately 80 percent of Norwegian mothers participate, whereas the figure for Australia is approximately 60 percent. These differences are also reflected in the figures for average working hours. However, as soon as the youngest child starts school (represented by age group 5-9) participation increases substantially in Australia, but since Norwegian mothers also increase their participation, there remains a substantial difference between mothers in the two countries. In fact, we see that Norwegian mothers with a youngest child between 5 and 9 years of age have very similar connections to market work as the females without children, except for lower part-time ratios in the latter group. The effect of children is much more pronounced in Australia; that is, Australian mothers have lower labour force participation and are more likely to work part-time if they are employed. However, the difference between the two countries has decreased in recent years. A comparison with figures for 2000 presented in OECD (2002) shows that Australian mothers have increased their labour supply substantially, recently.

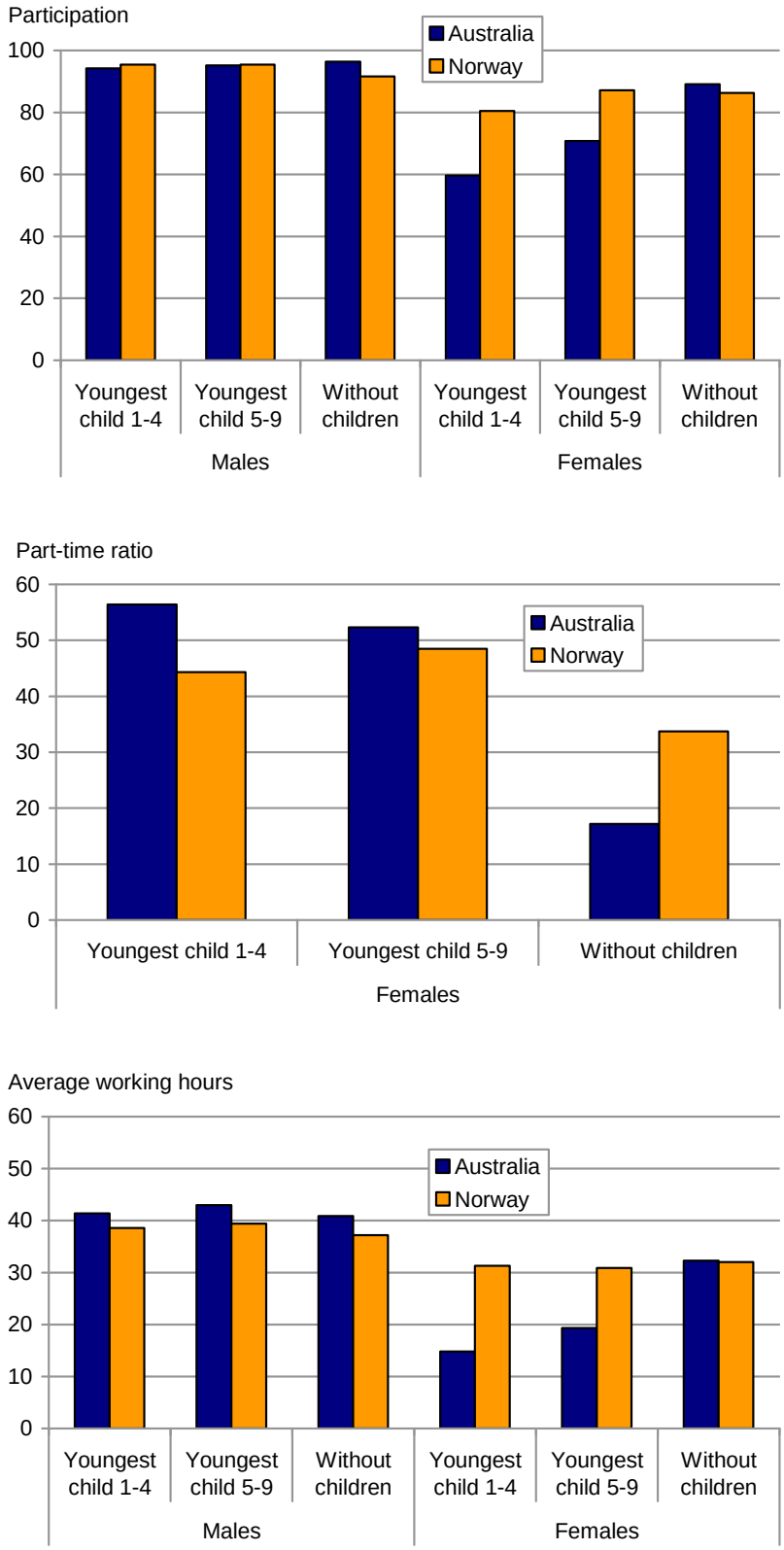
Women without children, who are selected to be of a comparable age as the women with children in this figure, participate equally in the labour market in Australia and Norway. If anything, these Australian women participate to a slightly higher degree and are less likely to work part time, compared to Norwegian females in the same situation.

3.3 Income distributions

We now move on to consider income distributions of Australia and Norway, as changing family transfers to improve labour supply incentives may have distributional consequences. Previous studies of cross-country income inequality, such as Gottschalk and Smeeding (1997; 2000) and Förster and Vleminckx (2004) have shown that the income inequality in Norway is substantially below that of Australia. In this section, we examine to what extent these differences still exist, and in particular focus on the variation in incomes among families with children in the two countries.

[20] We restrict the comparison to families with children aged between 1 and 4, because Australian children usually enter preparatory school at the age of 5 and many Norwegian mothers of infants will be on parental leave.

Figure 2. Labour market connections for married/cohabiting men and women, aged 20 to 45, by age of the youngest child



Sources: Authors' calculations using the Survey of Income and Housing Costs 2003-04 for Australia and the Labour Force Survey 2005 for Norway.

The methodological approach taken in this comparison is as follows: income is measured by equivalent income, which is derived by aggregating income over all household members, dividing by an equivalence scale to allow for economies of scale, and letting each household be represented with as many persons as there are household members.[21] The equivalence scale is defined as the square root of the number of household members, children included (Buhmann *et al.*, 1988).

The data sources for the microsimulation models of Norway and Australia are used for this part of the analysis. A brief description of the microsimulation models LOTTE for Norway is provided in Aasness *et al.* (2007) and of the Melbourne Institute Tax and Transfer Simulator (MITTS) for Australia in Buddelmeyer *et al.* (2007). The main data source of LOTTE is derived from individual income tax returns, made available for a representative sample of households through the Income and Property Statistics for Households (Statistics Norway, 2005). LOTTE is currently based on data from 2004, which include information for around 13,000 households. The data are projected to 2007 in accordance with macro economic realisations and predictions for income growth, income composition, etc.

The household and individual information for Australia, on which the calculation in this section is based, is from the ABS' Survey of Income and Housing Cost 2002/2003. The income and wage information in these data is inflated with the Consumer Price Index and the increase in Average Weekly Earnings respectively, to represent values at the first quarter in 2007 (ABS 2006b, 2006a).

We measure income inequality by two different measures, the Gini coefficient and the income ratio of the person at the 90^{th} decile to the person at the 10^{th} decile. Further, in order to provide information about the effects of family transfers on the income distribution, we provide estimates of the concentration coefficient for the child benefit or family payment. The concentration coefficient for the child benefit/family payment can be interpreted as a conditional Gini coefficient; it measures the concentration of the child benefit when individuals are ranked according to their post-tax income, see e.g. Lambert (2001). As a result, the concentration coefficient measures the relation between total income and the child benefit: the coefficient is 0 if the transfer is equally divided across the population, it takes negative values if poorer households receive more of the transfer, whereas positive values indicate a pro-rich transfer. The child benefit/family payment concentration coefficient is calculated for families with children under 18 years of age.[22]

The figures reported in Table 5 are in accordance with the findings for Australia and Norway in previous cross-national studies of income inequality, see Förster and Vleminckx (2004) for the most recent estimates. The income inequality in Australia is substantially higher than in Norway. Although overall Australia is more unequal, the subgroup of families with children has very similar Gini coefficients in Norway and Australia. Income inequality amongst families with children under 18 years of age, as indicated by the Gini coefficient, is quite similar between the two countries, although the decile ratio indicates more variation in incomes in Australia. This similarity seems mostly due to the targeted family payments in Australia. When family payments are excluded from the post-tax income, the Gini coefficient would increase to 0.319 for Australia and the decile ratio would increase from 2.98 to 4.48. Both changes indicate the importance of family payments for equality in Australia. Excluding the Child Benefit for Norway has a much smaller effect; the income inequality as measured by the Gini coefficient would be 0.262 and the decile ratio increases from 2.59 to 2.84.

[21] This procedure is in accordance with what Ebert (1997) describes as method 3.

[22] Note that calculations of concentration coefficients are carried out for "fixed remaining income". That is, separation of transfers from the rest of income does not alter any of the other income components. We focus on behavioural effects (of changes in transfers) in Section 4.

Table 5. Estimates of income inequality and the distribution of family transfers across incomes in 2007

	Australia			Norway		
	Gini coeff.	P90/P10 (decile ratio)	Concen-tration coeff.	Gini coeff.	P90/P10 (decile ratio)	Concen-tration coeff.
Income inequality						
all	0.298	3.77		0.268	2.92	
all families with children 0-17	0.247	2.98		0.245	2.59	
same as above, excl. child benefit	0.319	4.48		0.262	2.84	
all families with preschoolers	0.245	2.78		0.245	2.47	
Distribution of child benefit, all families with children 0-17			-0.340			-0.079
Distribution of childcare subsidies, all families with preschoolers[a]			-0.027			0.440

Note a: For Norway this is done for households with children aged 1-2.

The concentration indices are as expected for the family payments in the two countries (negative for Australia and close to zero for Norway), given that Australia targets these payments at poorer households and Norway provides universal child benefits. With regard to the childcare subsidies, the calculation of the concentration coefficient for Norway is done for children aged 1 or 2, only. The targeting of these subsidies in Australia is somewhat counterbalanced by the higher childcare use by parents who are in the labour force (and therefore better off). As a result the concentration index is close to zero. Norway does not target childcare subsidies and therefore only experiences the latter effect, causing the concentration coefficient to be positive and large; indicating that the subsidy is received to a larger extent by those on higher post-tax income than by those on lower levels of post-tax income.

