Effects of Child Care Demands and Policies on Household Labour Supply in Australia

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Executive Summary

- This is the first study based on Australian data evaluating the impact of child care costs on the labour supply behaviour of households. Two separate data sets are used: child care demands and costs are estimated based on the Child Care Survey of 1996, and labour supply behaviour is modelled using the 1996/1997 Survey of Income and Housing Costs.

- 1996/1997 is the most recent period for which detailed data on child care, labour supply and income are available. Although several changes in child care have taken place since then, the analysis is still relevant in the current context assuming that individuals' preferences have not changed to a large extent between 1996/1997 and now. The model informs us on the effect of financial aspects, relating to child care, on the labour supply of different household members.

- The analysis proceeds in two stages. First a model of child care costs is estimated conditional on the household's labour supply choice. These estimates are then used to impute a cost of child care based on the household characteristics for all possible values of labour supply choices. Imputed child care costs (taking into account child care subsidies) are incorporated in the calculation of net household incomes by deducting them from the net income. A labour supply model is then estimated based on these adjusted net incomes.

- Various models of child care costs and hours of child care use are estimated. Lone parent and two-parent households are treated separately. Results suggest that formal and informal child care are substitutes, that is if more informal child care is used then less formal child care is needed. To some extent at least, the two types of care can be used interchangeably. However, the relationship is much weaker when looking at formal and informal costs because much of the substitution into informal care hours is done at zero prices. An increase in the price of formal care by 1 per cent is expected to decrease the demand for formal care by 0.3 to 0.6 per cent for couples depending on the age of the child. For lone parents the estimated effects are more imprecise and more variable although still negative. Both formal and informal care demands are normal goods where an increase in income by 1 per cent increases the demand for formal care by around 0.2 per cent and where an increase in the primary earner's income by 1 per cent increases demand for informal care by 0.1 to 0.2 per cent.

- The impacts of child care cost and price increases on household labour supply are simulated using the model estimates. Doubling of the gross price of child care reduces the participation rate by around 2.2 per cent for sole parents and 1.2 per cent for married women. The lower effects for married women relative to lone parents are found consistently in the various models. When increasing net costs instead of gross fees the effects are higher (a reduction of 4.5 and 2.5 per cent is observed for lone parents and married women respectively). Effects on the labour supply of married men are negligible.

- A comparison of our results with overseas findings shows that the sign of the effects are similar but the quantitative results for women and lone parents are in the low end of the range. Specifically, the Australian labour supply responses to child care costs are more similar to those found in the U.K. than the U.S. estimates.

- For certain subgroups in the population, the responses in labour supply to increases in child care costs are substantially larger. For sole parents, the average effect of a doubling of the gross child care fee is a fall of 2.2 per cent in expected hours of work. This reduction is close to 11 per cent for those with preschool children and nearly 15 per cent for those with preschool children and earning low wages. The effect for married women is lower than for lone parents at an average reduction of 1.4 per cent. A larger reduction of 3.4 and 3.9 per cent is found for married women with preschool children on any wage and on low wages respectively.

1 Introduction

In the last decade, much of public policy concerned with reducing poverty and welfare dependence has focused on promoting individuals' attachment to the labour force. In Australia, the 1987 Social Security Review heralded the shift towards policies providing incentives to participate in the labour market and away from more passive redistributive schemes. For families with children, the issue of nonparental child care has been treated as crucial in the decision of parents to engage in market work and policy reforms have included substantial increases in the subsidization of child care services. Such policy shifts overseas sparked many research projects on the relationship between labour supply and nonparental child care use. However, as far as we know, there has been no formal study of the effects of child care policies on labour supply and child care demand decisions in Australia.

This paper is part of a research program that aims to estimate the demand and costs of nonparental child care[1] along with the labour supply decision of parents in Australia. A related goal is to use the resulting estimates to simulate responses to policy shifts in child care subsidies and benefits. The paper builds on an earlier paper (Doiron and Kalb, 2002), which looked at the size of child care costs in Australia and the potential effect of these costs on labour supply. In that first paper, existing labour supply estimates were used to approximate the impact of child care costs through a reduction in household income. Here, we re-estimate the labour supply model explicitly taking into account the structure of both child care demands and costs. This allows us to simulate the effects of specific child care policy reforms on household labour supply.

Until very recently there was no Australian data set which provided both the details on child care use on the one hand and the labour supply, income, and human capital variables on the other to estimate micro-econometric models of these joint decisions.[2] We must use and merge two different data sources. Specifically, information from the

[1] Unless otherwise indicated, we use the term child care to mean nonparental care.

[2] The Household, Income and Labour Dynamics in Australia (HILDA) survey could be used in future research. The variables in this survey are somewhat different from the ones in the two surveys used in this paper. The first wave only collects information on child care use when all primary caregivers are employed. The second wave, which is not yet available, collects the information for all households with children.

Child Care Survey conducted by the ABS is linked with data from the Income and Housing Survey for comparable years. The model with child care demand and labour supply is an extension of the labour supply model currently used in the Melbourne Institute Tax and Transfer Simulator (MITTS).

Discussions of the provision of child care services and policies among policy makers and researchers generally presume a strong link between child care costs and availability on the one hand, and labour supply especially that of the mother on the other.[3] However, results based on overseas research suggest that this link is more complicated and harder to estimate than was at first believed.[4] In some cases, estimated labour supply responses have been smaller than expected. Empirical research based on local data and incorporating the institutions and policies in place is necessary to shed light on the importance of this relationship and the effectiveness of policies related to child care in Australia.

In order to simulate the effects of specific child care policy reforms on labour supply, a model with endogenous child care demand and labour supply must be estimated. Furthermore, this model must incorporate detailed information on the relationship between policy parameters and the household decisions regarding labour supply and child care use. In this paper we estimate costs of and demands for child care conditional on labour supply and on household characteristics based on the Child Care Survey data. These estimates are then used to impute revised net incomes (the original incomes minus the imputed child care costs) for the households in the Income Distribution Survey. Labour supply parameters are then estimated taking into account the parameters of the child care demand and cost functions.

Two different models of child care costs are used. In the first, we estimate the costs directly without separating the parameters of the demand functions from the prices paid by the households. This yields a more precise and simpler model of costs. It also limits the policy reforms that can be simulated since this approach does not provide estimates of adjustments in child care use to price changes. The child care policies in

[3] Section 3 in this paper provides a discussion and several references.
[4] See Section 3 of this paper.

use in Australia cannot be explicitly incorporated since they depend on the price rather than the total costs to the households.[5]

The second model consists of a system of demands for hours of child care, which are then used to estimate child care costs. The estimation of demands is complicated by the endogeneity of hourly costs faced by the households. We use data on fees charged by child care centres to capture exogenous variations in prices in the market for child care services. Information on the fees is obtained from the Commonwealth Census of Child Care Services conducted by the Department of Family and Community Services.

The paper is organized as follows. Section 2 describes the main features of the child care data and discusses the main problems and issues that arise in this type of model. Section 3 provides a review of the literature. A brief description of the child care policies in place at the time of the data collection is given in the following section. Section 5 presents the results from the estimation of child care costs and section 6 the responses in labour supply. Section 7 discusses the modelling and the estimation results for the child care demands. Labour supply estimates using child care costs based on prices and hours of child care imputed from the model of demands are given in Section 8. Section 9 presents some simulation results. Section 10 consists of concluding remarks.

2. Description of Data and Issues in the Modelling of Child Care and Labour Supply

Information on the use and costs of child care is collected by the ABS in a specialized survey: the Child Care Survey. This household survey is conducted occasionally (recently every three years) and contains data for a large and representative sample of Australian families with children less than 12 years of age. The most recent year for which we have both the Child Care Survey and the Survey of Income and Housing Costs (SIHC) available is 1996. Since we need to merge information from the two

[5] At the time of collection of the data used here these subsidies were Child care Rebate and Assistance. The current subsidy is named Child Care Benefit.

data sets this is the year we use for our estimations. This means that we model a situation which is quite different from the current situation. The value of the analysis lies in describing the relationship between the cost of child care and the labour supply of parents. One would not expect this relationship to have changed substantially between the time of the survey and now. Therefore information on this relationship obtained using the 1996/1997 data can still be useful today.

The 1996 Child Care Survey contains information on 11,419 children under 12 living in 6,421 income units. Unlike most of the data sets used overseas, the Child Care Survey includes information on child care for all households regardless of their employment status. This dramatically simplifies the modelling of participation and the effects of child care costs on the decision to work. For most of the empirical work shown below, children are grouped in income units and total child care (across all children in the income unit) is used. It is more appropriate to treat the household as the unit of observation in the models of child care and labour supply since it is the decision-making unit. All empirical work is conducted separately for lone parents and couples.

Child care is a very heterogeneous service. There is considerable usage of both informal services provided by relatives, often at no monetary charge, and of highly structured, formal day care centres offering large variations in quality and in fees.[6] Availability of services differs by age of child and region, but also in ways that are usually unobserved by the researcher (for example access to cost-free care by relatives or friends). Table 1 presents information on child care use by households according to the employment status of the parents and the age of the youngest child.

Approximately 60 per cent of households with children under 12 years of age use child care services. This proportion is larger for households with working parents: 81 per cent of employed lone parents and 69 per cent of two-worker households use child

[6] Based on the classification used in the survey, informal child care includes relative and non-relative care while formal child care includes: before and after school care, long day care, family day care, occasional care, preschool, and other formal care arrangements. The treatment of preschool is further discussed later in the paper.

care. This proportion rises further when children under 5 are present: nearly all working lone parents and over 80 per cent of working couples use child care. Working parents not using child care could be working at home or in the case of couples, hours could be coordinated to have one parent at home. Among couples, 40 per cent of total child care hours are in formal arrangements while for lone parents, the proportion is just over 30 per cent. The proportion of formal-care hours is not overly sensitive to the employment status of parents but it depends strongly on the age of the children in the household. Interestingly, most households in the survey state that they are not constrained in their hours of child care use.[7]

Table 1 Child care use by type, parents' employment and age of youngest child

	Age of youngest child				Total
	10-11	**5-9**	**3-4**	**0-2**	
Couples					
Two workers					
Percentage using care	45.12	59.41	89.78	81.29	69.38
Share of formal hrs in total care use	0.114	0.213	0.540	0.441	0.360
Sample size (unweighted)	397	1042	479	843	2761
One worker					
Percentage using care	17.98	24.58	69.80	53.50	46.23
Share of formal hrs in total care use	0.069	0.154	0.703	0.445	0.460
Sample size (unweighted)	169	516	360	1039	2084
No workers					
Percentage using care	15.81	9.23	53.38	44.77	34.55
Share of formal hrs in total care use	0.000	0.000	0.722	0.504	0.480
Sample size (unweighted)	47	113	80	220	460
All couples					
Percentage using care	35.26	45.19	78.71	63.86	57.24
Share of formal hrs in total care use	0.103	0.200	0.607	0.447	0.399
Sample size (unweighted)	613	1671	919	2102	5305
Lone parents					
Worker					
Percentage using care	64.09	76.99	98.62	97.95	81.35
Share of formal hrs in total care use	0.088	0.195	0.563	0.416	0.294
Sample size (unweighted)	96	198	69	74	437
Non worker					
Percentage using care	23.86	37.32	74.03	60.04	50.16
Share of formal hrs in total care use	0.037	0.101	0.506	0.358	0.311
Sample size (unweighted)	84	232	119	244	679
All Lone Parents					
Percentage using care	45.00	55.40	82.93	69.48	62.35
Share of formal hrs in total care use	0.075	0.160	0.531	0.378	0.303
Sample size (unweighted)	180	430	188	318	1116

Note: the numbers in the Table are weighted to represent the Australian population

[7] Approximately 9 per cent of the households state that they require additional child care but find it is unavailable. This does not include parents who say they are constrained because of high child care prices.