4. Labour supply and distributional effects of changes in Australian and Norwegian family transfer programmes

Although differences in family policies alone are unlikely to explain the disparities in mothers' labour supply in the two countries, the large differences in family support schemes are expected to contribute to the gap between the two countries. In this section we will describe the effects of strengthening the labour supply incentives of Norwegian and Australian family policies. This is done by analysing the effects of the substantial fee reductions following the so-called "childcare compromise" in the Norwegian case (see Section 3.1), and by describing the effects of a similar reduction in childcare fees in Australia. In the Australian case, we also discuss the effects of abolishing the income testing features of the family support schemes. As labour incentives might come at a cost in terms of distributional effects, it is important to combine information about labour supply effects with descriptions of effects on income distributions.[23] We also provide measures of the total costs of changes, after taking behavioural adjustments into account.

Methodologically, we rely on results from microsimulation models, developed for Australia (Doiron and Kalb, 2005; Kalb and Lee, 2007a) and Norway (Kornstad and Thoresen, 2006; Kornstad and Thoresen, 2007). The models used to obtain the behavioural microsimulation responses are estimated based on micro data information on families' decisions with respect to the mother's labour supply and families' choices of care, and then

[23] Other studies that discuss labour supply effects and distributional effects of changes in family support include Creedy (1998), Hotz and Scholz (2003), Kornstad and Thoresen (2004; 2006), Brink *et al.* (2007).

the parameter estimates are used to simulate the effects of policy changes. The decision models are based on the assumption of utility maximising behaviour by families, subject to a budget constraint. One important condition for families with pre-school children is that market work for both parents typically implies a demand for non-parental care alternatives.

An important similarity between the simulation models employed here is that they both are based on discrete choice labour supply models; for an introduction to discrete choice labour supply models, see Creedy and Kalb (2005). This means that parents are assumed to choose between a limited number of discrete options in the labour market, and in the Norwegian model parents also choose from a limited number of options in the care market. In the Australian model approach, the choice of the amount of care is continuous but only two types of childcare are distinguished: formal and informal care. Thus, households are not assumed to choose work and childcare characteristics along a continuous scale, which appears to be in accordance with the discrete characteristics observed in these markets. Using this approach, limitations in choice sets can also be taken into account, which is especially important in the Norwegian case; see the discussion of waiting lists for access to centre-based care in Section 3.

Discrete choice models are also practical. Especially, the assumption that the stochastic element follows an extreme value (type 1) distribution yields a relatively simple structure of choice probabilities. We relegate more detailed descriptions of the two models to Appendix A for Norway and Appendix B for Australia.

Before discussing the simulation results, it is useful to compare the implied labour supply elasticities of childcare costs arising from these models. For Australia, the increased costs of childcare reduce participation and hours of work by a modest amount on average. For partnered women with preschool children, the elasticity in hours of work is –0.08 with respect to costs.

The hours of work elasticities according to the Norwegian data are somewhat larger than those found in Australia, approximately -0.17 for mothers of 1 to 5 year old children (Kornstad and Thoresen, 2007). Moreover, Kornstad and Thoresen argue that the rationing of access to centre-based care would give higher responses, compared to a non-rationing situation. These results indicate that changes in childcare costs will have larger effects in Norway than in Australia.

Compared to international estimates of the labour supply elasticities with regard to childcare costs or prices, both Norway and Australia are at the lower end of the range. Estimates for the US tend to be at the higher end of the range, between 0 and -0.92 for participation (Anderson and Levine, 1999) and between -0.024 (Ribar, 1995) and -0.78 (Averett *et al.*, 1997) for average hours of work. The values for the Canadian participation elasticities are somewhat lower and range between -0.156 (Michalopoulos and Robins, 2000) and -0.38 (Powell, 1997). The Australian and Norwegian elasticities are closer to elasticities estimated for European countries, see e.g., Blundell *et al.* (2000), Chiuri (2000), Choné *et al.* (2003), Wrohlich (2006). A survey of estimates can be found in Kalb (2007).

In the following, we first discuss the effects of care subsidisation in the Norwegian case, and then move on to describing the effects of childcare fee reductions and abolishing means testing of family payments and childcare subsidies in Australia. We only focus on the effects on mothers' labour supply, and the analysis is restricted to mothers who are married or cohabiting.

4.1 Effects of low fees in centre-based care in Norway

As noted in the discussion so far, the design of Norwegian support schemes can be characterised as encouraging female labour supply. Female labour supply incentives were

further improved by the introduction of the so-called "childcare compromise".[24] In the following, we therefore focus on the effects of lowering fees for centre-based care by describing the effects of the substantial fee reductions introduced by the "childcare compromise".

When the reform has been fully implemented, the fee for full-time care in day care centres should not exceed NOK1,500 per month per child.[25] In contrast, parents paid NOK2,800 per month on average for full-time care in centres run by local authorities in August 2003 (Eibak, 2003).[26] In order to include discounts for siblings and part-time care we assume that fees are NOK1,500 for the first child, NOK1,200 for the second child, whereas the maximum fee is set at NOK900 for the third child. We also let expenses vary with respect to working hours/opening hours at centres: the cost of 25–32 hours of weekly care is set equal to 75 percent of the full-time rate, while the fees for 17–24 hours and for 1–16 hours of care per week are scaled down to 50 percent and 25 percent of the full-time rate respectively. As an approximation, the reform we are evaluating implies a fee reduction of nearly 50 percent, benefiting nearly 70 percent of families of preschool children (1–5 years of age).

The tax and transfer system for 2003 serves as a reference or base-line when studying the effects. Thus, we project the data from the year of data collection, 1998, to 2003. The projection means that all income components, including female wage rates, are adjusted to 2003 levels by the wage growth in the period, that the prices of non-parental care are adjusted according to information on price changes in the period, and that the families are taxed according to the 2003 tax law.

A particular feature of our data and the modelling approach is that we exploit family-specific information on constraints in the market for care in centres, see Appendix A and Kornstad and Thoresen (2007) for further details. It is assumed that those families that report being constrained in 1998 still are constrained in 2003.

Results before and after the policy change are presented in terms of probabilities for various combinations of labour supply and childcare. In accordance with features of Norwegian markets for non-parental care, we distinguish between centre-based care and other paid-care alternatives. The simulated probabilities are derived by calculating the average probability for each state, based on the individual choice probabilities.

Similarly, with respect to descriptions of effects on income distributions: measures of incomes are obtained by calculating average expected equivalised disposable income for each household member, before and after the policy reform. The reduction in prices will increase demand for centre-based care, and it might be unrealistic allowing mothers to choose freely under the prevailing conditions in the market for care at centres, even though the "childcare compromise" aims at ending waiting lists for centre-based care. Under the assumption that the degree of rationing is at the same level as in the reference system, we expect that the depicted rate cuts will induce changes as described in Figure 3. The probability for parental care/home work is reduced, and the use of full-time work/childcare centre increases substantially. In total, labour supply increases by about two hours per week on average, or about 8 percent. This corresponds to an increase of about 7,000 man-years.

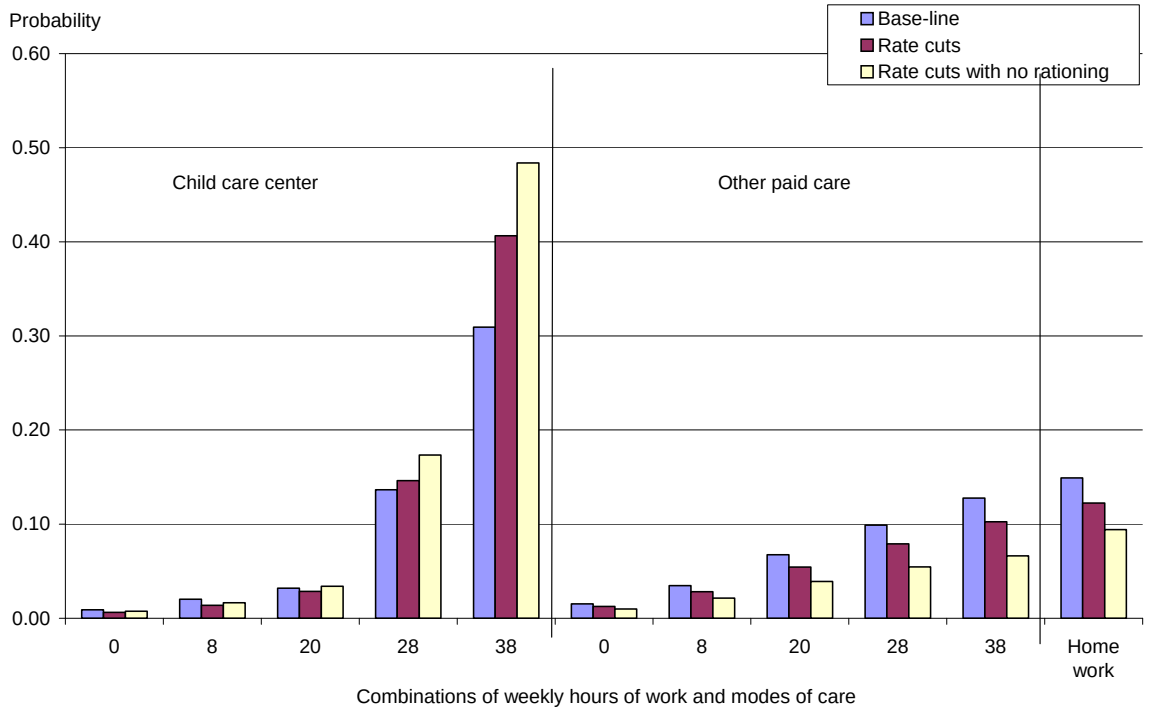
Figure 3 also shows the probabilities for an alternative where the rate cut is combined with a no-rationing assumption, thus, simulating the total effect of the "childcare compromise". We see that the behavioural effects are substantially stronger when removing the rationing constraint. For this alternative, the overall effect on hours of work is an increase in labour supply by about 13 percent, or approximately 12,000 man-years.

[24] Another alternative would be to abolish the home care allowance.

[25] The future inflation-regulated maximum fee is set at NOK1,750. In this paper, for the 2003 simulation, we employ the NOK1,500 rate.

[26] Fees at privately owned centers are usually somewhat above those owned by local authorities.

Figure 3. Probabilities in base-line system compared to probabilities when maximum fees at childcare centres are set at NOK1,500

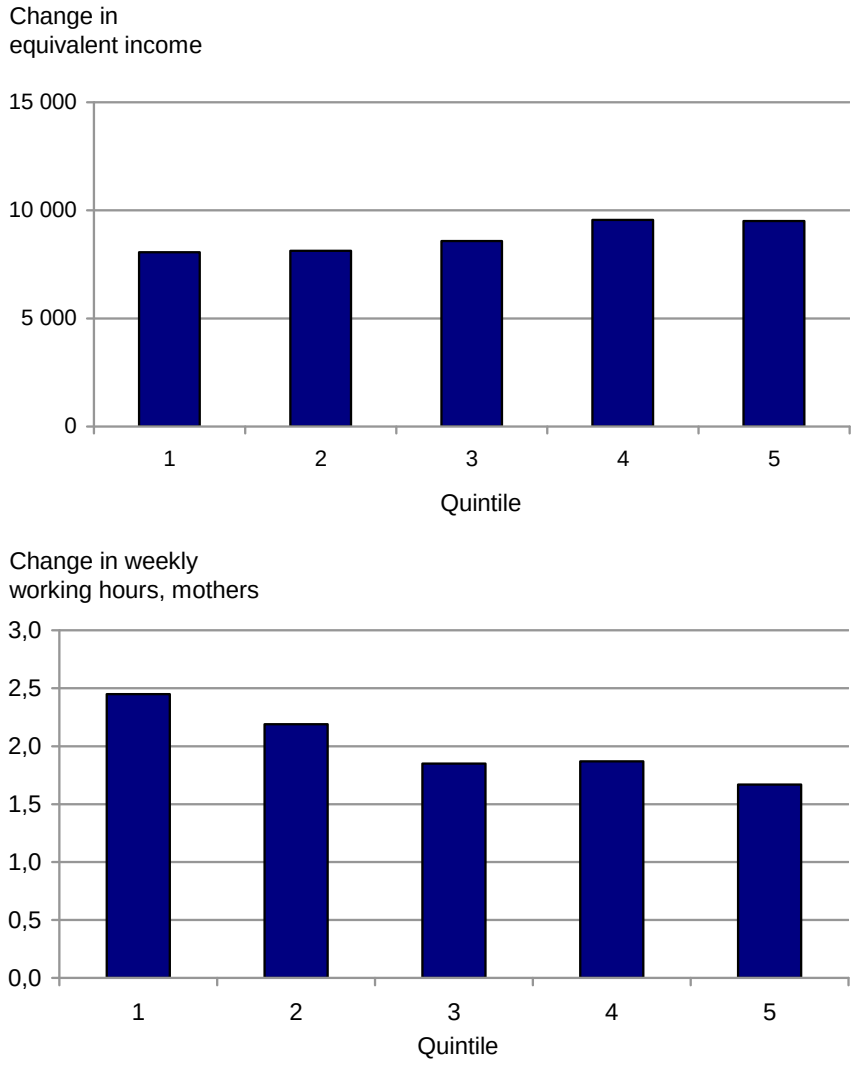


The effects of fee reductions on the distribution of incomes in the case of unchanged rationing are shown in the upper panel of Figure 4. The effects on incomes can be decomposed into two sources: firstly, the reforms affect household incomes in a direct way, which refers to the effect on disposable income before behavioural adjustments. Secondly, alterations in the tax-benefit system make the mothers adjust behaviour both with respect to labour supply and the choice of childcare alternatives. These two effects are added together to obtain the total effect on incomes.

The distributional gains, described in Figure 4, reflect that the indirect effects through working hours responses and changes in the use of childcare centres are larger at the low end of the income distribution, see the lower panel of Figure 4, while the direct effects are more significant among high-income families, as there is a positive relationship between income and use of centre-based childcare in the pre-reform situation. Combining the two effects, benefits are larger for high-income quintiles compared to the other quintiles, which confirms that this reform is not very beneficial for families at the low end of the income distribution.

According to official planning documents (Innst. S. nr. 250, 2002-2003), total costs of the childcare compromise are approximately NOK3.15 billion. We estimate the costs of ending queues when fees are unchanged at NOK1.1 billion, which implies that rate reduction costs amount to approximately NOK2 billion. This latter figure reflects both the 8 percent rise in the demand for care in centres and the direct effect of reduced fees (for unaltered demand). Moreover, we find that tax revenues are expected to increase by about NOK740 million, due to the broadening of the tax base that follows from increased female labour supply. The net effect on government expenditure of rate cuts is then about NOK1.250 billion. This illustrates the importance of taking revenue changes through labour supply adjustments into account when discussing changes in family policies.

Figure 4. Effects on income distribution and on distribution of weekly working hours from fee reductions, Norway



This example clearly points out some of the dilemmas when designing family support schemes: the fee reductions encourage female labour supply, but this labour supply stimulating policy change does not have advantageous distributional effects, at least with respect to the income distribution. That is, this example illustrates that there might be trade-offs between distributional ambitions and objectives to attract more women to market work.[27] We will return to this issue in Section 4.3, after discussing policy changes to the Australian family support schemes in Section 4.2.

4.2 Improving labour supply incentives in Australia

As discussed in Section 3, income testing is another important policy design issue where the two countries have chosen different policy directions: Norway basically provides universal payments to families and subsidises childcare for all families who make use of it, whereas family payments and childcare subsidies in Australia are much more targeted at families at the lower end of the income range. Subsection 4.2.1 therefore discusses the effect of changing the

[27] Whether this also improves economic efficiency is a more complicated issue, briefly discussed in Section 2.

2002-03 family payments and childcare subsidies, so that the payments are no longer withdrawn with increased income. The 2002-03 payments were very similar to the current situation, with the exception of the Child Care Tax Rebate, which was not introduced until 2004-05. In addition, as a comparison to the simulation for Norway, we simulate the effect of a decrease in formal childcare fees by 50 percent in Subsection 4.2.2. This change is equivalent (percentage wise) to the simulation for Norway in Section 4.1.

4.2.1 Abolishing all income tests in family payments and childcare subsidies

In this section, we simulate the effect of not having any income tests to qualify for Family Tax Benefits or Child Care Benefits. The cost to the government of implementing this for the whole population (including sole parents), when labour supply effects are not taken into account, is AU$9.504 billion in Family Tax Benefit payments and Rent Assistance.[28] It is clear that if we do not want to reduce the support for low-income families and if we do not want to income test family payments, then the additional cost to government is going to be substantial, even if labour supply responses will counteract costs; more on that shortly.

Using behavioural microsimulation, we can assess the effect of this policy on couples' labour supply. The labour supply model only predicts the labour supply changes for wage and salary workers between 15 and 64 years of age with dependent children under 18 years of age. Those who are self-employed, full-time students or disabled remain at their observed labour supply in the simulation. The results show that women respond more than men to the reduced marginal effective tax rates resulting from abolishing all income tests associated with Family Tax Benefits and Child Care Benefits. Women are usually more responsive to financial incentives and they are also more likely to be currently out of the labour force. Abolishing income testing on these payments will make it more attractive to enter the labour force by reducing the accumulation of withdrawal rates, which are added to the income tax, faced by this group. However, the effects are rather modest: on average mothers increase their average working hours by 0.67, reflecting that the labour supply of Australian mothers is less elastic than the labour supply of Norwegian mothers. A smaller positive effect of 0.24 hours on average per week is found for men.

When the labour supply responses are taken into account, the overall cost to government decreases, since labour supply of partnered men and women are both expected to increase. The total cost of the policy change is predicted to be AU$9.247 billion of additional Family Tax Benefit payments and Rent Assistance for couple families and AU$348 million in additional childcare subsidies.

Taking into account the additional income tax revenue and reduced income support payments, the cost to the government for introducing this policy change for couple families alone would be AU$8.799 billion in additional government expenditure, and an additional AU$406 million in childcare subsidies. The latter have increased due to the expected increase in labour force participation which results in an increase in the use of childcare. The combined expenditures are thus reduced with AU$390 million due to increased labour supply. It is clear that the increased labour supply only offsets a very small proportion of the total cost of introducing universal family payments.

Examining the distributional impact of this policy change for all families with dependent children aged under 18 years of age, when labour supply is fixed, there is a small increase in the Gini coefficient from 0.247 to 0.253 and a small increase in the decile ratio from 2.949 to 3.114. As expected, the concentration index for family payments increases from -0.379 to -0.040, indicating that the payment is now less targeted towards low-income families. Focussing on families with preschoolers only, the effects are somewhat larger: the

[28] To some extent, Rent Assistance is linked to receipt of the maximum rate of Family Tax Benefit.

Gini increases from 0.248 to 0.258 and the decile ratio increases from 2.764 to 2.958. Similar to the family payment concentration index, the concentration index for childcare subsidies increases from -0.036 to 0.214, indicating a substantial change in the distribution of child care subsidies after the policy change.

Allowing for labour supply responses and focusing on couple families only, Table 6 shows that families in the higher quintiles receive on average a larger increase in their equivalised disposable income than families in the lower quintiles. However, when labour supply changes are not allowed, the change in income would have been even lower for the lowest quintile relative to the highest quintile. This indicates that the lower quintiles are more likely to change labour supply due to the policy change than the higher quintiles. As a result, they benefit more from the policy change than they would have without changing their labour supply. Similar to the results for Norway, Table 6 shows that the direct effects of the policy change (presented in the first row) are higher for the higher quintiles whereas the indirect effects (through changed labour supply) are higher for the lower quintiles. The combined effect (second row) remains highest for the top quintile, as expected.

Table 6 Distributions of income and labour supply changes arising from abolished income testing, Australia[a]

Change in:	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
disposable income ($/week)					
for fixed labour supply	6.92	17.23	43.82	56.98	64.20
allowing for labour supply changes	28.84	39.14	62.78	68.98	75.53
average hours worked (men)	1.32	0.20	0.03	-0.03	-0.13
average hours worked (women)	1.18	1.48	0.65	0.53	0.05
labour force participation rate (men)	2.6	-0.1	0.0	-0.0	-0.1
labour force participation rate (women)	3.7	4.9	1.9	1.3	0.4

Note a: By quintiles of equivalised disposable income unit income.

Table 6 also reveals some interesting differences between mothers and fathers in terms of the distributions of changes in working hours and labour force participation. Fathers belonging to the upper quintiles have very small (negative) responses to the changes, whereas mothers' responses remain larger (and positive). The reason for this difference is that households in the higher quintiles are much more likely to contain men who are already participating in the labour force and work substantial hours, thus offering less scope for increases in labour supply, whereas any of the quintiles are likely to contain families with women who are not working or working low hours. However, for both groups labour supply responses are lower in the higher quintiles than in the first two quintiles.

4.2.2 Decreasing childcare fees

To create a comparable policy change to the one used in the simulation for Norway in 4.1, we simulate a reduction in childcare fees by 50 per cent, which is comparable in relative terms to the reduction in fees simulated for Norway.

The main component of the costs to the government is associated with halving childcare fees. This cost is calculated by taking 50 per cent of the original childcare costs, and assuming that childcare prices do not change as a result of this additional subsidy. For all families together the cost is estimated at AU$0.9 billion per year, and for couple families only, the cost is estimated at AU$0.7 billion per year. Due to the lower childcare fees, childcare subsidies also decrease (assuming that families will not receive more in subsidy than they pay for childcare services).