One of the major difficulties in modelling the demand for child care lies in the formulation of the price. Observed prices are generally not constant as often one must buy a fixed number of hours of care in advance. Prices are also frequently zero, and almost surely endogenous as parents choose among providers offering differing levels of quality and other attributes (usually unobserved) along with differing price structures. Table 2 presents information on average hourly costs for those households who use child care. Most households (over 90 per cent) who use formal care pay a positive hourly cost whereas just over 10 per cent of households pay a positive price for their informal care usage. Focussing on formal care, we find that the average hourly cost varies by age of child, which is perhaps not surprising, but it varies almost as much by the employment status of the parents. Clearly, parents are facing more than one price and a choice is made over prices and other attributes of child care.[8]

Table 2 Summary statistics on weekly hours and hourly costs for households who use child care

a. by employment status

	Couples				Lone parents		
	Two workers	**One worker**	**No workers**	**Total**	**Worker**	**Non worker**	**Total**
Weekly hours of child care	15.58	7.12	5.73	11.39	23.72	13.66	17.59
Pays for child care	0.55	0.53	0.53	0.54	0.49	0.38	0.43
Formal	0.95	0.92	0.94	0.94	0.95	0.93	0.94
Informal	0.18	0.06	0.02	0.14	0.15	0.03	0.09
Hourly cost (if non-zero)	2.58	2.12	1.43	2.38	1.79	1.17	1.53
Formal	3.00	2.39	1.52	2.71	2.07	1.68	1.89
Informal	3.60	3.99	1.88	3.64	2.99	2.76	2.96

b. by age of youngest child

	Couples				Lone parents			
	10-11	**5-9**	**3-4**	**0-2**	**10-11**	**5-9**	**3-4**	**0-2**
Weekly hours of child care	2.86	5.86	18.27	15.22	8.01	13.45	31.23	20.64
Pays for child care	0.17	0.32	0.76	0.60	0.17	0.28	0.70	0.51
Formal	0.91	0.93	0.95	0.94	1.00	0.93	0.94	0.95
Informal	0.06	0.13	0.20	0.14	0.08	0.10	0.11	0.08
Hourly cost (if non-zero)	3.58	3.04	2.25	2.23	2.42	2.28	1.23	1.26
Formal	5.32	3.27	2.57	2.58	2.41	2.50	1.92	1.55
Informal	4.55	3.85	3.54	3.49	3.35	3.43	2.20	2.73

Note: the numbers in the Table are weighted to represent the Australian population

[8] It is likely that these hourly costs incorporate some of the government subsidies paid for child care. This is yet another reason why prices will vary by households. For example, parents who work are more likely to have higher incomes and therefore receive less government assistance. As a result they would pay higher child care fees. See below for more details on policies related to child care.

When combining the modelling of child care demand and labour supply, a new complexity arises. Many researchers recognise that child care can affect labour supply not only through the household budget constraint but also directly through an hours constraint. Since young children must be cared for, parents must substitute their hours of work time for a similar number of hours of child care. Hence, a minimum level of child care use is attached to each level of hours of work by the parents. Placing structure on this direct relationship between hours of child care and hours of work is a difficult issue. Should the same level of substitution be applied to the father and mother's hours of work? Can their hours of work be chosen to minimize the amount of outside care needed? How should this constraint be adjusted for the presence of several children?

A related issue is that of the reason for child care use. If child care is seen as beneficial to the child, then usage is not purely dictated by hours of work and the hours constraint must reflect this. The large variation in the share of formal care with the age of the youngest child found in our data suggests that the reason for using formal child care may be different across children. Table 3 presents information on the different reasons for child care use. For 62 per cent of children aged 3 to 4 years, parents give "beneficial for the child" as the main reason for formal care use. This reason is chosen mostly for those children who attend preschool. Work is listed as a main reason (for at least one child in the household) for 42 per cent of the households who use formal care and 47 per cent of the households who use informal care. Hence, there are multiple reasons for child care depending on the age of the child and the type of care.

Table 3 Main reason for using child care

	Formal	**Informal**
Reason given as main for at least one child in household		
Work	41.98	46.62
Job search/study	2.52	2.14
Personal/other	15.90	49.23
Beneficial for child	42.70	4.26
Beneficial for child named as main reason by child		
0-2 years old	15.19	2.06
3-4 years old	62.04	6.20
5-9 years old	11.67	3.31
10-11 years old	3.96	1.97

Note: the numbers in the Table are weighted to represent the Australian population.

Finally, an important question in the area (but outside the scope of this report) is that of the effects of child care on the development of children. An analysis of this issue requires longitudinal data linking various measures of well-being and achievement to time spent in child care.

3. Literature Review

Although there has been no direct estimation of the labour supply effects of child care subsidies in Australia, several studies have addressed related issues. One of the policy thrusts by state and federal governments consists in ensuring the provision of sufficient child care places to meet demand and this issue has received some attention in Teal (1992) and Szukalska et al. (1999). Others have been concerned with the imputation and estimation of the costs of child care using various methodologies: Ross (1986), Ross and Saunders (1990), and various researchers at NATSEM (see for example Szukalska et al. (1999) and the references therein). Although there are some disagreements, results mostly suggest that costs of child care are high and influence the parents' decision to work. It was also suggested that the child care policies in place in the mid to late 90's did not provide incentives to low wage mothers with young children to participate in the labour market.

Cobb-Clark et al. (2000) present direct evidence from non-working mothers who report that child care problems are not the main factor determining their decision not to participate in the labour market. Due to small sample sizes, only results for couples are provided. Although these results seem to diverge from previous ones, the discrepancy could be due to differences in the samples used. The use of large and representative samples in our study allows the separate treatment of different household types while maintaining a systematic modelling framework overall. Cobb-Clark et al. also point out the large degree of heterogeneity in the structure of costs, prices, and forms of child care. This again highlights the importance of modelling different kinds of child care and allowing for possible endogeneity of prices.

The study by Apps and Rees (2000) looks at costs of children within the household and household decisions on the consumption of goods and the allocation of time. The

costs of children are internal and based on the children's share of consumption as well as the opportunity cost of parental time spent in child care. Australian data on time use allows them to separate the non-market time spent on leisure from parental child care. They find that the value of parental time devoted to child care is a substantial component of total child care costs.

Apps and Rees focus on the internal cost of parental child care while in this paper we deal with the external costs of child care services. The implicit assumption being made in our model is that one hour of leisure by a parent is equivalent (in terms of household utility) to one hour of parental care either directly from enjoyment in caring for one's children or indirectly through the input in the children's development. Since child care subsidies in Australia have been directed solely at child care services provided outside the home, our approach is appropriate for the simulation of the effects of policy changes in child care subsidies. However, our simplified specification of the behaviour of the household and the lack of data on internal costs means that the child care costs estimated in this paper constitute only part of the total costs. Clearly a framework that captures both components of the costs would be an important extension.

The following is a selected list of recent overseas studies. Controlling for variations in quality and the resulting endogeneity of prices has been an important issue in this work. Most of the studies on child care demand are based on household surveys and these rarely include measures of quality or other attributes of the child care service. Hence the correction for endogeneity in prices has been done by using some of the variables as instruments for price variations or by merging information from other sources. Blau and Robins (1988, 1989) use regional variations in expenditures to measure price and quality changes. Kimmel (1998), and Ribar (1992, 1995) use regional variations in child care regulations and wage levels, Blau and Robins (1988) and Leibowitz, Klerman and Waite (1992) impute information on wages of child care workers by state, while Duncan, Paull and Taylor (2001a, b) match information on availability of services by local authority. Other researchers match information from household surveys to information from care providers on fees and other attributes of care. This method uses variations from the supply-side of the market to capture

variations in the price-quality packages of child care services available to households. Walker (1992), Blau and Mocan (1999), Blau and Hagy (1998) and Hagy (1998) are examples of studies using this approach.

With the exception of selection effects into paid child care (that is nonlinearities at zero prices), little work has been done on the nonlinear pricing schedules offered for child care services. Exceptions are Ribar (1995) and Walker (1992).

The issue of quantity constraints linking hours of child care and hours of work has also received little attention with most studies using an unrestricted model of both hours of work and child care use. Exceptions are Connelly (1992) and Kornstad and Thoresen (2002) in which it is assumed that hours of work and child care use must be equal, Blundell et al. (2000) who estimate the relationship between hours of work and hours of child care for different groups and Duncan, Paull, and Taylor (2001a) who relax the assumption of equal hours of labour supply and child care by allowing child care use to exceed the mother's hours of work. The latter approach recognizes that child care may be seen as beneficial to the child and is not solely purchased to allow mothers to work. Results from these studies suggest that imposing quantity constraints directly on child care demands has potentially large effects on parameter estimates. However, there is still much contention over the appropriate form which should be used to model this constraint.

In the empirical work to date many of the data sets only include information on child care for those households in which mothers work. Explaining the relationship between child care demand and the decision to participate has been much more difficult because of this feature of the data. The issue of informal care has also been problematic because of the lack of information needed to explain availability and attributes of such care. Blau and Hagy (1998) and Michalopoulos et al. (1992) are two of the rare studies which model jointly the employment decision and the choice of mode of child care.

Finally, we mention a paper that deals with the impact of child care on child development. To our knowledge, Blau (1999) is the only study explicitly addressing this issue. It is found that on average, child care characteristics are not systematically related to measures of child development.

Empirical results based on U.S. and U.K. data sets vary considerably with the particular approach used as well as the data set. Generally, it has been found that policies which reduce the costs of child care induce an increase in both labour supply and child care use. The responses in labour supply are quite small on average but they are stronger for people at the bottom of the income distribution so that progressive measures generally elicit a larger reaction.[9] Use of child care by employed mothers is more price sensitive than for unemployed mothers. Formal child care is also more sensitive to price and wage effects than informal care. Little effect of policy reforms on substitution towards higher quality child care can be found. Also, quality and quantity appear to be substitutes at least for formal care but there are indications that existing measures of quality are not adequate in capturing important features of the trade-offs being made in this respect.

4. Policy Setting

In this section, we provide a brief description of the policies related to child care in place at the time of the survey in 1996.[10] Major policy shifts have been implemented in 2000 and one goal of this research program was to investigate how these reforms were likely to impact on child care use and labour supply. This section discusses the main changes introduced by the new system. Although a detailed policy change could not be simulated with the available data (as discussed in Section 9), more general changes could be simulated, indicating the likely effect of policy changes.

[9] Anderson and Levine (1999) provide a review of econometric studies and conclude that the overall elasticity of labour force participation of mothers with regard to child care prices lies between -0.05 and -0.35. Women with few skills are more affected than higher skilled women.
[10] For more details on the policies, the readers are referred to Szukalska et al. (1999).

Several types of subsidies were available for child care in 1996. Direct funding was provided to help build, equip and operate child care centres. This was meant to ensure a sufficient number of child care places. Two kinds of subsidies were available to households. These depended on the family's income, assets, employment status, number of children and child care expenses. Child care assistance was means-tested and paid directly to the providers. This reduced the fees paid by eligible families. The child care rebate was not means-tested and paid to the parents upon receipt of claims for child care expenses. The rebate could be claimed for work-related expenses only, which includes training and looking for work. Of the respondents in the Child Care Survey who paid for formal child care services, 40 per cent (of couples and lone parents) claim to have received the rebate. 30 per cent of couples and 25 per cent of lone parents who paid for informal child care services claimed to have received the rebate as well. For Child Care Assistance, information is provided only for families with children aged less than 7 years. For these, 26 per cent who used some form of child care also claimed to have received assistance (24.5 per cent of couples and 41 per cent of lone parents).

The empirical work in this paper, uses child care rebate and assistance parameters as they were in April 1997. The Child Care Assistance is based on a ceiling fee per hour. This fee is set at $0.73 for school-going children, $2.30 for children of preschool age and $3.05 for preschool children in child care less than 30 hours per week. Assistance is paid for up to 50 hours of child care per week up to $115 per child and is subject to a minimum fee payable by the parents of $19.50 for one child in care and $22.00 for two or more children in care. Parents can earn up to $522 per week without any Assistance being withdrawn. Some Child Care Assistance can be received by households with weekly earnings of up to $1264, $1482 or $1810 with one child, two children, or more than two children in care respectively.

In addition to the Assistance scheme, households with an income of less than $70,000 per annum can claim back 30 per cent of their child care costs under the Rebate scheme. If the income is over $70,000 per annum, households can claim back 20 per cent of their child care costs. For each additional child (starting with the second child), the income threshold increases by $3000. The rebate is subject to a weekly

ceiling fee of $115 for one child and $230 for two or more children where a minimum weekly fee of $19.50 is payable by the parents.