The labour supply responses are much lower than for the policy change in 4.2.1: an increase of 0.01 hour per week for men and 0.11 hour per week for women. The subsidy

decreases by about AU$50 million per year when taking labour supply into account. Additional tax revenue of AU$49 million and reduced expenditure of AU$48 million is expected due to increased labour supply. Overall, allowing for labour supply responses, government expenditure will be reduced by about AU$86 million.

The income distribution measures with and without accounting for behavioural responses only change very slightly. Comparing the average effect of the policy change by equivalised income quintiles, Table 7 shows clear differences between lower and higher quintiles. Similar to the policy change in subsection 4.2.1, although the change in income is much smaller, the direct effect is highest for the higher quintiles. The indirect effect is higher for men in lower income quintiles and highest for women in the middle income quintiles. As a result this policy change is likely to benefit the higher income quintiles more than the lower income quintiles. As expected, female labour supply is more affected than male labour supply.

Table 7. Distributions of income and labour supply changes arising from childcare fee reductions, Australia

Change in:	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
income ($/week)[a]	2.09	3.25	5.28	9.08	10.07
average hours worked (men)	0.15	0.02	0.01	-0.02	-0.03
average hours worked (women)	0.13	0.26	0.29	0.30	0.14
labour force participation rate (men)	0.3	0.0	0.0	0.0	0.0
labour force participation rate (women)	0.4	0.8	0.8	0.6	0.3

Note a: change in disposable income (net of childcare cost) at fixed labour supply levels. At the moment, the change in income when allowing for labour supply responses cannot be calculated. However, given the small labour supply responses the results will be similar to those assuming fixed labour supply.

4.3 Discussion

The analysis in this paper has brought up some distinct differences between Australia and Norway with respect to family policies, the motivations behind the policies and the economic conditions they work within. The effects of policies aimed at encouraging labour supply are closely tied to such characteristics.

The paper has shown that the scope for increased labour supply is higher in Australia than in Norway, since labour force participation rates of Australian mothers are substantially below the Norwegian levels. Moreover, part-time ratios are higher in Australia. Different designs of family support schedules are likely to contribute to this (or are at least supporting these arrangements). The labour supply of Australian mothers is expected to increase when we remove the income testing of Family Payments and childcare subsidies, with 2.1 percentage points for the participation rate and 0.67 hours per week in average working hours. The labour supply of fathers increases to a much lesser extent. The main reason for effects not being stronger is that Australian mothers are not found to be very responsive with respect to changes in childcare costs.

From an income redistributional perspective, Australian family policies play a major role in alleviating income dispersion, whereas Norwegian support schedules work in an economy which starts from a lower income inequality before family transfers. For instance, the Gini coefficient for income inequality among Australian families with children aged between 0 and 17 years of age increases from 0.25 to 0.32 when family payments are excluded from post-tax income, which is a substantial increase. With its universal design, the Norwegian Child Benefit does not redistribute to the same extent, as is clearly illustrated by the much smaller increase in the Gini coefficient when removing it, compared to what is observed for Australia. It is reasonable to hypothesise that low income inequality, before making any transfers, facilitates support schemes with less advantageous redistributional

effects. As shown, Norway is currently investing even more money in the child care sector through the fee reductions following the "childcare compromise". These are subsidies that to a large extent favour high-income families.

The Norwegian transfer system is more expensive than the Australian transfer system. The overall tax level is higher in Norway and a substantial part of this revenue is transferred to families with children. Adding to the expenses is the fact that parents of children aged 1-2 years receive support for all care alternatives; that is, care by parents at home and care by childminders are subsidised through the home care allowance. Given the already high labour force participation of Norwegian parents and the weak income redistributional performance of fee reductions, there are reasons to question the introduction of further labour supply incentives, such as the fee reductions of the "childcare compromise". There appears to be relatively little gain at a rather high cost. However, this initiative could be seen as an investment in education providing an additional or alternative justification for the expenditure. This idea is supported by the move of the responsibility for child care policies from the Ministry of Children and Family Affairs to the Ministry of Education. As a result, the combination of low fees and close to 100 percent coverage for centre-based care (at least for children aged between 3 and 5 years) could be interpreted as a move to include pre-school care as part of publicly provided education in Norway.[29]

Next, one may ask if the Nordic model is a system to which Australia should aspire; a question also put forward by Datta Gupta *et al.* (2006) more generally (that is, without a focus on Australia). Given the evidence presented here, such as low elasticities and the limited changes in labour supply when simulating the effects of policy changes towards the Nordic system, the substantial increases in female labour supply without major interventions over the past decades[30], and given the inequality of pre-tax and transfer income, it cannot be ruled out that the continued use of family policies to redistribute income may be preferable over a more universal system in the Australian context. The argumentation of Kaplow (2007), regarding the effects of policies on government revenue and subsequent effects on income taxation (as discussed in Section 2), can also be interpreted in support of this view. Thus, even though Australian and Norwegian economies are similar in several ways, the evidence presented here does not provide strong support for a move towards the Norwegian system in Australia. It might cost too much in terms of higher taxes and less income redistribution relative to what it is expected to deliver in terms of labour supply.

However, high and continually rising prices for non-parental care in Australia may prevent low-income mothers to participate in the labour market. Perhaps the alternative of in-work benefits similar to those in the US and UK schedules are worth considering as examples of labour supply incentives that fit within the Australian system by specifically targeting low-income households. Such alternatives usually achieve more additional labour supply per dollar spent, by targeting those who are currently not working or working low hours.[31] In addition, it aids in achieving more equitable income distribution outcomes. Alternatively, linking additional childcare subsidies to a certain level of participation in the labour force may achieve a similar more favourable labour supply response and as a result a lower cost to the government (see Kalb and Lee, 2007b).

Finally, another aspect worth mentioning in relation to the Australian support system is compliance and administration costs. The income testing, in particular, complicates the

[29] This reinforces the need for more information about social and cognitive outcomes of early education systems.
[30] In the past 7 years, there has been a reduction in the withdrawal rate of the single parenting payment in Australia, encouraging part-time work of single parents. Smaller changes were an increase in the income range where income support of partnered parents was withdrawn and the simplification of family payments avoiding an accumulation of withdrawal rates.
[31] See Buddelmeyer *et al.* (2007) for results on several simulations of introducing a tax credit in Australia.

administration of income support payments requiring authorities to check incomes and assets of applicants, which is likely to generate substantial costs for the authorities to administer and for the tax-payers to comply with the rules. Ideally, such costs should be included when evaluating policies and policy changes, but may be difficult to quantify.

5. Conclusion

The family policy models of Australia and Norway represent two alternatives to the "in-work" type family support systems of the UK and the US, which have been given a lot of attention in the literature. Norwegian policy is based on subsidised non-parental care and universal family income support, whereas Australian support mostly consists of means-tested or income-tested transfers. In this paper we address the question whether there are reasons to change the schedules of Australia and Norway to provide improved labour supply incentives.

The analysis has brought together information about the design of the family support systems and the current economic conditions in the two countries. We show effects on mothers' labour supply, on income distributions and on the costs to government of changing the income support schedules to strengthen labour supply incentives. It is shown that the reduced fees in Norway encourage female labour supply, but the labour supply stimulating policy change does not have advantageous distributional effects, at least with respect to the income distribution. That is, this simulation illustrates that there might be trade-offs between the aim of redistributing incomes and the objective to attract more women to market work. Since the amount of resources being transferred to this part of the population is already substantial in Norway, there are reasons to question further use of revenues for this group.

The results for Australia support the same view: labour supply encouraging policy changes are costly, have detrimental distributional effects and the gains in terms of working hours are limited. The abolition of all income testing of all family payments and childcare subsidies is found to be very costly if we do not want to reduce the support for low-income families. Furthermore, a large proportion of the additional expenditures are transferred to families at the high end of the income range, similar to the Norwegian simulation.

The lack of substantial distributional gains from labour supply adjustments is also shown when simulating a reduction in the childcare fees in Australia with a similar proportion (50 per cent) as in the simulation for Norway. Even though labour supply responses are higher at low levels of income, the effects are too modest to have a substantial effect on income distributions. Again, the additional expenditure is expected to benefit mostly those at the higher end of the household income range.

Despite the expected lack of success of introducing Nordic style family income support there remains a concern in Australia regarding relatively low labour force participation rates of mothers. High and continually rising prices for non-parental care in Australia may prevent low-income mothers to participate in the labour market. It is suggested that more targeted rather than universal payments may be more appropriate in the Australian context, in which there is more inequality in pre-tax incomes and in which most transfers are tightly targeted towards low-income households. Perhaps in-work benefits similar to those in the US and UK are worth considering as examples of labour supply incentives that fit within the Australian system. Alternatively, linking additional childcare subsidies to a certain level of participation in the labour force may achieve favourable results. These alternatives may achieve more additional labour supply per dollar spent (resulting in a lower cost to the government) and may aid in achieving more equitable income distribution outcomes.

References

Aasness, J., J. K. Dagsvik and T. O. Thoresen (2007): "LOTTE - The Norwegian Tax-Benefit Model System", in A. Gupta and A. Harding (eds.), *Modelling Our Future: Population Ageing, Health and Aged Care*, International Symposia in Economic Theory and Econometrics Volume 16, Amsterdam: Elsevier, 513–518.

Acs, G., and E. Toder (2007): Should we Subsidize Work? Welfare Reform, the Earned Income Tax Credit and Optimal Transfers, *International Tax and Public Finance*, vol. 14, 327–343.

Anderson, P.M. and P.B. Levine (1999): Child Care and Mothers' Employment Decisions, Working Paper No. 7058, National Bureau of Economic Research.

Australian Bureau of Statistics (ABS) (2005) *Taxation Revenue, Australia (reissue), 2003-04*, Catalogue no. 5506.0, Canberra.

ABS (2006a): *Average Weekly Earnings, Australia*, Catalogue No. 6302.0 (Table 3), Canberra.

ABS (2006b): *Consumer Price Index, Australia*, Catalogue No. 6401.0, Canberra.

ABS (2006c): *Yearbook Australia, 2005*, Catalogue no. 1301.0, Canberra.

Averett, S.L., Gennetian, L.A. and Peters, H.E. (2005): Paternal child care and children's development, *Journal of Population Economics*, vol. 18, 391-414.

Averett, S.L., Peters, H.E. and Waldman, D.M. (1997), Tax Credits, Labor Supply, and Child Care, *The Review of Economics and Statistics,* vol. 79, 125-135.

Berger, L.M., Hill, J. and Waldfogel, J. (2005): Maternity Leave, Early Maternal Employment and Child Health and Development in the US, *The Economic Journal*, vol. 115, F29–F47.

Bergstrøm, T., and S. Blomquist (1996): The Political Economy of Subsidized Day Care, *European Journal of Political Economy*, vol. 12, 443-457.

Blau, D.M. and A.P. Hagy (1998): The Demand for Quality in Child Care, *Journal of Political Economy*, vol. 106, 104–46.

Blomquist, S. and V. Christiansen (1995): Public Provision of Private Goods as a Redistributive Device in an Optimum Income Tax Model, *Scandinavian Journal of Economics*, vol. 97, 547–567.

Blundell, R., A. Duncan, J. McCrae and C. Meghir (2000): The Labour Market Impact of the Working Families' Tax Credit, *Fiscal Studies*, vol. 21, 75–104.

Brewer, M., A. Duncan, A. Shephard and M.J. Suárez (2006): Did Working Families' Tax Credit Work? The Impact of In-work Support on Labour Supply in Great Britain, *Labour Economics*, vol. 13, 699–720.

Brink, A., K. Nordblom and R. Wahlberg (2007): Maximum Fee vs. Child Benefit: A Welfare Analysis of Swedish Child-Care Fee Reform, *International Tax and Public Finance*, vol. 14, 457–480.

Buddelmeyer, H., Creedy, J. and G. Kalb (2007): *Tax Policy Design and Behavioural Microsimulation Modelling*, Cheltenham: Edward Elgar.

Buhmann, B., L. Rainwater, G. Schmaus and Smeeding, T.M. (1988): Equivalence Scales, Well-being, Inequality, and Poverty: Sensitivity Estimates across Ten Countries Using the Luxembourg Income Study (LIS), database, *Review of Income and Wealth*, vol. 34, 115-42.

Callan, T. and A. van Soest (1996): Family Labour Supply and Taxes in Ireland, Economic and Social Research Institute Working Paper No. 78, Dublin, Ireland.

Choné, P., D. le Blanc and I. Robert-Bobée (2003): Female Labor Supply and Child Care in France, CESifo Working Paper No. 1059.

Connelly, R. and J. Kimmel (2003): Marital Status and Full-Time/Part-Time Work Status in Child Care Choices, *Applied Economics*, vol. 35, 761–77.

Creedy, J. (1998): Means-Tested versus Universal Transfers: Alternative Models and Value Judgements, *Manchester School of Economic and Social Studies,* vol. 66, 100–117.

Creedy, J., and G. Kalb (2005): Discrete Hours Labour Supply Modelling: Specification, Estimation and Simulation, *Journal of Economic Surveys,* vol. 19, 697–734.

Datta Gupta, N., N. Smith and M. Verner (2006): Child Care and Parental Leave in the Nordic Countries: A Model to Aspire to, IZA DP No. 2014, The Institute for the Study of Labor, Bonn.

Del Boca, D. (2002): The Effect of Child Care and Part Time Opportunities on Participation and Fertility Decisions in Italy, *Journal of Population Economics,* vol. 15, 549–73

Department of Family and Community Services (2003): *2002 Census of Child Care Services,* Commonwealth of Australia, Canberra.

Department of Families, Community Services and Indigenous Affairs (2005): *2004 Census of Child Care Services,* Commonwealth of Australia, Canberra.

Diamond, P.A. (1980): Income Taxation with Fixed Hours of Work, *Journal of Public Economics*, vol. 13, 101–110.

Doiron D. and G. Kalb (2005): Demands for Childcare and Household Labour Supply in Australia, *Economic Record*, vol. 81, 215–236.

Duncan, A., C. Giles and J. MacCrae (1999): Household Labour Supply, Childcare Costs and In-Work Benefits: Modelling the Impact of the Working Families Tax Credit in the UK, Working Paper, Institute for Fiscal Studies, London.

Ebert, U. (1997): Social Welfare when Needs Differ: An Axiomatic Approach, *Economica*, vol. 64, 233–244.

Eibak, E.E. (2003): Undersøking om foreldrebetaling i barnehagar august 2003, Notater 2003/77, Statistics Norway. (*in Norwegian*)

Eissa, N. and H.W. Hoynes (2004); Taxes and the Labour Market Participation of Married Couples: The Earned Income Tax Credit, *Journal of Public Economics*, vol. 88, 1931–58.

Förster, M.F. and K. Vleminckx (2004): International Comparisons of Income Inequality and Poverty: Findings from the Luxembourg Income Study, *Socio-Economic Review*, vol. 2, 191–212.

Gottschalk, P. and T.M. Smeeding (1997): Cross-National Comparisons of Earnings and Income Inequality, *Journal of Economic Literature*, vol. 35, 633–87.

Gottschalk, P. and T.M. Smeeding (2000): "Empirical Evidence on Income Inequality in Industrialized Countries", in A.B. Atkinson and F. Bourguignon (eds.): *Handbook of Income Distribution*, Vol. 1, New York: Elsevier-North Holland, 261–307.

Graafland, J.J. (2000): Childcare Subsidies, Labour Supply and Public Finance: An AGE Approach, *Economic Modelling,* vol. 17, 209–246.

Gregg, P., Washbrook, E., Propper, C. and Burgess, S. (2005): The Effects of a Mother's Return to Work Decision on Child Development in the UK, *The Economic Journal*, vol. 115, F48–F80.

Gustafsson, S. and F. Stafford (1992): Child Care Subsidies and Labor Supply in Sweden, *Journal of Human Resources*, vol. 27, 204–30.

Heckman, J.J. (1979): Sample Selection Bias as a Specification Error, *Econometrica*, vol. 47, 153–161.

Hotz, V.J. and J.K. Scholz (2003): "The Earned Income Tax Credit", in R. Moffitt (ed.): Means-Tested Transfer Programs in the United States, Chicago and London: The University of Chicago Press.

Håkonsen, L. (2003): Child Care Subsidies and Economic Efficiency, Working Paper no. 17/2003, Telemark Research Institute.

Ilmakunnas, S. (1997): Female Labour Supply and Work Incentives, Labour Institute for Economic Research, Finland.

Immonen, R., R. Kanbur, M. Keane, and M. Tuomala (1998): Tagging and Taxing: The Optimal Use of Categorical and Income Information in Designing Tax/Transfer Schemes, *Economica*, vol. 65, 179–92.

Innst. S. nr. 250 (2002-2003): Innstilling fra familie-, kultur-, og administrasjonskomiteen om barnehagetilbud til alle - økonomi, mangfold og valgfrihet. (*In Norwegian*)

Jaumotte, F. (2003): Labour Force Participation of Women: Empirical Evidence on the Role of Policy and other Determinants in OECD Countries, *OECD Economic Studies*, No. 37, 2003/2.

Kalb, G. (2002): Estimation of Labour Supply Models for Four Separate Groups in the Australian Population, Melbourne Institute Working Paper No. 24/02, University of Melbourne.

Kalb, G. (2007): Children, Labour Supply and Childcare: Challenges for Empirical Analysis, Melbourne Institute of Applied Economic and Social Research Working Paper No. 15/2007.

Kalb, G. and W.-S. Lee (2007a): Childcare Use and Parents' Labour Supply in Australia, Melbourne Institute of Applied Economic and Social Research Working Paper No. 13/07, University of Melbourne.

Kalb, G. and W.-S. Lee (2007b): The Effect of an Alternative Childcare Subsidy on Labour Supply: A Policy Simulation, Melbourne Institute of Applied Economic and Social Research Working Paper No. 14/2007, University of Melbourne.

Kalb, G. and R. Scutella (2002): Estimation of Wage Equations in Australia: Allowing for Censored Observations of Labour Supply, Melbourne Institute Working Paper No. 8/02, University of Melbourne.

Kaplow, L. (2007): Optimal Income Transfers, *International Tax and Public Finance*, vol. 14, 295–325.

Keane, M. and R. Moffitt (1998): A Structural Model of Multiple Welfare Program Participation and Labor Supply, *International Economic Review*, vol. 39, 553–589.

Kornstad, T. and T.O. Thoresen (2004): Means-Testing the Child Benefit, *The Review of Income and Wealth*, vol. 50, 29–49.

Kornstad, T. and T.O. Thoresen (2006): Effects of Family Policy Reforms in Norway: Results from a Joint Labour Supply and Childcare Choice Microsimulation Analysis, *Fiscal Studies*, vol. 27, 339–271.

Kornstad, T. and T.O. Thoresen (2007): A Discrete Choice Model for Labor Supply and Child Care, forthcoming in *Journal of Population Economics*.

Lambert, P.J. (2001): *The Distribution and Redistribution of Income*, Third edition, Manchester and New York: Manchester University Press.

Løyland, K. and T.O. Thoresen (2004): En undersøkelse av den registrerte dagmammavirksomheten, Notater 2004/41, Statistics Norway. (*In Norwegian*)

Mehlum, H., K. Moene, and R. Torvik (2006): Institutions and the Resource Curse, *The Economic Journal*, vol. 116, 1–20.

Michalopoulos, C. and P.K. Robins (2000): Employment and Child Care Choices in Canada and the United States, *Canadian Journal of Economics*, vol. 33, 435–70.

The Ministry of Children and Equality (2006): St.prp. nr. 1 (2006-2007). (*In Norwegian*)

The Ministry of Education and Research (2005): St.meld. nr. 28 (2004-2005). (*In Norwegian*)

OECD (2002): Employment Outlook, Paris.

OECD (2006a): OECD Factbook 2006 – Economic, Environmental and Social Statistics, Paris.

OECD (2006b): Revenue Statistics 1965-2005, 2006 Edition, Paris.

OECD (2006c): OECD Employment Outlook. Boosting Jobs and Incomes, Paris.

OECD (2006d): OECD Employment Outlook. Boosting Jobs and Incomes. Supplementary Material (www.oecd.org/els/employmentoutlook/statsupplement).

Powell, L.M. (1997), 'The Impact of Child Care Costs on the Labour Supply of Married Mothers: Evidence from Canada', *Canadian Journal of Economics*, vol. 30, 577-594.

Ribar, D.C. (1995): A Structural Model of Child Care and the Labor Supply of Married Women, *Journal of Labor Economics*, vol. 13, 558-597.

Rosen, S. (1996): Public Employment and the Welfare State in Sweden, *Journal of Economic Literature*, vol. 34, 729–740.

Saez, E. (2002): Optimal Income Transfer Programs: Intensive versus Extensive Labour Supply Responses, *The Quarterly Journal of Economics*, vol. 117, 1039–1073.

Statistics Norway (2005): Household income statistics (http://www.ssb.no/english/subjects/05/01/ifhus_en/).

Statistics Norway (2006): Population (http://www.ssb.no/befolkning_en/).