On 1 July 2000, the above two schemes were replaced by the Child Care Benefit. Families receive the Child Care Benefit according to their use of child care and income. Households can use up to 20 hours of approved child care per child without a work, education or training requirement. Usage of informal (registered) care is subsidized at the minimum rate of $0.434 per hour (or $21.70 per week). The maximum rate ranges from $129 per week for one child in care to $140.29 per week per child for 3 children or more in care. School-age children have a maximum rate at 85 per cent of these amounts. The maximum rate starts tapering out after the household reaches an annual income over $29,857. The taper rate is 10 per cent for one child and 15 per cent for two or more children. A second taper rate is introduced for incomes over $69,828 per year for families with at least two children in care. This taper is set at 25 per cent for two children in care and 35 per cent for three or more children in care.[11]

Under the Child Care Benefit, families who use child care part-time, that is less than 34 hours in Long Day Care Centres or less than 38 hours in Family Day Care Centres, receive a loading of 10 per cent and 33.33 per cent respectively. This loading is gradually reduced for those using between 34 to 38 hours in Long Day Care Centres and 38 to 50 hours in Family Day Care Centres. Finally, families may be entitled to a 33.33 per cent loading when non-standard hours of child care are required.

Although thresholds and taper rates are differently organised in 1997 and 2000, the level of payments is roughly similar (after accounting for inflation). The hourly maximum rates have increased somewhat, particularly when a family has more than one child in care and the taper rates have decreased and are at most 35 per cent compared to previous levels that could reach 50 per cent. Another difference is the maximum hourly rate for school-age children, which has substantially increased from $0.73 per hour to at least $1.96 per hour (in 1997 prices). Finally, the loadings for part-time care have decreased, and are now dependent on the type of child care that is

[11] All numbers in this paragraph are for the year beginning on 1 July 2000. The current numbers are different due to an annual indexation of thresholds and rates.

used and on the hours used. In addition, a loading for non-standard hours of child care was introduced.

The survey data do not provide direct information on the amount of subsidy received. Furthermore, the cost figures provided by respondents are likely to reflect the payment of child care assistance since this is paid directly to the providers and the survey question does not specify clearly whether gross or net costs should be given. Thus variations in the hourly cost will measure variations in the payment of government subsidies as well as the distribution of fees charged by the care providers.

5. Estimated Costs for Child Care Services

Since we are using two different data sets, we proceed to estimate the child care costs and household labour supply in two stages. First, child care costs are estimated as functions of the household characteristics and labour supply. These conditional cost functions are then integrated in the labour supply model by imputation based on the household characteristics: age and number of children, number and gender of parents, and geographical location. Thus for each household in the Survey of Income and Housing Costs child care costs are predicted and used to compute net incomes (original incomes minus child care costs) at various labour supply levels. The expanded budget constraints are then used to determine the optimal labour supply levels for the households.

Two different approaches are used to estimate child care costs. First, total cost functions are estimated directly. This approach is simple since we do not have to find instruments for the endogenous prices. It also yields precise estimates of the total costs as reported by the households. The major problem with this approach is the limited type of policy change that can be modelled and simulated. For example, one can simulate the effects of a reform that directly alters the costs of child care for different types of households but one cannot analyse policy changes that affect the prices paid for child care. The latter requires modelling the adjustments in child care demands in response to the price change. Since we want to simulate policy changes which impact on the prices of child care and since the relationship between hours of child care demanded and the price of child care is of interest in its own right we also

estimate demands for hours of child care. This alternative approach is presented in Section 7.

Separate cost functions are estimated for lone parents and couples. The dependent variable is total costs across children in the household for both formal and informal care.[12] This yields the most accurate estimate of total child care costs by households including any substitution between the two types of care. Note that since most informal care has a zero cost (see Table 2) the total cost of child care is composed mainly of expenditures on formal care. Tobit regressions that take into account the observations at zero cost are used to estimate the cost functions. Given the number of households with zero costs it is important to model the likelihood of being in this group explicitly.[13]

Appendix Table A1 presents means of the variables used in the Tobit regressions and the estimation results. We model variations in child care costs across households using variations in household composition (age and number of children, age of parents, and sex of parent in lone parent households), labour supply, income and geographical location. Labour supply is entered in a flexible manner allowing jumps at zero hours and nonlinearities at positive hours for couples.[14] Interactions between labour supply and the number and age of children are included to capture differences in household composition and its labour supply. Specifically, we need to model variations in costs stemming from the fact that households with young children also tend to be households with lower levels of labour supply. Interactions between the number of children by age and an employment indicator are included. For couples, this employment indicator equals one only if both parents work. Also interactions between children by age and hours of work of the parents are added. For couples, the minimum hours of work across both parents are used. [15]

[12] The distinction between formal and informal care is modelled below in the estimation of demands.
[13] We also estimated selection models but these were not well-behaved generally and we had to impose the restriction of perfect correlation in the error terms to achieve convergence. This is not surprising since we do not have variables that identify the selection into positive costs separately from the level of the costs and we must rely on functional form restrictions to identify the group paying zero costs. In effect it is difficult to generalize the Tobit model with these data.
[14] The quadratic term in hours was generally insignificant for lone parents.
[15] Various other specifications were estimated as well. We present a parsimonious model that captures the significant features of the data. More discussion of the appropriate specification of child care demands and costs is provided in section 7.

Various measures of fit are provided in the table. They show that the model explains variations in the data quite well with correlations between observed and predicted costs at around 50 per cent. The predicted probability of zero cost is within 3 percentage points of the observed frequency for both types of households and the difference between the average predicted and observed weekly cost is within $2.00 or 10 per cent of the observed cost.

The estimated effects of household composition on total costs are fairly intuitive. The number of infants under one year of age has no significant effect but other children of preschool age increase costs substantially. In contrast, a greater number of older children tends to reduce costs. Households with higher incomes pay higher costs and since this effect is at constant labour supply, it should be interpreted as a pure income effect.[16] This suggests that child care is a normal good. Households living in urban areas pay higher total costs as well. The difference in costs by state is generally insignificant for lone parents but it is generally significant for couples with the ACT (grouped with the Northern Territories) and NSW households having the highest costs and Western Australian families the lowest.

The relationship between hours of work and child care costs is difficult to interpret from the results presented in Appendix Table A1 because of the nonlinearities and interactions mentioned above. The specification also allows this relationship to differ between mothers and fathers for couples and according to the parent's sex for lone parent households. In order to simplify the interpretation of these results, Table 4 presents cost estimates for households at different levels of labour supply and income. Estimates are given separately for parents with no children under 5 years of age, one child aged 1 and two children aged 1 and 3 to 4 years respectively.

Costs increase by a factor of up to 4 when one child under 5 is added to a household in which all parents work. Also in these households, the effect of hours of work of the parent (the mother in couples) is more important than the effect of wages (income at constant hours). For example in the case of lone parents, weekly costs increase from $9.51 to $38.60 when increasing hours of work from 8 to 37 (the 25th and 75th

[16] Income is provided as a categorical variable in the Child Care Survey with 15 categories for fathers and 12 categories for mothers. Mid-points are used. Income includes both labour and nonlabour income. This is taken into account when imputing costs of child care for the labour supply estimation.

percentile values for this sample respectively) keeping income low. Increasing income from the 25th to the 75th percentile values would further increase these costs to $43.44. Similar results are found for the mother's labour supply in couples with two workers (the corresponding costs values are $7.24, $27.08 and $36.61.)

Table 4 Estimates of Weekly Child Care Costs (including zero costs)

	Couples			Lone parents		
	No Child under 5	**One Child aged 1**	**One Child aged 1 + One Child aged 3-4**	**No Child under 5**	**One Child aged 1**	**One Child aged 1 + One Child aged 3-4**
No workers	1.824	2.823	14.058	1.713	2.960	12.159
One parent works (father works in couples):						
Median I, median H	2.285	3.485	16.349	7.523	18.940	45.785
Low I, low H	2.260	3.450	16.229	5.543	9.510	18.796
Low I, High H	1.880	2.904	14.348	11.164	38.599	96.682
High I, high H	2.894	4.345	19.122	13.427	43.440	103.240
Both parents work- father has median hours and income and mother has:						
Median I, median H	5.802	17.185	53.591			
Low I, low H	3.314	7.274	25.861			
Low I, High H	5.641	27.079	82.754			
High I, high H	8.914	36.610	98.712			

Values used for income and hours:

	Income	**Hours**	**Income**	**Hours**
No workers			275	0
Father	140	0		
Mother	225	0		
One worker (father's values for couples)				
Low values	450	37	350	8
Median values	650	45	450	20
High values	900	45	550	37
Two workers (mother's values for couples)				
Low values	225	8		
Median values	350	20		
High values	550	37		

Notes: Estimates are based on Tobit regressions presented in Appendix Table A1. Costs are in 1996 dollars. For all characteristics other than labour supply and the presence of children 1 to 5 years old, the average characteristics over the samples are used to predict costs. In particular, households are given the average number of children over 5 years of age. Heading I refers to income including labour income and heading H indicates hours of work. The median, low and high values for income and hours are computed from sample information and are specific to the employment profile of the household. Low values correspond to the 25th percentile while high values are the 75th percentile. Specific values are given in the table. For couples, when one parent works it is assumed that the father is the worker. In this case the mother is given 57.20 for income and zero hours. These are the median values for that sub-sample. When both parents work, the father is given median hours and income and the mother is given the hours and income listed in the Table.

The effects of adding a child 3 to 4 years old are greater than those of adding a younger child. Further investigation (results not shown) shows that this is due to a

higher use of formal care, specifically the use of preschool, for these children. This is related to the reasons for child care use discussed earlier. Specifically child care is regarded beneficial for children in this age group.

To evaluate the cost imputation more generally, Appendix Table A3 presents the average observed and predicted costs in the Child Care Survey. Panel I in the table presents the comparison for the estimated total cost function.[17] The total predicted child care cost is reasonably close to the average observed value from the Child Care Survey. There is a slight over-prediction in costs over the whole sample: $17.69 versus $15.87 for couples and $10.62 versus $9.63 for lone parents. The model performs better for households in which all parents work. Perhaps this is not surprising since variation in hours of work form an important part of our deterministic model. We come back to the results in Appendix A3 later.

6. Labour Supply Estimates with Endogenous Costs of Child Care

This section describes the labour supply estimates, which take into account the imputed child care costs from the estimated cost functions presented above. For each household with children of 12 years or younger in the Survey of Income and Housing Costs 1996/1997 (SIHC)[18] a predicted cost of child care is imputed based on the characteristics of the household (state, urban, number and age of children, couples versus lone parents). This cost is generated for each possible labour supply choice allowed in the MITTS model. Also for each labour supply choice, a gross income level (including all transfers and taxes) is computed within the MITTS model and this income level is used in the predicted cost function for child care.

Table A2 in the appendix shows the weighted and unweighted distributions of the main variables used in the cost function for the Child Care Survey and the SIHC. For a more detailed description of the data from the SIHC the reader is referred to ABS (1997, undated). We find that the samples are similar in the family composition (age

[17] We believe that for many households these estimates of the costs are net of the assistance paid directly to providers.
[18] Note that this is introducing a small discrepancy in the definition of households since the Child Care Survey includes only households with children under 12. We cannot separate out children aged 12 as the SIHC provides the number of children aged between 10 and 12 as a group.

and number of children), the distribution by age and location, and the level of participation in the labour market. The largest differences are found in the distribution of hours of work. These remain even after weighting to represent the population distribution.

To evaluate the cost imputation for the households in the SIHC, panel I in Appendix Table A3 presents the simulated costs for that sample at the observed hours of labour supply[19] along with the observed and predicted costs in the Child Care Survey. The table shows an expected child care cost (including zero costs) which is reasonably close to the average observed value in the Child Care Survey, particularly when considering the small sample sizes of some of the subgroups being compared. The imputed costs in the SIHC are closer to the average predicted costs using the Child Care Survey data (that is the within sample prediction). This is not surprising since both are predictions from the same estimated model.

The gap between the average imputed cost for the households in the SIHC and the within sample prediction is within 1 dollar a week for couples and 2 dollars a week for lone parents. The difference is larger for households with all parents working. We believe there are several contributing factors responsible for these discrepancies. First is the difference in the sample of workers used in the Child Care Survey and in our cost imputations for the SIHC. In the Child Care Survey we cannot adequately identify the self-employed and child care costs are estimated for all workers. In the Survey of Housing and Income Costs self-employed workers are not given hours of work hence we have to exclude this group in our imputations of child care costs.