Van Soest, A. (1995): Structural Models of Family Labor Supply: A Discrete Choice Approach, *Journal of Human Resources*, vol. 30, 63–88.

Walker, J. (1996): Funding Child Rearing: Child Allowance and Parental Leave, *The Future of Children*, vol. 6, 122–136.

Wrohlich, K. (2006): Labor Supply and Child Care Choices in a Rationed Child Care Market, IZA DP No. 2748, The Institute for the Study of Labor, Bonn.

Appendix A: Estimation of decision model for families with pre-schoolers, Norway

A.1 Joint Labour Supply and Childcare Choice Model

According to traditional models of labour supply, hours of work is the primary choice variable, and this variable can be adjusted continuously (given the pre-tax wage rate). Thus, one ignores other aspects of labour supply that might be at least equally important, such as job location, type of work and other factors related to job satisfaction.

Moreover, when modelling the labour supply decisions of parents of preschoolers one needs to take into consideration that market work participation by both parents typically implies a demand for non-parental childcare, which entails (pecuniary) costs and affects the well-being of children. Recent suggestions of decision-making frameworks of joint labour supply and childcare choices include, e.g., Blau and Hagy (1998); Michalopoulos and Robins (2000); Connelly and Kimmel (2003). One should also consider the possibility that the family might be constrained in the market for non-parental care, as well as in the labour market. The childcare availability issue is emphasized by Gustafsson and Stafford (1992) and Del Boca (2002) with respect to labour supply responses of Swedish and Italian mothers, respectively.

A model for families with preschoolers for Norwegian families, laid out in Kornstad and Thoresen (2007), starts out from the assumption that jobs and various care alternatives are characterized by a number of pecuniary and non-pecuniary attributes. Parents' choice of job is influenced not only by working hours and wage rates, but also by the set of non-pecuniary attributes characterizing job satisfaction. Similarly, childcare options vary with regards to facilities, quality of staff, etc., as well as opening hours and fees. Many of these attributes are fixed for a given job or childcare option. For instance, opening hours are fixed at childcare centres, as frequently are hours of work and job satisfaction factors. A desire to alter features such as these would most likely imply a job change or a change of care provider. Hence, we assume that labour supply and choice of childcare are outcomes of discrete choices from finite sets of jobs and childcare arrangements, where each job is assumed to have fixed working hours, a wage rate and a number of non-pecuniary characteristics, and each care alternative has fixed opening hours, a care fee and specific quality attributes.

We do not observe all variables and choice opportunities that are relevant to the decision-makers. For instance, the quality of non-parental childcare is latent. Nor do we observe the variables determining job satisfaction apart from hours of work and wage rates for mothers that participate in market work. To capture the effects of these non-pecuniary attributes on preferences, alternative specific stochastic error terms are introduced, which are assumed to be both independent of observed characteristics and of each other.

As described in Section 3, a particular feature of the Norwegian market for non-parental childcare that is considered in the model specification is that it can be divided into two submarkets: a market for care at day care centres and a market for other types of paid care, dominated by childminders. The two markets differ in many respects, such as eligibility for public support, parental fees, opening hours and rationing, and should therefore be treated as separate markets. Availability is an important issue of the market for care at centres, which our modelling approach is well-suited to handle. Although there has been substantial growth in the number of places at day care centres over the past few decades, there are still queues, at least in some municipalities. However, coverage varies across municipalities. Based on these characteristics of the market for childcare, we divide all childcare arrangements into three different modes of care: care at centres $(m=1)$; care by other paid providers $(m=2)$; and own/parental care $(m=3)$. Similarly, jobs are divided into groups according to working hours.

We distinguish between non-participation ($j=1$); three types of part-time work; corresponding to 1–16 hours per week ($j=2$); 17–24 hours per week ($j=3$); 25–32 hours per week ($j=4$); and full-time work, 32+ hours per week ($j=5$).

Table A1 summarizes our categorization of working hours and care alternatives. Note that since we want to elaborate the point that market work for mothers must imply some sort of non-parental care, we assume that there is a fixed link (Ilmakunnas, 1997) between hours of market work and hours of non-parental care for $j>1$. This means that the male is not providing care during the working day.[32] However, note that we do not exclude the possibility of home-working mothers employing non-parental care alternatives, see the second column in Table 1. Thus, $j=1$ does not imply $m=3$, i.e., home work does not imply parental care. The combinations $j=1$ and $m=1$ or $j=1$ and $m=2$ suggest that non-parental care might be seen as a sole contributor to childcare quality, not only as a means of custody.[33] Leisure is otherwise assumed to contribute to the well-being of preschoolers, since mothers typically spend time with children when not working in the market.

Table A1. Classification of jobs and childcare arrangements

	Weekly working hours / weekly childcare hours (j)				
Mode of care (m)	0	1-16	17-24	25-32	32+
Day care centre	*j*=1, *m*=1	*j*=2, *m*=1	*j*=3, *m*=1	*j*=4, *m*=1	*j*=5, *m*=1
Other paid care	*j*=1, *m*=2	*j*=2, *m*=2	*j*=3, *m*=2	*j*=4, *m*=2	*j*=5, *m*=2
Parental care	*j*=1, *m*=3	-	-	-	-

As pointed out above, there is a finite number of jobs and childcare arrangements within each cell in Table A1, and the female is assumed to choose the job and childcare arrangement that maximizes preferences subject to the budget constraint. It follows from our model specification that the probability of choosing a job and childcare arrangement of category (*jm*) depends on the number of jobs and care arrangements offered within this group, relative to the numbers in other groups. In the simulations it is assumed that the relative numbers of feasible opportunities in the various groups in Table A1 remain fixed.

To consider the effects of rationing in the market for care in centres, we employ information from respondents on their access to such care. Mothers that report unsuccessful applications for centre-based care have a more limited choice set since they cannot choose care at centres, i.e., the choice opportunities in first line of Table A1 are not available. Unfortunately, we do not observe to what extent the other mothers are rationed. Thus, it is assumed that other non-users of centre-based care are not rationed. The effect of ending queues is discussed below.

Let us briefly present the main features of the model more formally. A more detailed model description can be found in Kornstad and Thoresen (2007). The discrete choice framework is based on the following: Let $U(C_{kr},H_k,k,r)=v(H_k,C_{kr})+\varepsilon^*_{kr}$ denote the utility of choosing job *k* from a finite choice set *B* and childcare arrangement *r* from a finite choice set *S*, where C_{kr} is annual consumption/disposable income corresponding to job *k* and childcare arrangement *r* and H_k is hours of work in job *k* for the mother. The stochastic error term takes account of preferences being influenced by non-pecuniary variables, such as quality of care and variables related to job satisfaction. The budget constraint is defined by wage income

[32] As seen in Figure 2 and evident from other data sources, males are predominantly full-time working.
[33] Approximately 3 percent of the parents use non-parental care even if the mother does not work.

(w_k times H_k), family income other than the mother's own earnings (I), the price of non-maternal childcare (Q_r) and taxes (T): $C_{kr} = w_k H_k + I - Q_r - T(w_k H_k, I, Q_r)$. The conversion into the categories described by Table A1 utilizes that the utility of the preferred job/care alternative in B_j and S_{jm} (see Table A1) is distributed as follows:

$$(A.1) \qquad U^*_{jm} \equiv \max_{k \in B_j, r \in S_{jm}} U(C_{kr}, H_k, k, r) \overset{d}{=} \log\left(\sum_{k \in B_j} \sum_{r \in S_{jm}} \exp\left(v(C_{kr}, H_k)\right) \right) + \varepsilon_{jm},$$

where ε_{jm} is i.i.d. according to the standard type 1 extreme value distribution, similar to the distribution of $\varepsilon_{kr} \equiv \varepsilon^*(C_{kr}, H_k, k, r)$, and d denotes equality with respect to distribution. We let the working hours within each hours of work group j be represented by median hours of work, and assume that the following approximation is close:

$$(A.2) \qquad \frac{1}{n_{jm}} \sum_{k \in B_j} \sum_{r \in S_{jm}} \exp\left(v(C_{kr}, H_k)\right) \approx \exp\left(v\left(\tilde{C}_{jm}, \tilde{H}_j\right)\right)$$

where n_{jm} is the number of opportunities in $B_j \times S_{jm}$, $\tilde{H}_j$ is the median working time in hours of work group j, and $\tilde{C}_{jm}$ is consumption, corresponding to working time, $\tilde{H}_j$. Thus, this modelling approach captures that the utility of the preferred job/childcare arrangement depends on the number of opportunities in each category, as discussed above. The choice probabilities corresponding to Table A1 are then given by

$$(A.3) \qquad P_{hjm} = \frac{\exp\left(v\left(\tilde{C}_{hjm}, \tilde{H}_j, X_h\right) + \log\left(n_{jm}/n\right)\right)}{\exp\left(v\left(\tilde{C}_{h13}, \tilde{H}_1, X_h\right) + \log n_{13}\right) + \sum_{i=1}^{5} \sum_{l \in \Omega_h} \exp\left(v\left(\tilde{C}_{hil}, \tilde{H}_i, X_h\right) + \log n_{il}\right)},$$

where

$$\Omega_h = \begin{cases} (1,2) & \text{if household } h \text{ is constrained in the market for care at centers} \\ (1) & \text{otherwise} \end{cases},$$

and X_h is a taste modifying variable and n is the base-line value of number of jobs. In other words, P_{hjm} is the probability that household h chooses a job with hours of work in group j and a childcare arrangement in mode m. In the following, effects of the family policy changes are reported in terms of changes in these choice probabilities. Kornstad and Thoresen (2007) describes in further detail the estimation procedure and the parameter estimates.

A.2 Data

Data from the Home Care Allowance Survey 1998 is employed in the estimation and in the simulation of the model, but in the simulations the data are projected to 2003. They were collected through postal interviews before the reform, with a response rate at 70 percent, and include detailed information on families' connections to work, use of childcare and composition of income. Only married or cohabiting parents with at least one child 1-5 years old are included in the analysis. Families that employ informal care by others, such as

grandparents, are excluded from the analysis. According to our data, only a small number of families have access to this type of care. In addition we exclude families where the mother is either pensioner, student, on maternity leave, or on other types of paid leave. The final sample includes 768 observations. A number of checks have been carried out in order to assess the representativity of the sample. We find that there is close correspondence between the distribution of variables as mothers' education and age, and the number of children in this sample and a much larger sample of families with preschool children, collected from the 1998-wave of the Income Distribution Survey.

Consumption and hours of work are measured annually, and consumption is defined as disposable family income. Post-tax family income in each state is derived by employing a tax benefit model, e.g., taking into consideration that childcare expenditures are deductible, up to a threshold.