Furthermore, comparing the distribution of hours of work for the employees in SIHC to those in the Child Care Survey, it is found that the first is more heavily weighted towards the higher categories of hours. This is particularly true for sole parents. Consequently higher average child care costs are expected based on the SIHC data.[20]

[19] In the imputation, we use the predicted probabilities of zero costs and non-zero costs for each household and draw from this distribution. The imputed value is zero if the first option is drawn and it is equal to the conditional expectation of child care costs if it is nonzero; that is we impute the expected cost of child care conditional on it being a positive value.

[20] Specifically more parents report working part time in the Child Care Survey. The differences are not substantial for couples and could be due to the treatment of self-employed workers. The proportion of self-employed workers in the SIHC is approximately 7.5 per cent for women and 14 per cent for men in two-parent households and 4 per cent for lone parents. If self-employed parents with young children are

Secondly, the weekly hours worked in the Child Care Survey is reported in much less detail and all hours over 39 are grouped together, whereas labour supply in the SIHC is measured at an hourly level up to 50 hours per week. As a result, the imputed cost in the SIHC is likely to be higher. Finally, children aged 12 cannot be separated from children aged between 9 and 11 years in the SIHC. Hence the proportion of households with children over 9 is larger in this survey than in the Child Care Survey and average child care costs are likely to be higher as a result of this as well. Since at high levels of labour supply (and income) the budget share of child care costs is small and since previous results suggest a smaller response to these costs at high levels of labour supply (and income), it is expected that the over-prediction of costs will have but a minimal effect on labour supply estimates.

Once a predicted child care cost is generated for each household and for each household labour supply, the labour supply model is applied to generate the predicted choice of employment for each household. Note that the predicted child care costs affect the labour supply through the household budget constraint only; that is we do not incorporate quantity constraints linking hours of work directly with hours of child care.

The third and fourth columns in Appendix Tables A4a and A4c present the labour supply parameters resulting from this estimation.[21] Compared to the labour supply parameters derived from the model without child care costs (the first and second columns of Tables A4a and A4c), we find that the estimates are not greatly affected by the inclusion of these costs. Not unexpectedly the largest changes are observed for the variables associated with children in the wife's labour supply preference and in the variables associated with children in the sole parent's labour supply and income preferences. That the addition of child care costs results in quite small changes in the labour supply parameters is not surprising given the size of the costs relative to many household incomes.[22] This is compounded by the averaging involved when one uses

more likely to work part time than salaried workers, their exclusion from the SIHC sample would result in greater hours of work for those households on average.

[21] For a discussion of the labour supply model's specification and an explanation of the interpretation of the parameters in the labour supply model without the use of imputed child care costs see Kalb (2002).

[22] As mentioned above we believe these predicted costs based on the reported total costs by households are underestimated since they are likely to be net of at least part of the child care subsidies. In the next section of the paper we use an estimate of gross costs based on fees reported by service providers.

measures of predicted costs. Note that this does not mean that a policy shift affecting child care costs cannot have a substantial labour supply impact. If the policy change affects incomes for those households located in an area of the labour supply which is highly responsive to changes in income, then the policy can induce a substantial reaction in labour supply for these households even with relatively small changes in the parameter estimates.

We also estimate the labour supply model with an alternative approach using a simulation technique. This consists of predicting child care costs including an error term drawn from a distribution with characteristics equal to those estimated as part of the cost function model. Repeated draws are taken for each household and the likelihood function is averaged over these draws before being maximized. In the prediction stage, optimal labour supply is predicted for each draw and an average is taken over the draws. Technically, this involves averaging the labour supply estimates rather than the costs estimates. This method provides a more efficient prediction of the child care costs since it incorporates the variation in unobservables affecting costs based on the estimated variance of these unobservables. Appendix Tables A4b and A4d show the results of this alternative approach in columns three and four. For couples, parameter estimates are quite similar for the two approaches while for lone parents, larger differences from the model without child care costs are found using this simulation method.

It is not straightforward to derive the implications of the parameter shifts from the labour supply model directly, therefore some simple simulations using the labour supply estimates are undertaken to shed more light on the implications for predicted labour supply levels. Specifically, we use the labour supply parameters to perform an experiment in which we double the costs of child care. This could be interpreted as a doubling of the price if there were no adjustment in demand.[23] Tables 5a and 5b show that for both types of households and both estimation methods the participation rate and the expected hours of labour supply fall when child care costs are doubled. The reductions in labour supply are greatest for lone parents (a drop of 8 to 11 per cent) and for married mothers (a drop of 5 to 5.5 per cent), while for fathers the effect is much smaller (-0.2 per cent).

[23] Adjustments in demand are explicitly accounted for in the next section of the paper.

Comparing Tables 5a and 5b we see that using average costs (instead of averaging over labour supply) yields larger effects on labour supply, indicating that the effect of child care cost on labour supply is not linear, but decreasing with the cost. That is the total effect will be larger if everyone experiences a small cost compared to the situation where some households experience no costs while others experience high costs.

The differing labour supply reactions by males and females are consistent with the findings in Apps and Rees (2000). Their results indicate that the allocation of time to nonmarket work and leisure by females is more sensitive to the presence of children. In other words a larger transfer to children is made by mothers than fathers in two-parent households.

Table 5a Labour supply estimates and changes for households with children (using expected costs)

	Lone parents		Couples			
			Fathers		Mothers	
	Exp hrs	Part.	Exp hrs	Part.	Exp hrs	Part.
Initial Estimates:						
-predicted values	11.35	0.398	38.24	0.901	14.52	0.505
- actual values	11.32	0.402	38.14	0.903	14.00	0.515
- % correct predictions		48.22		37.00		36.81
Costs are Doubled:						
-predicted values	10.06	0.360	38.16	0.898	13.71	0.483
-change	-11.4%	-3.8ppts	-0.2%	-0.3ppts	-5.6%	-2.2ppts

Note: Exp Hrs denotes expected hours of labour supply including zeroes. Part. indicates the participation rate.

Table 5b. Labour supply estimates and changes for households with children (10 draws)

	Lone parents		Couples			
			Fathers		Mothers	
	Exp hrs	Part.	Exp hrs	Part.	Exp hrs	Part.
Initial Estimates:						
-predicted values	11.36	0.398	38.24	0.901	14.52	0.505
- actual values	11.32	0.402	38.14	0.903	14.00	0.515
- % correct predictions		47.80		37.02		36.88
Costs are Doubled:						
-predicted values	10.47	0.372	38.17	0.899	13.78	0.485
-change	-7.8%	-2.6ppts	-0.2%	-0.2ppts	-5.1%	-2.0ppts

Note: Exp Hrs denotes expected hours of labour supply including zeroes. Part. indicates the participation rate.

Blundell et al. (2000) estimate a labour supply model incorporating child care costs in the household budget constraint. As part of the evaluation of the Working Families' Tax Credit, one set of simulations described in the paper explores the effect of an increase in child care prices by 50 per cent. The expected hours of labour supply decrease by 1 per cent for lone parents, 2.4 per cent for women with employed partners and 4.2 per cent for women with unemployed partners. If we interpret the experiment illustrated in Tables 5a and 5b above as an increase in child care prices of 100 per cent (keeping hours of care constant), our results for women in couples are broadly similar to the U.K. findings. However, the effects for lone parents in our data are larger. This can be explained by the fact that the price increase in the Blundell et al. paper will be partly absorbed by the child care credits in the Family Credit scheme hence net price increases are likely to be much smaller for those with low incomes.

To further illustrate the effects of child care costs on labour supply, Table 5c presents labour supply responses to the doubling of child care costs for various subgroups. The method with 10 draws from the child care cost function is used. This breakdown clearly shows the importance of the presence of preschool children in the household. For lone parents, the relative fall in labour supply more than doubles (from 7.8 per cent to 18.4 per cent) when we consider households with at least one preschool child. For mothers in two parent households the relative effect on labour supply is slightly less, but the fall in labour supply still more than doubles (from 5.1 per cent to 10.8 per cent). This is not surprising since it is among these households that we find the largest costs of child care.

The effect of child care costs on labour supply is also greater for sole parents who earn a wage below the median. The same is true for mothers in two-parent households who earn below the median wage especially if their husbands earn an above-median wage. Again the direction of these effects is not surprising since a large increase in child care costs (at constant wages) implies a relative increase in the value of time at home versus time in the labour market. It is interesting that the size of this effect is smaller in absolute value than that coming from the presence of preschool children but it is still quite substantial. When both parents earn a below-median wage, the labour supply effect is somewhat smaller, perhaps indicating the necessity of both parents

working. Finally, it is interesting that the father's labour supply responds very slightly to child care costs and this effect is similar across types of households.

The overall implication is that increases in child care costs can cause a large reduction in labour supply for both lone parent and two-parent households. This change will occur mostly among households where the parent (the mother in two parent families) is facing a low wage and there is a preschool child. The magnitudes of the effects due to a doubling of child care costs vary from a drop in expected hours of 7.8 per cent (5.1 per cent) on average for lone parents (two-parent households) to a reduction of 19.6 per cent (11.6 per cent) for low wage families with at least one preschool child.

Table 5c Labour supply effects caused by the doubling of child care costs (10 draws)

	Lone parents		Couples			
	Expected hours		Expected hours men		Expected hours women	
All in sample	**Hours**	**% diff.[a]**	**hours**	**% diff.[a]**	**hours**	**% diff.[a]**
Initial estimate (1)	11.36		38.24		14.52	
Double costs (2)	10.47	-7.8	38.17	-0.2	13.78	-5.1
Wages < median wage[b]						
Initial estimate (1)	6.37		34.36		9.74	
Double costs (2)	5.73	-10.0	34.29	-0.2	9.27	-4.8
Female Wage < median , male wage>median[b]						
Initial estimate (1)			40.73		11.22	
Double costs (2)			40.68	-0.1	10.61	-5.4
Households with children less than 5 years						
Initial estimate (1)	5.71		38.18		10.56	
Double costs (2)	4.68	-18.4	38.06	-0.3	9.42	-10.8
Households with children less than 5 years and wages < median wage[b]						
Initial estimate (1)	3.76		34.32		6.92	
Double costs (2)	3.02	-19.6	34.23	-0.3	6.30	-9.0
Households with children less than 5 years and Female Wage < median , male wage>median[b]						
Initial estimate (1)			40.80		7.60	
Double costs (2)			40.74	-0.2	6.72	-11.6

Note a: The difference between (2) and (1) is taken.

b: For all households, the median wage levels used are the following: for lone parents $9.68, for husbands $16.29 and for wives $11.55. For households with children less than 5 years old, the median wage levels used are: for lone parents $9.61, for husbands $15.79, and for wives $11.23.

7. Estimation of Demands for Child Care

The estimation of total costs of child care discussed in Section 5 is straightforward and provides relatively precise estimates of total costs. However, with these estimates

it is not possible to separate the adjustments in the quantities of child care from variations in the hourly costs. From a policy perspective, it only allows the simulation of effects of reforms that impact on the costs of child care without specifying how these impacts are achieved. More specifically, child care subsidies in Australia are based on fees rather than total costs and hence the impact of a policy shift on total costs will depend on the responsiveness of the demand for child care to its price. This implies that demand equations must be estimated in order to model the effects of specific policy reforms on the total costs of child care and on labour supply.

As discussed previously, there are several reasons to believe that the hourly costs for child care services reported in the Child Care Survey are endogenous and do not represent the total array of prices faced by households. Since households choose among services offering various quality attributes, the observed hourly cost will reflect unobservable characteristics that influence household choices. Also, the observed hourly cost will depend on the amount of subsidy received by the household through the Child Care Assistance Program since this is paid directly to the service providers. It is likely that the subsidy depends at least in part on characteristics that are not included in our data.[24]

In order to have some measure of exogenous variations in prices faced by households for child care services, we use information on fees charged by the service providers and collected by the Department of Family and Community Services through its Commonwealth Census of Child Care Services. This approach is similar to that used in recent overseas studies such as: Walker (1992), Blau and Mocan (1999), Blau and Hagy (1998) and Hagy (1998). A more detailed description of these fees is provided in the following section of the paper.

7.1 Fees for Child Care Services

The Commonwealth Census of Child Care Services is conducted regularly and includes all services receiving funding from the Commonwealth Government of Australia. This basically includes all providers of formal child care. Information from

[24] For example, the amount of rebate and assistance is dependent on the household's income and the discrete nature of the income variable is likely to constitute a source of endogeneity.

the Census is used extensively by government officials to monitor the provision of child care services and to formulate policy in this area. In order to have comparable information with our two other data sets, we use the Census conducted over 1996 and 1997.[25] The 1996-97 Census provides information on 7,624 services spread across Australia. More information on the Census can be obtained from the Department of Family and Community Services (1999).

We use average fees by state and age of child to measure variations in prices faced by households for formal child care. Information on fees is provided separately for different types of providers (community based long day care services, private long day care services, employer and non-profit long day care services, family day care schemes, and outside school hours care services). A weighted average fee across types of services is computed from the Census data using the number of children in the particular types of care (by age) to construct weights to be applied to the providers. For some types of providers, weekly fees are published while for others the fees are on an hourly or a sessional basis. However, providers within the groups may charge fees on a variety of bases (for example, weekly, daily, half-daily or hourly). We convert all fees to hourly rates using information provided by the Department of Family and Community Services on the hours used to compute the published figures. The resulting fees by state and age of child are presented in Table 6.

Table 6 Hourly fees by state and age of child

	Age of Child			
States	**5 and over**	**3-4**	**2**	**0-1**
NSW	2.866	3.260	3.463	3.756
Vic	2.670	3.196	3.226	3.250
Qld	2.555	2.889	3.031	3.196
SA	2.633	3.391	3.399	3.401
WA	2.728	3.154	3.227	3.348
Tas	3.041	3.758	3.761	3.885
NT	2.798	3.083	3.130	3.186
ACT	3.323	3.623	3.723	3.756
Total	2.739	3.173	3.282	3.419

A comparison with the hourly costs of child care observed in the data (see Table 2) shows that fees are on average a bit higher than the paid hourly costs especially for children under school age. This could be due to the Child Care Assistance, which

[25] This Census was conducted over a two year period. Questionnaires were sent to a subset of the providers in 1996 with the remaining centres being contacted in the following year.

creates a wedge between fees charged by the services and the costs paid by the households. It is interesting that the fees charged by providers fall when older children are concerned while the average price of formal care by household increases with the age of the youngest child. This is probably due to the much lower Child Care Assistance available for school-aged children (see the details in Section 4).

The use of fees charged by providers of child care services raises issues of how to treat preschool and how to define formal versus informal care. In the previous sections of the paper, when presenting statistics on formal and informal care we took the usual definition of formal care used in the literature. This definition also corresponds to that used in the Child Care Survey. This definition of formal includes preschools. However, preschools are not considered child care service providers from the point of view of the Department of Family and Community Services and instead are considered to form part of the education system. The fees presented in Table 6 do not include fees charged by preschools. These latter fees can be quite a lot lower. From the Child Care Survey, we find an average hourly cost of $1.77 per child for preschool compared to $2.50 per hour for other formal child care for 3 to 5 year olds.[26] There are several other issues involving the use of preschool and we return to this question below.[27]

7.2 Modelling Demands for Child Care

Although it is likely that formal and informal care are to some extent substitutes they also seem to be quite different goods and it is important to separate the types of care when estimating the demand for child care. If the demand for child care follows standard demand theory and if formal and informal care are in fact substitute goods, then one would expect demand for formal care to be negatively related to the fee for formal child care services and the demand for informal care to vary positively with this fee. For informal care we assume a zero fee is payable since 90 per cent of households bear no costs for their use of informal care.

[26] These averages are computed for weekly usage of child care/preschool of 11 hours or less. The cut-off point of 11 hours is chosen to make a reasonable comparison between the cost of preschool, which is mostly provided for around 10 hours per week, and other types of formal care, which have a wider variety of hours usage.

[27] Note that this issue does not affect the labour supply estimates in the previous section since they are based on total costs of child care.

One has to reconcile this zero (observed) price with the limited quantity of informal care used as standard demand theory would predict unlimited demand of a good at zero price. A few approaches have been used in the literature to solve this problem. The most straightforward one is to assume that informal care involves costs, which are not included in the observed hourly price. Unless they are correlated with other variables, these costs end up being captured by the constant or by the error term. An alternative explanation is that the availability of informal care is likely to vary across households. Unfortunately, the survey data used here do not include information that permits the explicit modelling of this feature of child care. For example, proximity to other family members would be an important component of the determination of informal care usage.[28] To some extent variations in the availability of informal care will also be part of the error term.[29]

The framework used for the estimation of the system of demands for formal and informal care is a bivariate Tobit. This model is presented formally in Appendix B and is estimated by full information maximum likelihood (FIML) techniques. The approach is a straightforward extension of the univariate Tobit model used previously to estimate costs. In particular, the model takes into account the correlation between unobservables affecting formal and informal demands. For example proximity to family members, an unobservable characteristic, could increase the use of informal care and simultaneously reduce the hours of formal care demanded by reducing the cost of informal care relative to that of formal care. In this case a negative correlation between error terms would be generated by the missing information.

As for the usual Tobit regression, the bivariate Tobit is restrictive in that it forces the coefficients on the explanatory variables to be the same in determining the choice between using zero or positive hours of care as the choice of the particular number of hours of care (if positive). A more general approach (a selection model) has been tried but this model was not well-behaved and convergence was only achieved when the errors in the selection and on hours were forced to have perfect correlation of 1.0.

[28] An alternative framework could be used whereby households have limited demands for nonparental child care services either through a quantity constraint relating hours of work to hours of child care or through a saturation point with no added well-being to be gained for additional child care hours. These extensions would require more extensive data on the households and a much more complicated model.
[29] We believe that some of the explanatory variables included in the model capture part of the variation in availability of informal care. This is explained in more detail in Subsection 7.3.3.

This is similar to what was found in the cost function estimation and the likely reason is the same, namely, the lack of an instrument which identifies the choice of entering the external care market separately from the choice of hours of care.

7.3 Estimation Results for Child Care Demands

7.3.1 Variables and functional specification

Appendix Table A5 presents the results of the bivariate Tobit model for the demand for child care. As for the cost function model presented previously, the demand model is conditional on the labour supply choice of the parents, the gross income of the parents, as well as household composition. Except for rural/urban indicators, variables representing geographical location have been excluded since the variation in child care fees captures most of these effects.[30] The particular specification used for the explanatory variables (that is nonlinearities and interactions) remains an empirical matter. Some guidance can be obtained by considering the underlying household decision-making model.

Suppose that the household chooses hours of child care separately for each child. Also suppose that the structure of this decision is the same for children in the same age group, then the total demand for child care hours should have as explanatory variables the household characteristics (such as income and in our case labour supply) multiplied by the number of children. However, if the household decision is to some degree independent of the number of children then the variables should also enter without being interacted with the number of children. For example, the decision to use nonparental care could depend on the mother's employment independently of the number of children involved.

A separate reason for including interactions stems from the policies on child care subsidies in place at the time of the survey. As described earlier, subsidies were based on household income hence the effects of the fees should depend on the level of income.

[30] Specifications with the geographical dummies were estimated and the coefficients on these dummies were generally insignificant. The main effect of this generalization was to increase standard errors.

We began with specifications that included many interactions and nonlinearities and tested down. In the specification presented in Appendix Table A5, fees are interacted with indicator dummies for the presence of children in three age groups. Also fees times the number of children in the household in the age groups 0 to 2 and 3 to 4 are included.[31] Interactions of child care fees with the household income and in particular with income groupings corresponding to policy parameters were insignificant. The specification of the labour supply variables is similar to what was done for the cost functions. Specifically, labour supply levels enter nonlinearly with jumps at zero and quadratic effects for positive hours of work. Also, employment indicators and hours of work are interacted with the number of children by age group. The parents' ages matter for informal child care but not for formal child care.

7.3.2 Treatment of preschool

The results presented in Appendix Table A5 correspond to a model in which preschool hours are included in informal rather than formal care. In making this decision we took several issues into account. Firstly, as mentioned above the fees for formal care do not include preschool fees.[32] To the extent that preschool fees are correlated with other child care fees, it would make sense from a modelling perspective to include preschool hours in formal care. As shown below, this does not seem to be the case. Secondly, hours of preschool are more or less fixed and once the decision to use preschool has been made, the observed hours may not reflect demanded hours. This could be an argument for the exclusion of preschool hours altogether and this is one of the specifications we estimated. The results relative to formal child care demand from this model are similar to those presented below with preschool included in informal child care.

Thirdly, the main reason given for preschool usage is that it is beneficial to the child (see section 2 above). This reflects the fact that in many ways, preschool can be regarded more as education than as child care although it is not compulsory. The implication from a modelling standpoint is that the demand for preschool is likely to

[31] Note that this specification implies that a fee for a particular age group only matters for the household if there are children in that age group in the household. This seems like a reasonable assumption.
[32] To our knowledge there is no data set providing representative fees for preschools.

have a different structure compared to other child care. A solution to this problem would be to estimate a system of demands with three types of child care: formal (excluding preschool), informal and preschool. This trivariate model is substantially more complex and given the small sample size of households with usage of preschool, this approach does not seem feasible.[33]

Table 7a presents descriptive statistics related to preschool usage from the Child Care Survey. The averages presented in the table are computed only for those households who use formal child care and who have children aged 3 to 4 years old. Fees from the Commonwealth Census of Child Care Services for formal care involving children 3-4 years old are also included for comparison. The figures in Table 7a show that there is little variation in the hours of preschool used by employment status compared to that observed for other forms of formal care. This supports the view that preschool hours are less flexible than hours chosen for other types of formal care. The hourly costs are also much smaller than other forms of care. Remember that these costs are gross (since they are not subject to the child care subsidies) and hence should be compared to the fees charged by the care providers rather than the hourly costs reported by households for other forms of formal care. Although there is some variation in hourly costs for preschools across households depending on the employment status of the parents, this variation is smaller than that observed for other types of formal care. Finally the sample sizes given in table 7a show that the estimation of a more complex trivariate model, separating preschool from other formal and informal care demands, would rely heavily on small numbers of observations especially for lone parent households.

Table 7b provides marginal effects of fees for formal care on the quantity of child care demanded for three different specifications of the treatment of preschool hours.[34] These are the derivatives of the predicted dependent variable (the expected hours of child care including the probability of zero hours) with respect to fees. The marginal effects are computed for each data point and averaged over the sample. Standard

[33] We estimated a version of the bivariate model conditional on preschool hours. These results were quite similar to those with preschool included in informal care. This latter model cannot be used to estimate labour supplies since information on child care usage is not available in the SIHC - the data set used to model labour supply.

[34] Other than the treatment of preschool hours, the specifications are the same as presented in Appendix Table A5.

errors are computed on these averages with a bootstrap estimator using 200 replications.[35]

Table 7a Summary statistics on hours and hourly costs of preschool for households who use formal child care and who have children aged 3-4.

	Couples				Lone parents		
	Two workers	**One worker**	**No workers**	**Total**	**Worker**	**Non worker**	**Total**
Prop of preschool in formal care hrs.	0.439	0.649	0.479	0.531	0.288	0.519	0.422
Weekly hours							
-preschool	5.761	6.757	5.582	6.170	4.906	6.404	5.778
-other formal	15.049	5.049[a]	11.940	10.815	23.406	12.315	16.954
Hourly cost (if >0)							
-preschool	2.073	2.046	1.540	2.024	2.049	1.799	1.869
-other formal	2.964	2.494	1.390	2.685	1.781	1.442	1.617
Average fee for other formal (Census)[b]	5.249	5.257	5.415	5.265	5.290	5.507	5.416
Sample Size	436	371	67	874	64	89	153

Note: The sample is restricted to the households who use some amount of formal care (including preschool) and who have children aged 3 to 4. The statistics are calculated for all children in the household and not just those aged 3 to 4. a) The seemingly low number of hours for couples with one worker is due to a large number of zero hours for formal care other than preschool. b) The average fee is a weighted hourly fee for the household with weights measuring the proportion of children in the various age groups. The hourly fees are higher than those presented in Table 6 because households have more than one child on average. Although it may seem surprising that fees are larger in jobless households, this is due to the presence of younger children.