In the calculation of disposable income in the various states in the choice set, observations on childcare fees and wage rates are needed. Measures of the fees that the parents face in childcare centres are derived from the Parental Pay Survey 1998. Fees in other paid care alternatives are derived from a survey of childminders' childcare production in 2002 (Løyland and Thoresen, 2004), and adjusted to the 1998 level by the consumer price index. There is close correspondence between measures of average prices in other paid care according to this survey and the Home Care Allowance Survey 1998. Thus, the care prices that families in the present analysis face will vary with respect to modes of care (centres and other paid care), and the centre-based care price measures reflect families' geographical location and discount schemes with respect to siblings.

Table A2. Summary statistics for the sample used in the simulations (N=768)

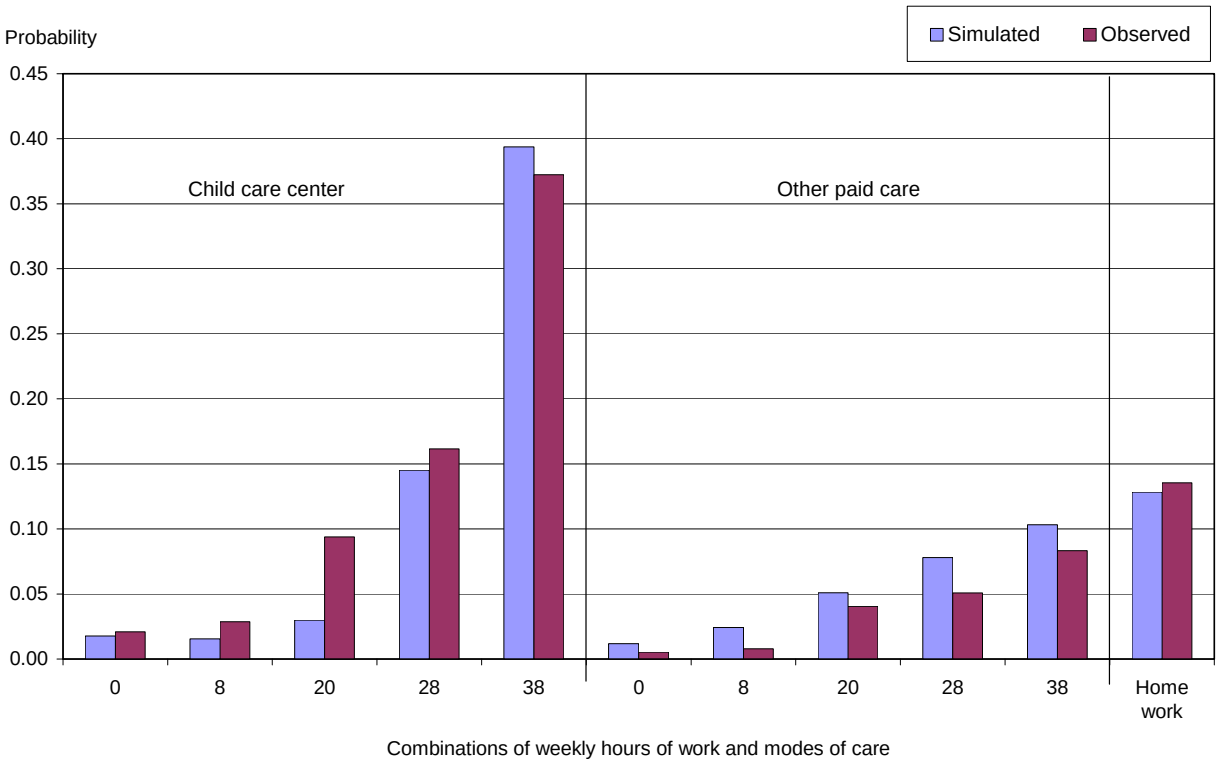
Variable	*Mean*	*Standard deviation*
Household disposable income (NOK)	326,200	89,628
Number of children	2.0	0.98
Mother's weekly hours of work	26.2	13.9
Mother's gross wage rate (NOK)	102.4	17.7
Dummy variable for rationing in the market for care at centres	0.163	0.37
Participation dummy (participation rate)	0.838	0.37
Dummy for part-time work 25-32 hours per week and use of day care centre	0.162	0.37
Dummy for full-time work and use of day care centre	0.373	0.48
Dummy for work at home and parental care	0.136	0.34

Measures of mothers' wages are derived by estimating a wage equation (with log wage as the dependent variable) using Heckman's (1979) selection model. The wage equation is applied both for females that do not work as well as for those working. To consider that wages vary across jobs, we make 30 random draws of the error term from the log-normal distribution for each female. Wages are measured by dividing annual labour income by annual hours of work. Table A2 yields summary statistics for the non-projected data. Household disposable income is derived from the families' actual income in 1998.

Figure A1 shows how well the estimated model fits the data by displaying the actual frequencies of the different combinations of working time and childcare modes and the

corresponding probability distribution based on model simulations. The simulated probabilities are derived by calculating the average probability for each state, based on the individual probabilities from equation (A.3). Despite the tendency to underestimate the probability of employing care at centres for low values of weekly hours of work, the model scores well on this kind of visual evaluation.

Figure A1. The distribution of observed and simulated choices, 11 states. Families with children 1-5 years old



Appendix B: Estimation of a decision model for all couples, Australia

B.1 Two-Step Labour Supply and Childcare Demand Models

Labour supply and childcare demand are estimated in two separate steps. First, a bivariate tobit model is estimated for formal care use and informal care cost (for details, see Doiron and Kalb, 2005). Explanatory variables include amongst others, hours of work, number and age of children, presence of other adults in the household, and price of childcare. The predicted demand for formal childcare and cost of informal childcare from this model is then used to impute childcare costs for households in the SIHC sample at the different levels of labour supply. The budget constraint for each household (in this case allowing for childcare costs) can be constructed using the Melbourne Institute Tax and Transfer Simulator (MITTS), a microsimulation model for Australia. First, for each hours level, a gross income level (together with all transfers and taxes) is computed within the MITTS model. Then, for each household with children of 12 years or younger in the SIHC, a predicted cost of childcare is imputed based on the characteristics of the household (State, urban residency, number and age of children, and calculated gross income). This predicted childcare cost can be generated for each possible hours level allowed in the discrete choice labour supply model.

Net childcare costs are calculated from the predicted gross costs of childcare and the predicted levels of childcare benefits. These are calculated within MITTS based on the characteristics of the households and the predicted formal childcare costs (which are computed from predicted formal childcare demand multiplied by the average childcare fees for that particular household). Any childcare subsidies are deducted from formal costs, before adding the formal and informal costs together. The result is a predicted net childcare cost for each household based on predicted formal demands, average fees per household, total predicted informal care costs and calculated subsidies.

The labour supply model is described in detail in Kalb (2002). Here, we provide an overview only. Given the aim of simulating policy changes with regard to taxes and transfers, priority is given to incorporating all possible details of the taxation and social security system. The approach follows most of the literature in adopting a neoclassical framework: utility is maximised conditional on the total amount of time available to each adult and a household budget constraint. It is expected that utility increases with an increase in leisure and home production time (referred to as leisure for convenience) and income (consumption of all other goods). Households maximise utility by choosing leisure (and hence labour supply) for each adult.[34] The labour supply values for each parent are the endogenous variables in the model. Wage rates, non-labour income (other than taxes and transfers), household composition and other household attributes are exogenous. Specifically, the exogenous factors include the number and ages of children, the age and education level of each parent, and components of income other than labour earnings, transfers and taxes. The rules of the taxation and social security systems are used to obtain the net income of the household arising from its choices of labour supply.

Turning to the choice of functional form, the labour supply function is modelled as a discrete choice. Restricting the number of possible working hours to a limited set of discrete values is done in many other studies (for example, Van Soest, 1995; Keane and Moffitt, 1998; Duncan *et al.*, 1999). The advantage of using a discrete choice framework is that it allows

[34] It is assumed that all non-employed are voluntarily not working and that participants are at their preferred labour supply points.

more complex modelling of the budget constraint. For couple households, the labour supply is derived from the following:

$$\max U(x, l_1, l_2) \quad \text{(B.1)}$$

subject to a time constraint for each adult:

$$l_1 + h_1 = T \quad \text{and} \quad l_2 + h_2 = T \quad \text{(B.2)}$$

$$(h_1, h_2) \in \mathcal{A} \times \mathcal{B}$$

and subject to a budget constraint:

$$x = w_1h_1 + w_2h_2 + y_1 + y_2 + B(c, w_1h_1 + w_2h_2 + y_1 + y_2) - \tau(B, w_1h_1 + y_1, w_2h_2 + y_2, c) - cc(h_1, h_2, c, w_1h_1 + w_2h_2 + y_1 + y_2) \quad \text{(B.3)}$$

where U( ) is the utility function of a two-adult household; l_1 and l_2 indicate the leisure hours (including home production) per week of the husband and wife (married or de facto) respectively; h_1 and h_2 are the hours of work of husband and wife; $\mathcal{A}$ and $\mathcal{B}$ are the sets of discrete points from which values can be chosen for h_1 and h_2; T is the total time available for each person in the household; x indicates net income per week, which is assumed equal to household consumption; w_1 and w_2 are the gross wage rates of husband and wife respectively; y_1 and y_2 are the non-labour incomes of husband and wife; c is a set of household attributes; B(.) is the amount of benefit a household is eligible for given their household characteristics c and household income; τ is the tax function that indicates the amount of tax to be paid; and cc is the childcare cost to be paid.

In the discrete choice case the budget constraint is defined on a discrete set of points $h_1 \in \mathcal{A} = \{0, h_{11}, h_{12}, ..., h_{1m}\}$ and $h_2 \in \mathcal{B} = \{0, h_{21}, h_{22}, ..., h_{2k}\}$ on the interval [0,T], instead of being defined on a continuous set of working hours [0,T].[35] Using these sets, net income x is calculated for all (m+1)×(k+1) combinations of h_1 and h_2. For this limited set of hours, one can then calculate the level of utility generated by each possible combination of hours. The choice of labour supply is simultaneously determined for both adult members of the household. Depending on the choice of utility function, different interactions between household income and the labour supply of adults can be modelled.