Since preschool affects children 3 to 4 only, we expect the effects of excluding preschool hours in formal care to be stronger for that group. The results in Table 7b show that for couples, it is the relationship between fees and demands for the age group 0-2 that is affected. The results suggest that, among couples, hours of preschool are positively correlated with fees charged for formal care for children between 0 and 2 years old. Hence the inclusion of preschool in formal care makes the interpretation of the price effects more problematic and since this is a main policy variable, it is preferable to exclude preschool from formal care. For lone parents results suggest that preschool fees could be positively related to other fees for formal care for children aged 3-4. Hence an argument for the inclusion of preschool in formal care could be made. However we choose to be consistent with the treatment of preschool in the sample of couples and to include it in the informal care component for all households.

[35] For more information on the bootstrap estimator, please see Wooldridge (2002, pp.378-380).

A comparison of likelihood values also suggests that the inclusion of preschool in informal care is preferable. The log likelihood value for couples for the model with preschool included in formal care is –19109.450 and –18465.961 when preschool is included in informal care. The values for lone parents are -4757.617 and –4665.046 respectively. Although the models are not nested and cannot be tested against each other formally, the AIC (Akaike Information Criterion) would suggest that the models in which preschool is treated as informal care are preferred. In the following, preschool is grouped in informal care unless otherwise stated.[36]

Table 7b Marginal Effects of Fees on Formal and Informal Child Care Demands, Various Specifications (standard errors in parentheses)

	Couples		Lone Parents	
	Formal	**Informal**	**Formal**	**Informal**
Preschool hours are included in formal care:				
Children 0-2	-0.029 (0.986)	0.382 (1.321)	-5.262 (3.463)	4.910 (5.935)
Children 3-4	-0.442 (1.532)	5.498 (1.822)	-4.122 (3.891)	7.463 (8.273)
Children 5+	-0.431 (0.135)	-0.041 (0.266)	-0.391 (0.310)	2.729 (1.485)
Preschool hours are included in informal care:				
Children 0-2	-0.832 (0.995)	1.455 (1.370)	-5.419 (3.739)	5.265 (5.887)
Children 3-4	-0.585 (1.308)	6.585 (2.183)	-0.144 (3.961)	3.497 (9.162)
Children 5+	-0.412 (0.133)	-0.090 (0.281)	-0.365 (0.291)	2.049 (1.421)
Preschool hours are excluded:				
Children 0-2	-0.806 (0.989)	0.378 (1.353)	-5.277 (3.756)	4.953 (5.954)
Children 3-4	-0.607 (1.353)	5.684 (1.829)	-0.028 (4.129)	7.293 (7.863)
Children 5+	-0.411 (0.119)	-0.045 (0.240)	-0.356 (0.287)	2.706 (1.351)

Notes: Marginal effects are computed for each data point and averaged over the samples. Standard errors are computed on these averages with a bootstrap estimator using 200 replications. Other than the treatment of preschool, the specifications are identical in the three models and correspond to the one presented in Appendix Table A5.

7.3.3 Discussion of results from the demand model

We now turn to the results of the demand estimation for our chosen model as presented in Appendix Table A5. Various measures of fit are provided in the table.

[36] Although results for the model with preschool excluded from the analysis are included for comparison, this model is not preferred since it forces the impacts of preschool to be captured at least partly in the error and hence reduces the predictive power of the model. This is especially important when predicting total child care costs to be included in the labour supply estimates.

Overall the models perform well in the sense that they explain over 50 per cent of the variation in formal care demands and 20 to 34 per cent for informal care. Also, the average predicted probability of zero hours is within 1 percentage point from the observed frequency for formal demands and within 8 percentage points for informal demands. In general the models explain formal demands much better than informal care. This is not surprising given the lack of information on the availability of informal care.

Appendix Table A3 presents the average predicted demand for child care and the average observed demand for households based on the employment status of the parents. There is a slight overprediction of demands: 12.83 versus 11.47 for couples and 21.22 versus 18.30 for lone parents. The overprediction is greater among households with working parents. This is similar to what was found in the total cost model. Although employment is treated in a flexible manner in the model, some aspects of the relationship are not fully captured. It is possible that a selection type framework with different parameters at zero would be more appropriate. Without an instrument to distinguish between entry into child care and the hours of care chosen a larger sample size would be required to estimate such models. This is left for future work.

We now turn to the parameter estimates. For both couples and lone parents we find that formal and informal care demands are substitutes in the sense that unobservables that tend to increase one form of use also tend to reduce the other. Maximum likelihood estimates of the correlation coefficients for the error terms are -0.17 for lone parents and -0.27 for couples. Although the correlation is not very strong it is significantly different from zero for both groups of households.[37] The negative correlation could reflect the impact of unobserved characteristics such as availability of informal care or the range of quality offered in the formal care services as captured by the error terms.

To facilitate the discussion of the results of the bivariate demand model, we compute and present marginal effects of all explanatory variables in Table 8. For continuous variables (hours of work, income, fees, number of children) these are the derivatives

[37] P-values are 0.001 and 0.000 respectively.

Table 8 Marginal Effects on Formal and Informal Child Care Demands, Preschool Hours Included in Informal Care (standard errors in parentheses)

	Couples		Lone Parents	
	Formal	**Informal**	**Formal**	**Informal**
Income:			0.004 (0.001)	0.005 (0.004)
Father	0.001 (0.000)	0.002 (0.000)		
Mother	0.002 (0.001)	0.001 (0.001)		
Hours of work:				
Father	-0.059 (0.024)	0.019 (0.043)	0.155 (0.153)	0.420 (0.202)
Mother	0.123 (0.018)	0.175 (0.027)	0.243 (0.054)	0.187 (0.085)
Employment:				
Father	0.322 (0.534)	3.115 (0.933)	5.673 (2.893)	17.092(4.213)
Mother	4.052 (0.341)	6.461 (0.500)	3.063 (2.283)	17.511(4.676)
Fees:				
Children 0-2	-0.832 (0.995)	1.455 (1.370)	-5.419 (3.739)	5.265 (5.887)
Children 3-4	-0.585 (1.308)	6.585 (2.183)	-0.144 (3.961)	3.497 (9.162)
Children 5+	-0.412 (0.133)	-0.090 (0.281)	-0.365 (0.291)	2.049 (1.421)
No. Children:				
< 1 Yr.	0.320 (0.435)	3.996 (0.714)	1.511 (1.445)	11.382(3.638)
1 Yr.	2.803 (0.389)	3.876 (0.711)	3.722 (0.960)	8.161 (2.875)
2 Yrs.	4.459 (0.376)	4.151 (0.589)	7.234 (0.986)	2.955 (2.035)
3-4 Yrs.	2.291 (0.503)	6.311 (0.912)	3.888 (1.844)	9.392 (2.262)
5-9 Yrs.	-0.387 (0.201)	1.480 (0.365)	0.580 (0.659)	6.077 (1.506)
10 + Yrs.	-2.648 (0.414)	0.532 (0.580)	-2.813 (1.185)	5.607 (2.811)
Capital City:	0.378 (0.234)	0.675 (0.390)	1.144 (0.540)	-2.020 (1.419)
ACT&NT:	1.773 (0.526)	-1.093 (0.663)		
Parents' age:				
15-24:				6.570 (2.700)
Mother		1.627 (1.517)		
Father		3.073 (1.732)		
25-34:				4.145 (1.782)
Mother		0.905 (0.479)		
Father		1.174 (0.482)		
Parent is male:			2.177 (2.067)	-2.606 (3.578)

Notes: Marginal effects are computed for each data point and averaged over the samples. Standard errors are computed on these averages with a bootstrap estimator using 200 replications. Income is measured in dollars per week. Hours of work are measured in hours per week and marginal effects are averaged over the samples of workers only. Employment refers to the labour force status during the reference week. The counterfactuals for the change in employment are as follows: for those observed working, they are given hours of zero and income equal to the average income observed among non-workers when evaluating the expected value for employment set at zero. For non-workers, they are given average hours of work and income observed among workers when evaluating the expected hours of child care for employment set at one. The averages used for the counterfactuals are computed separately for males and females and for the two types of households. Fees are measured in dollars per hour and marginal effects are averaged over the samples of households with children in the age group under consideration. The parents' age groups are relative to the 35 and over group. For couples, the capital city dummy does not include the ACT or Darwin. The ACT&NT dummy is set at one for all observations in the ACT or NT. We must group the Northern Territories with the ACT because this is how the data are grouped in the SIHC survey. For sole parents, the capital city dummy is also set at one for all ACT and NT observations.

of the predicted dependent variable (the expected hours of child care including the probability of zero hours) with respect to the variable in question. For indicator variables, the difference in the expected hours of child care with the indicator set alternatively at one and zero is used. In all cases, the marginal effects are computed for each data point and averaged over the sample. Standard errors are computed on these averages with a bootstrap estimator using 200 replications.[38]

The results presented in Table 8 seem reasonable and generally are in line with expectations. Families with more children use more child care and so do higher income groups and families with working parents. Additional children of preschool age increase the use of formal child care while older children reduce usage of this type of care. For example, an additional child aged 3 to 4 increases formal child care by over 2 hours per week in two-parent households and almost 4 hours for lone parents. An additional child aged 10 or over reduces formal child care by over two and a half hours per week for both couples and lone parents. Informal child care is increased by the presence of additional children regardless of their age but effects are generally stronger for younger children. Except for the children under 1 year old and those aged 5-9 for formal care and 10 and over for informal care, the effects of adding children on hours of care are substantial and significant.

Parents' employment generally increases usage of both formal and informal child care but the effects are usually stronger for informal care, and for lone parent households. The only exception to this is the effect of hours of work by fathers in two-parent households. Increasing the hours of work for these fathers reduces formal child care usage by a small amount (.06 hours per week for an increase of one hour of work). The mother's employment status has greater effect on child care use than that of the father for two parent households. Couples in which the mother works use around 4 additional hours of formal care and 6.5 hours of informal care per week. An employed lone mother uses 3 additional hours of formal child care and 17.5 additional hours of informal care compared to a non-working lone mother. Increasing hours of work by working mothers in couples is related to a similar increase in both formal and

[38] For comparison, the marginal effects for the model with preschool included in formal care are presented in Appendix Table A6. Note that all results discussed in the text below are consistent with the results of the model in which preschool is treated as formal care. The largest differences are found in the effects of fees as presented in Table 7b.

informal care (.10 to .20 hour of care for an additional hour of work). For working lone mothers, an additional hour of work raises both formal and informal care by around .20 to .25 hours per week. Effects of labour supply on child care demand are substantial and significant except for fathers in two-parent couples where effects are often small and insignificant and for hours of work by sole fathers where the sample size is quite small and only the effect on informal care is significant.

Younger parents use more informal child care but no significant effects were found for formal care. The parents' age could be an indication of the availability of informal care from grandparents. Male lone parents use more formal care and less informal care; however these effects have high standard errors probably due to the small sample size (only 7 per cent of lone parents are male). Families living in urban areas (excluding the ACT) use more formal care however this effect has a large standard error. Couples living in the ACT or NT use over one and a half hours per week more in formal child care compared to couples living in other states. They also use one hour per week less in informal care. The effects of residence in a capital city, the ACT or NT are not significant for informal child care use.

Income increases usage of both formal and informal child care. Note that these income effects are computed keeping labour supply fixed hence they should be interpreted as pure income effects. The results suggest that child care is a normal good. An increase of $100 per week in the income of a lone parent keeping their labour supply constant would raise the use of child care by around one hour per week in total, the increase almost evenly distributed between formal and informal care. In comparison, similar increases in the incomes of either mothers or fathers in two-parent households would cause an increase in total care of about one third of an hour.

Fees are negatively related to usage of formal care and with one exception are positively related to informal care. This is consistent with the interpretation of formal and informal care as substitute goods. Among couples, the fees for older children are negatively related to informal care although the effect is very small and insignificant. The size of the coefficients on the fees seems reasonable however the standard errors are generally large and several of the coefficients are insignificant. This is likely to be due to the lack of variation in our instrument for child care prices. (Fees only vary with states and particular age groups for children.) Measures of fees that vary with

other characteristics of the households would be preferable but these are not available. Despite the large standard errors, the marginal effects of fees are generally consistent across specifications. This can be seen in Table 7b for the various specifications of preschool use in the models.

To facilitate the interpretation of the income, price and hours of work effects, we present these in the form of elasticities in Table 9.[39] A similar procedure as for the marginal effects is used to derive these results; that is, elasticities are calculated for each data point and averaged over the samples. Standard errors on these averages are computed with a bootstrap estimator using 200 replications.

Table 9 Elasticities for Formal and Informal Child Care Demands (standard errors in parentheses)

	Couples		**Lone Parents**	
	Formal	**Informal**	**Formal**	**Informal**
Income:			0.415 (0.167)	0.107 (0.082)
Father	0.189 (0.066)	0.190 (0.035)		
Mother	0.196 (0.049)	0.024 (0.028)		
Hours of work:				
Father	-0.953 (0.363)	0.098 (0.233)	0.534 (0.746)	0.520 (0.219)
Mother	0.355 (0.135)	0.230 (0.086)	0.912 (0.202)	0.205 (0.094)
Fees:				
Children 0-2	-0.644 (0.784)	0.540 (0.517)	-3.430 (2.818)	1.147 (1.268)
Children 3-4	-0.343 (0.773)	1.606 (0.520)	-0.044 (1.738)	0.497 (1.314)
Children 5+	-0.524 (0.177)	-0.034 (0.107)	-0.499 (0.417)	0.372 (0.261)

Notes: Elasticities are based on the marginal effects presented in the previous table. They are computed for each data point and averaged over the samples. Standard errors are computed on these averages with a bootstrap estimator using 200 replications. For hours of work, elasticities are averaged over the subsets of workers only. For fees, the averages are taken over households with children in the relevant age groups.

The own price elasticity (the proportional effect of fees on hours of formal care) is negative and quite strong for both types of households.[40] A doubling of child care fees will cause a reduction in demand for formal care of 34 to 64 per cent for couples. For lone parents the elasticities are more variable with effects ranging from 4 to 343 per cent. As for the marginal effects, the standard errors on the average elasticities are

[39] An elasticity is defined by dividing the percentage change in a variable of interest by the percentage change in the variable causing the change in the first variable, it thus measures the effect of a change. For example, a price elasticity of the demand for child care is expressed as the percentage change in the demand for child care (resulting from the price change) divided by the percentage change in price.

[40] It is difficult to compare these numbers with results from other studies since they are conditional on labour supply. We compare results of simulations of changes in child care prices on labour supply in Section 8.

relatively large especially for lone parents. Informal care is a substitute in the sense that formal price effects are positive except for the case of older children in couples, where a small insignificant negative elasticity is observed. Again these estimates are fairly imprecise.

Income elasticities are positive in all cases. The effects are stronger for formal than for informal care. For two-parent households, a doubling of the mothers' income (at constant labour supply) would result in an increase of 20 per cent in formal care usage and no significant change in informal care. Doubling the fathers' income would raise both formal and informal care by 19 per cent. For lone parents, doubling the household income would cause an increase of 42 per cent in formal care and just over 10 per cent in informal care.

Positive and significant effects of hours of work on child care use are found for mothers. A doubling of hours of work among working mothers in two-parent households would cause an increase of 36 per cent in formal care and 23 per cent in informal care. Among working lone mothers, a similar increase in working hours would almost double the hours of formal care while also causing a 21 per cent increase in informal care. Results for lone fathers' hours of work can also be large, but they are imprecise. For fathers in couples, an increase of 10 per cent in their hours (these hours are already quite high and even a small increase leads to a very high level of work) would lead to a reduction in formal care of around 10 hours per week while having no significant effects on informal care.

7.3.4 Predicted demand for child care

Returning to Table A3, we compare the predicted demand for child care with the observed demand in panel III. Except for the nonworkers in two-parent households, the demand for child care is overestimated on average but only to a small extent: 12.8 hours per week versus 11.5 for couples and 21.2 versus 18.3 for lone parents. The predicted number of people who do not use child care is fairly close to the observed number except when all adults in the household are working, in which case the number of households with zero demand is over-predicted. The predictions regarding hours of use and probability of non-zero usage are very close to observed values for

formal care. For all subgroups, predicted hours of formal care are well within one hour of the observed values and predicted probability of use is within one percentage point of the observed frequency. The overall averages (over both types of care) are further from observed values because of the poorer fit of the model for informal demands.

Finally, in Table 10 we present estimates of total weekly demands for child care (formal and informal) by employment status, income and presence of young children. These predictions are constructed from the estimated bivariate Tobit model of child care demands. (Please refer to Appendix Table A5 for the underlying coefficient estimates.) The household types in Table 10 are chosen to illustrate the separate effects of the presence of young children, hours of work and income on child care demands.

Table 10 Estimates of Total Weekly Demand for Child Care Hours (including zero hours)

	Couples			**Lone parents**		
Households	**No Child under 5**	**One Child aged 1**	**One Child aged 1 + One Child aged 3-4**	**No Child under 5**	**One Child aged 1**	**One Child aged 1 + One Child aged 3-4**
No workers	2.819	4.592	6.054	9.514	14.377	32.339
One parent works (father works in couples):						
Median I, median H	4.144	6.255	6.761	18.564	38.379	72.865
Low I, low H	3.923	6.038	6.949	15.549	30.470	54.017
Low I, High H	3.848	5.846	6.353	22.277	52.419	104.536
High I, high H	4.539	6.795	7.302	24.204	56.217	109.769
Both parents work- father has median hours and income and mother has:						
Median I, median H	10.755	18.617	19.176			
Low I, low H	8.598	12.841	10.499			
Low I, High H	12.030	25.243	31.192			
High I, high H	12.648	26.674	33.701			

Notes: Estimates are based on Tobit regressions. Please refer to Appendix Table A5 for more details. For all characteristics other than labour supply and the presence of children 1 to 5 years old, the average characteristics over the samples are used to predict hours of care. In particular, households are given the average number of children over 5 years old. I refers to income including labour income and H indicates hours of work. The median, low and high values for income and hours are computed from sample information and are the same as those listed in Table 4.

We begin by looking at the effect of young children in households with working parents assuming the parents work the median number of hours and earn the median income for the household in question. We find that adding a young child aged 1 to lone-parent households with a working parent increases total child care demands by

20 hours per week. Note that the parent is assumed to work 20 hours per week in this case. For couples with one worker (the father) there is a modest increase of around 2 hours per week in child care demand. When both parents work the increase is substantial - 8 hours per week- but it is less than for lone parents. (The mother is also assumed to work 20 hours per week in this case.) Adding a second child of preschool age, specifically a child aged 3 to 4, raises hours demanded by a small amount for couples but it doubles the number of hours predicted for lone parents.

Turning now to the effects of hours of work, we find that both for couples and for lone parents, it is hours of work rather than income which is the main determinant of child care demand. For example in the case of lone parents, raising hours of work from 8 to 37 increases child care demand by 20 to 25 hours for each preschool child. Raising income from 350 to 550 per week causes an increase of roughly 3 hours per week per preschool child. (These hours and income levels correspond to the 25^{th} and 75^{th} percentiles observed in the subsample of working lone parent households.) A similar result is found for couples. Increasing the mother's hours of work from 8 to 37 raises total demand for care by roughly 10 hours per preschool child while raising income per week from 225 to 550 causes an increase of around one hour per preschool child. For couples with only the father working, both increases in hours of work and income have small impacts only.

8. Labour Supply Estimates with Endogenous Demands for Child Care

In this section of the paper we present a model of costs of child care based on the demand model discussed above. The model allows us to predict the adjustment in formal child care demand and informal child care costs following a shift in the child care fees charged by child care providers. The approach also provides a reasonable prediction of both formal and informal child care costs. More details are given in Section 8.1. The labour supply model that incorporates imputed child care costs from this child care cost model is discussed in Section 8.2.

8.1 Demand for Formal Child Care and Cost of Informal Child Care

This model of costs is basically the same as the bivariate model of demands described in Section 7 with informal care costs replacing the hours of informal care demanded. This model provides a better prediction of informal care costs than would a model based on the demand for informal care given the lack of exogenous prices for informal care and the prevalence of zero prices.[41] Similar to the joint model of demands, the bivariate Tobit is used as the econometric framework. Hence the occurrence of zero informal costs and zero formal demands are explicitly modelled and so is the substitution between the two types of child care. Costs of preschool are included in informal costs for the same reasons as those discussed in the previous section. All explanatory variables in this specification are the same as those used in the joint demand model.

The estimates for this specification are given in Table A7 with the associated marginal effects presented in Table 11. The fit of the model is similar to that of the previous framework. We compare within sample predictions with observed (gross) costs in Appendix Table A3 Panel II. Observed gross costs for formal care are computed as observed hours of formal care (excluding preschool) times the average fee for the household. These costs are added to observed informal care costs (including preschool) to form the total given in Table A3. There remains a slight over-prediction on average: $27.05 versus $25.24 for couples and $27.20 versus $25.95 for lone parents. These discrepancies are small given the complexity of the dependent variable and we are satisfied with the performance of the model.

Comparing the marginal effects for the demand for formal child care in Table 11 with those in Table 8, we conclude that they are similar in the two specifications with the exception of a change in sign of the small (and insignificant) marginal effect of child care fees for 3 to 4 year olds for lone parent households. Not surprisingly there are larger differences in the marginal effects for informal costs. This is expected given the change in the dependent variable from weekly hours to weekly costs. Again the

[41] In effect using a predicted price for informal care times a predicted quantity of informal care demanded would yield zero costs for this type of child care and would not capture the variation in informal costs observed in the data.

Table 11 Marginal Effects on Formal and Informal Gross Costs, Preschool Costs Included in Informal Costs (standard errors in parentheses)

	Couples		Lone Parents	
	Formal	**Informal**	**Formal**	**Informal**
Income:			0.004 (0.001)	-0.000 (0.002)
Father	0.001 (0.000)	0.005 (0.001)		
Mother	0.002 (0.001)	0.006 (0.002)		
Hours of work:				
Father	-0.059 (0.026)	-0.022 (0.061)	0.167 (0.158)	0.393 (0.360)
Mother	0.125 (0.021)	0.148 (0.039)	0.239 (0.052)	0.113 (0.080)
Employment:				
Father	0.397 (0.582)	2.847 (0.882)	5.970 (3.133)	7.774(5.388)
Mother	4.069 (0.305)	5.969 (0.915)	3.298 (2.656)	5.311(4.651)
Fees:				
Children 0-2	-0.691 (0.953)	5.108 (2.258)	-4.845 (3.824)	4.641 (3.836)
Children 3-4	-0.698 (1.305)	1.581 (3.714)	0.187 (4.082)	-7.413 (5.307)
Children 5+	-0.418 (0.118)	-0.258 (0.329)	-0.327 (0.328)	-0.491 (0.438)
No. Children:				
< 1 Yr.	0.337 (0.445)	3.813 (1.124)	1.805 (1.315)	2.156 (1.638)
1 Yr.	2.804 (0.406)	3.601 (0.952)	3.792 (1.040)	0.196 (1.721)
2 Yrs.	4.476 (0.401)	4.655 (0.906)	7.298 (0.945)	-1.734 (1.566)
3-4 Yrs.	2.264 (0.541)	6.132 (1.204)	3.965 (1.601)	3.325 (1.362)
5-9 Yrs.	-0.375 (0.201)	1.287 (0.412)	0.574 (0.670)	-0.487 (0.847)
10 + Yrs.	-2.637 (0.393)	-3.018 (0.973)	-2.892 (1.057)	-1.181 (1.575)
Capital City:	0.328 (0.255)	1.852 (0.574)	1.175 (0.529)	0.327 (0.757)
ACT&NT:	1.823 (0.562)	1.312 (1.167)		
Parents' age:				
15-24:				-0.868 (1.276)
Mother		-4.490 (1.185)		
Father		5.972 (4.331)		
25-34:				2.565 (1.047)
Mother		-0.558 (0.658)		
Father		-0.749 (0.689)		
Parent is male:			2.090 (2.264)	0.561 (2.220)

Notes: Marginal effects are computed for each data point and averaged over the samples based on the estimates in Table A.7 in the appendix. Standard errors are computed on these averages with a bootstrap estimator using 200 replications. Income is measured in dollars per week. Hours of work are measured in hours per week and marginal effects are averaged over the samples of workers only. Employment refers to the labour force status during the reference week. The counterfactuals for the change in employment are as follows: for those observed working, they are given hours of zero and income equal to the average income observed among non-workers when evaluating the expected value for employment set at zero. For non-workers, they are given average hours of work and income observed among workers when evaluating the expected hours of child care for employment set at one. The averages used for the counterfactuals are computed separately for males and females and for the two types of households. Fees are measured in dollars per hour and marginal effects are averaged over the samples of households with children in the age group under consideration. The parents' age groups are relative to the 35 and over group. For couples, the capital city dummy does not include the ACT or Darwin. The ACT&NT dummy is set at one for all observations in the ACT or NT. We must group the Northern Territories with the ACT because this is how the data are grouped in the IDS survey. For sole parents, the capital city dummy is also set at one for all ACT and NT observations.

substantial differences between the two specifications are found for lone parent households. The employment of the lone parent causes a much smaller effect on informal costs than on the informal hours demanded which suggests the availability of care at a zero price. An increase in formal care fees is more likely to cause a reduction in informal care costs despite a positive effect on hours used, again suggesting the increase is in informal hours at zero prices.