Importantly, as we are interested in analysing the effect of varying childcare costs on hours worked, the household budget constraint also incorporates childcare costs, cc. Rather than associating each household with one specific predicted childcare cost amount, recognising the uncertainty in predicted childcare costs, we use a simulated maximum likelihood approach to estimate the labour supply model. This involves repeated draws from the distribution of childcare costs to allow for the uncertainty associated with the childcare costs in this model. The draws are generated by including a draw from the error term when predicting childcare costs and demand using the model. This method provides a more efficient prediction of the childcare costs since it incorporates the variation in unobservables affecting costs based on the estimated variance of these unobservables. A further advantage is that the calculation of the Child Care Benefits is more accurate in this approach, given that the subsidy payable for the average childcare cost is not the same as the average Child Care Benefits based on potential outcomes for childcare costs. In this paper, we present results for the approach where 10 values are drawn from the distribution of the unobservables in the model of hours of formal care and costs of informal care. In other words, 10 draws are taken for each household and the likelihood function for the labour supply model is averaged over

[35] 0, h_{11}, h_{12}, etc represent the discrete values that labour supply can take. Here we have chosen 0, 5, 10, 15,…, 50 hours of labour supply for married women and singles. Given the low number of married men working low part-time hours, they are assumed to choose from 0, 10, 20, 30, 40 or 50 hours.

these draws before being maximised. The optimal hours of work level can be predicted for each draw and an average is taken over the draws. Technically, this involves averaging at a later stage, and over the hours of work estimates rather than the childcare costs estimates.

To deal with unobserved market wages for people who are not working, we estimate their potential wage using a wage equation estimated on workers.[36] A two-stage selection model is used to correct for possible selection bias. Separate wage equations are estimated for married men and married women (see Kalb and Scutella, 2002).

Based on the assumption of utility maximisation for each household and assuming households behave independently, the likelihood function can be written as:

$$\prod_i \Pr(U(x((h_{1i},h_{2i})_r),(h_{1i},h_{2i})_r,\varepsilon_r) \geq U(x((h_{1i},h_{2i})_s),(h_{1i},h_{2i})_s,\varepsilon_s) \textit{ for all } s) \qquad \text{(B.4)}$$

where r stands for the combination h_1 and h_2 that is preferred; s stands for all possible combinations that can be made, given the discrete choice sets for hours worked; and ε_r and ε_S represent error terms. Adding an error term to the utility function prevents contributions to the likelihood of any data point from becoming zero, by allowing for optimisation errors. Choosing an extreme value specification for the error term in (B.4) results in a multinomial logit model.

Following Keane and Moffitt (1998), a quadratic specification is used for the utility function. This utility function is simple but quite flexible in that it allows for the leisure of each person and income to be substitutes or complements. Parameters representing fixed costs of working are included in the utility when positive labour choices are made. The fixed cost of working parameter, γ, is included in the income variable x to indicate the cost of working versus non-participation (following Callan and Van Soest, 1996). As a result of the inclusion in x, this cost of working parameter is measured in dollars per week. The utility is specified as follows:

$$\begin{aligned} U(x,h_1,h_2) = {} & \beta_x(x-\gamma_1-\gamma_2)+\beta_1 h_1+\beta_2 h_2+\alpha_{xx}(x-\gamma_1-\gamma_2)^2+\alpha_{11}(h_1)^2+\alpha_{22}(h_2)^2+ \\ & \alpha_{x1}(x-\gamma_1-\gamma_2)h_1+\alpha_{x2}(x-\gamma_1-\gamma_2)h_2+\alpha_{12}h_1h_2 \end{aligned} \qquad \text{(B.5)}$$

where α.. and β. are preference parameters and γ_1 and γ_2 are the fixed cost of working parameters to be estimated (where the indices 1 and 2 denote the husband and wife respectively). The fixed cost is zero when the relevant person is not working.

We include observed heterogeneity by allowing β_1, β_2, β_x, γ_1 and γ_2 to depend on the personal and household characteristics listed above. Unobserved heterogeneity is added to β_1, β_2, β_x, and γ_2, in the form of a normally distributed error term with zero mean and unknown variance. Finally, the model is estimated using simulated maximum likelihood. In estimation, the unobserved heterogeneity parameters were found to be insignificant and were dropped.

B.2 Data

B.2.1 Data on Childcare Cost and Use

Data from wave 2 of the Household, Income and Labour Dynamics in Australia (HILDA) Survey (conducted in 2002) are first used to estimate the demand for childcare. Subsequently, data from the 2002 Survey of Income and Housing Costs (SIHC) are augmented with parameters from the childcare demand models, and used for labour supply modelling. The reason for using a two-stage estimation approach involving two data sets is to allow incorporation of detailed information on the Australian tax and transfer system. For this the Melbourne Institute Tax and Transfer Simulator (MITTS), which is based on the SIHC, is

[36] This follows the approach used by Van Soest (1995) and many others in the area.

needed. Work is underway to allow use of the HILDA data as the base file in MITTS. In principle, a simultaneous childcare demand and labour supply model could then be estimated and the entire analysis could be based on HILDA.

Table B1 shows the amount of childcare used based on wave 2 of the HILDA survey, broken down by family type and age of youngest child. As is to be expected, families with younger children are more likely to use childcare and families with more adults in paid employment are more likely to use childcare.

Table B1 Percentage Using Care by Age of the Youngest Child and Labour Force Status in Wave 2 of HILDA (2002)[a]

Age of youngest child:	0-2	3-4	5-9	10-11	**Total**
Couple families: Two workers (%)	83.0	92.1	64.1	46.2	70.9
Sample size (unweighted)	227	126	320	118	791
Couple families: One worker (%)	43.3	49.1	37.6	10.3	40.7
Sample size (unweighted)	254	92	112	34	492
Couple families: No workers (%)	37.2	32.6	18.5	0.0	27.8
Sample size (unweighted)	39	8	27	7	81
All couple families[b] (%)	60.7	71.5	54.2	35.9	57.1
Sample size (unweighted)	569	252	513	182	1516

Notes: a) The numbers in the table are weighted to represent the Australian population.
b) This group includes those families with unknown labour force status.

Table B2 compares the average hours used by the different types of household based on HILDA, broken down by employment status and age of youngest child. It also presents the average proportion of families who pay for childcare and the average hourly cost. Couple families use on average 12.85 hours of childcare and pay on average $3.02 per hour. Workers pay more than non-workers which is probably due to the means-tested Child Care Benefit. As expected, the highest hours of childcare are for pre-school aged children (under age 5).

Table B2 Weekly Hours and Hourly Cost of Childcare

	Employment Status				**Age of Youngest Child**			
	Two workers	One worker	No workers	Total	0-2	3-4	5-9	10-11
Average weekly hours of childcare for all	15.69	5.54	3.21	11.01	14.72	19.01	6.08	3.36
Proportion that pays for childcare	0.60	0.53	0.59	0.58	0.66	0.79	0.44	0.22
Hourly cost (in $) (if non- zero)	3.23	2.38	1.75	3.02	2.68	3.14	3.45	3.71

Note: The numbers in the table are weighted to represent the Australian population

B.2.2 Childcare Fees

An additional external source of data was used to obtain average hourly childcare fees by age of the child and State of residency. Average fees were calculated from the Child Care Census 2002 (Department of Family and Community Services, 2003), weighting the hourly fees of different types of childcare by the number of children of a particular age using that type of childcare. The hourly fees are calculated for the different services by dividing the weekly fees of Private Long Day Care and Community Long Day Care by 50 hours, Family Day Care by 35 hours, and Out of School Hours Care (OSHC) services by the average time of a session. Table B3 presents the average fees for four age groups by State. These fees are of a similar size as the average hourly cost presented in Table B2. The values in Table B3 are used for the analyses to avoid the issue of endogeneity of the observed prices to the demand for childcare.

Table B3 Hourly fees by state/territory and age of child in 2002 (in $)

	Age of child			
States/Territories	***5+***	***3-4***	***2***	***0-1***
New South Wales	3.57	4.00	4.22	4.56
Victoria	3.35	3.84	3.85	3.89
Queensland	3.12	3.56	3.63	3.70
South Australia	3.43	3.96	3.91	3.97
Western Australia	3.78	3.71	3.77	3.88
Tasmania	4.12	4.28	4.25	4.28
Northern Territory	4.59	3.67	3.68	3.76
Australian Capital Territory	4.22	4.30	4.38	4.39
Total	**3.43**	**3.86**	**3.94**	**4.07**

B.2.3 Data on Labour Supply

Weighted summary statistics for the labour supply variables from the 2002 SIHC are given in Table B4. Interviews for the SIHC of 2002/2003 were conducted in the same financial year when interviews for the second wave of HILDA were conducted. It is therefore appropriate to combine information from the two data sets for the estimation of labour supply models.

Table B4 Weighted Summary Statistics for the SIHC 1996/1997 and 2002/2003

	2002 (N=2,800,700)	**1996 (N=2,540,800)**
Continuous Variables	**mean**	**mean**
Average hours worked by head	37.183	36.910
Average hours worked by spouse	21.235	18.920
Age head	43.322	42.673
Age spouse	40.921	40.216
Number of children in income unit	1.061	1.183
Percentage of households without a child	0.443	0.408
Wage rate head	23.224	18.388
Wage rate spouse	17.774	13.852
Dummy Variables		
Education of head		
• No qualifications	0.375	0.421
• Vocational qualification	0.296	0.292
• Diploma	0.122	0.128
• University degree	0.208	0.158
Education of spouse		
• No qualifications	0.495	0.602
• Vocational qualification	0.216	0.170
• Diploma	0.088	0.099
• University degree	0.202	0.129
Youngest child in income unit is		
between 0 and 2	0.151	0.180
between 3 and 4	0.070	0.074
between 5 and 9	0.122	0.136
between 10 and 15	0.119	0.114
Employment status head		
Non participation	0.087	0.069
Unemployed	0.036	0.056
Employed	0.877	0.875
Employment status spouse		
Non participation	0.318	0.352
Unemployed	0.030	0.042
Employed	0.652	0.606

To show changes over time, summary statistics are also given for the SIHC 1996/1997. Comparing the two years provides a few interesting insights. First of all, it is evident that female labour force participation has increased in recent years. Disaggregating employment by age of the youngest child reveals that the increase is largest for parents with children under 5 years of age. In addition to the increased employment rate, there has been a slight increase in average working hours of those who are working as well.

We also compute summary statistics describing female labour force status in 2002 further. Including all mothers, it is found that 63.5 percent are in the labour force and 51.7 percent of those working for wages or salaries work part time. Restricting the sample to mothers with children aged under 16, 60.5 percent are in the labour force and 52.5 percent on wages or salaries work part time. Finally, restricting the sample to mothers of pre-school children, that is mothers with children aged under 5, 47.8 percent are in the labour force and 63.0 percent on wages or salaries work part time

Comparing education across the two years in the SIHC, all groups appear to have larger proportions of individuals at the higher education levels. There also appear to be relatively fewer households with preschool children. The higher education level and the decrease in the proportion of families with young children are both expected to increase labour supply.