Finally, the effects of the age of the parents are different for both types of households. When looking at hours of informal care demanded, we found that younger parents had larger demands for informal care hours. We interpreted this as a measure of the availability of care by grandparents. That the effect of the parents' age on costs is more likely to be negative is an indication that the increase in hours is often at zero cost.

Weekly gross costs of child care are predicted for various household types using the parameters in Table A7 and the fees in Table 6. For formal care, the gross costs are calculated as the predicted hours demanded times the average fee for the household given the number and age of children in the household. For informal care, gross costs are simply the predicted level of costs from the estimated model. The two are added to yield the total gross costs of child care. The results are presented in Table 12.

Although we cannot directly compare the level of the gross child care costs in Table 12 with the child care costs computed earlier in the paper (and presented in Table 4) we do find that the variation in costs across household type is similar in the two models. This is also the case for the level of demands presented in Table 10.

Specifically, the addition of a 3 to 4 year old child adds more to the gross costs than the addition of a one year old child, the mother's or lone parent's labour supply has a larger effect on child care costs than the father's labour supply, and hours of labour supply affect child care costs more than income does.

Table 12 Estimates of Weekly Gross Costs of Child Care (including zero hours)

	Couples			Lone parents		
Households	**No Child under 5**	**One Child aged 1**	**One Child aged 1 + One Child aged 3-4**	**No Child under 5**	**One Child aged 1**	**One Child aged 1 + One Child aged 3-4**
No workers	1.032	1.819	9.422	2.546	10.618	41.980
One parent works (father works in couples):						
Median I, median H	1.188	1.868	11.430	15.327	32.272	107.488
Low I, low H	1.191	1.973	10.983	12.254	17.828	49.346
Low I, High H	1.024	1.674	10.105	22.167	81.016	224.108
High I, high H	1.437	2.153	13.314	26.259	91.967	240.713
Both parents work- father has median hours and income and mother has:						
Median I, median H	3.405	8.062	32.974			
Low I, low H	2.324	4.046	19.071			
Low I, High H	3.591	12.948	49.193			
High I, high H	4.967	16.668	58.469			

Notes: Estimates are based on Tobit regressions. Please refer to Appendix Table A7 for more details. Costs are in 1996 dollars. For all characteristics other than labour supply and the presence of children 1 to 5 years old, the average characteristics over the samples are used to predict costs. In particular, households are given the average number of children over 5 years old. I refers to income including labour income and H indicates hours of work. The median, low and high values for income and hours are computed from sample information and are the same as those listed in Table 4.

8.2 Labour Supply

The predicted gross costs described above are used to impute child care costs for households in the SIHC sample for different labour supply choices. The methodology used to input the gross costs in the labour supply framework of MITTS is similar to that used when total costs functions were estimated (see Section 6). There is one additional step in the imputation namely the calculation of net costs from the predicted gross costs. Predicted levels of Child Care Assistance and Rebate are calculated within MITTS based on the characteristics of the households and the predicted formal child care costs. These subsidies are deducted from the formal costs, before adding the formal and informal costs together.[42] The result is a predicted net child care cost based on predicted formal demands, average fees per household, total predicted informal care costs and calculated subsidies.

[42] It is assumed that all people paying for formal child care are eligible for the rebate (that is they are either working or in training or searching for a job). This will understate the child care cost to some extent, although one would expect that most families with children in formal child care (which excludes preschool) do this for employment or education reasons.

The last rows in parts a) and b) of panel II in Table A3 present the simulated net child care costs and the probability of zero net cost for the SIHC. The predicted net cost is lower than the observed cost in the Child Care Survey for couples ($12.20 versus $15.87) and higher for lone parents ($16.94 versus $9.63). We believe there are two factors responsible for the greater discrepancies between observed and predicted values when dealing with net costs. First, observed costs in the Child Care Survey are likely to include the Child Care Assistance and Rebate for some of the households given that the question does not distinguish between gross and net costs. Consequently the observed cost should be somewhere in between the true gross cost and the net child care costs based on the calculated subsidy. This is what we observe for couples.

Secondly, applying the average fee to all households is likely to overestimate the cost to poorer households who have greater incentive to seek out the cheaper options. These hypotheses cannot be verified explicitly with the available data. However, it is good to keep in mind that as a result of this, child care costs for lone parents may be overstated given that the proportion of families on low income is likely to be higher for this type of household.

Similar to the previous model of labour supply based on estimated cost functions for child care services, we can construct predicted costs from expected hours of child care or draw a sample of values for hours thereby retaining more of the variation in costs observed in the Child Care Survey. The latter approach reflects to a greater extent the uncertainty associated with the imputation. It is also more efficient in that more information from the estimation of the demands will be used in re-estimating the labour supply functions. A further advantage is that the calculation of Child Care Assistance and Child Care Rebate is more accurate in the latter approach, given that the subsidy payable for the average child care cost is not the same as the average Child Care Assistance and Rebate over all possible child care cost levels.[43] In this section 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.

[43] An alternative procedure would use draws from the observed distribution of fees charged by the providers by state of residency and age of children. However, this would require access to unpublished data from the Census on Child care Services. This is left for future research.

The results of the labour supply re-estimation including the child care costs estimated from the child care demand model are given in the last two columns of Appendix Tables A4b and A4d. Again the overall results are similar to the original estimates in the direction and the relative size of the parameters. There is more of an impact on some of the coefficients for lone parent households. Given the larger predicted child care costs for lone parents (see Table A3) a larger change in the parameters is expected.

Table 13a presents the overall labour supply values for those households in the SIHC with children. These are based on the new parameter estimates, which take into account the child care costs estimated from the formal demand/informal costs models. The average predicted labour supply values are virtually identical to those resulting from the simpler modelling of the total cost for child care (see Table 5b). The predictive power in the two labour supply models is similar as well.

In order to facilitate the interpretation of the results, we conduct a similar experiment to that presented in Section 6 namely we look at labour supply responses following a doubling of the child care costs. Two changes are examined. First, we look at the changes in expected labour supply resulting from a doubling of the net cost of child care. This is similar to the experiment conducted in Section 6 for the total cost function and can be used to check the consistency of our results in the more complex framework. These results are presented in the middle of Table 13a.

Compared to Table 5b, the labour supply responses in Table 13a are smaller: a fall of 6.5 per cent in hours for lone parents compared to 7.8 in the previous estimates and similarly a fall of 3.3 per cent for mothers in two-parent households compared to 5.1 per cent. This is easily explained for couples since the predicted child care costs are lower in the current specification. Furthermore, the latest estimates will be more accurate if the lower net costs are in fact due to an over-reporting of the 'net' costs in the Child Care Survey.

The results for lone parents are harder to understand given that their predicted child care costs are higher on average in the current specification. The answer lies in a comparison of the predicted costs of child care at all possible labour supply levels and

not just at the observed choice. Such a comparison reveals that at 0 and 5 hours of work the predicted costs of child care are higher in the current specification, but that for all hours up to 45 the predicted costs are lower. Hence it is relatively less attractive to reduce labour supply to 0 or 5 hours in the current specification in response to a doubling the cost of child care and the predicted reduction in labour supply is not as high as in the cost function specification. The higher average cost based on the demand for child care model (as presented in Table A.3) is a result of higher costs only at very low labour supply hours. This supports our conjecture that the households at the bottom of the income distribution are choosing child care with low hourly costs relative to average fees. It also implies that we may be understating the labour supply responses for lone parent households when using the demand for child care model to impute child care costs.

Table 13a Labour supply estimates and changes for households with children accounting for child care assistance and child care rebate (10 draws)

	Lone parents		Couples			
			Fathers		Mothers	
	Exp hrs	Part.	Exp hrs	Part.	Exp hrs	Part.
Initial Estimates:						
- predicted values	11.35	0.398	38.24	0.901	14.52	0.505
- actual values	11.32	0.402	38.14	0.903	14.00	0.515
- % correct predictions		47.68		37.03		36.88
Double net costs without adjustments in demand:						
-predicted values	10.61	0.380	38.18	0.900	14.04	0.492
-change	-6.5%	-1.8ppt	-0.2%	-0.1ppt	-3.3%	-1.3ppt
Gross prices are doubled allowing for adjustments in demand:						
-predicted values	11.10	0.389	38.25	0.901	14.32	0.499
-change	-2.2%	-0.9ppt	+0.0%	0.0ppt	-1.4%	-0.6ppt

Note: Exp Hrs denotes expected hours of labour supply including zeroes. Part. indicates the participation rate.

The last set of results in Table 13a presents the labour supply responses to a doubling of the gross hourly price of child care letting the quantity demanded adjust to the price change. In addition, Child Care Assistance and Rebate are recalculated for the new cost values. The net costs will now be smaller as the demands for formal care are negatively related to the price for most households (see Subsection 7.3.3) and higher levels of Child Care Assistance and Rebate will be obtained for eligible households.

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We observe from Table 13a that as expected, the effects on labour supply are lower when the adjustment in the quantity demanded is taken into account. As seen previously, for most households, an increase in the price of formal care implies a large substitution in hours demanded from formal to informal care as well as a reduction in the total quantity demanded. There remains a negative effect on mothers' labour supply although it has decreased from –6.5 per cent to –2.2 per cent for sole parents and from -3.3 to -1.4 per cent for married mothers. The inclusion of the Child Care Assistance and Rebate and the modelling of changes in the demand for child care have brought our results closer to the results in Blundell et al. (2000), who included child care credits in their simulations of the effect of price increases for the U.K. (see Section 6).

Table 13b looks at the effects of increases in child care costs for different types of households. As expected, when we include adjustments in demand and subsidies we find smaller labour supply effects for most households. The relative results for the different groups have however remained the same. Lone parents, particularly those with preschool children, are most affected. For these households, a doubling of the fee causes a reduction in labour supply of 11 per cent on average over the sample. When restricting the sample to those earning less than the median wage, the effect increases to 15 per cent. It is interesting to note that a doubling of the fee has a greater impact on sole parents with preschool children earning low wages than a doubling of the net costs. At the original fee, they already receive close to the maximum amount of rebate and assistance so that doubling the fee more than doubles the net cost and the lower demand for child care is not sufficient to counteract this completely. This is confirmed by comparing the imputed child care cost when doubling the net cost with the imputed child care cost when doubling the gross fee at the different labour supply levels. For low-paid lone parents with preschool children, the child care cost more than doubles when doubling the gross fees.

Married men are hardly affected by child care fee increases. Men's labour supply is also practically unchanged by the presence of preschool children (on average 38.18 hours per week for men with preschool children, versus the sample average of 38.24).

The wage levels however are important for this group's labour supply (on average 34.36 hours per week for men on less than median wages, versus 38.24 hours).

Table 13b Labour supply effects for households with children under 12 years of age

	Lone parents		Couples			
	Expected hours		Expected hours men		Expected hours women	
All in sample	**Hours**	**% diff.[a]**	**hours**	**% diff.[a]**	**hours**	**% diff.[a]**
Initial estimate (1)	11.35		38.24		14.52	
Double net cost (2)	10.61	-6.5	38.18	-0.2	14.04	-3.3
Double gross fee (3)	11.10	-2.2	38.25	+0.0	14.32	-1.4
Wages < median wage[b]						
Initial estimate (1)	6.47		34.36		9.71	
Double net cost (2)	6.03	-6.8	34.30	-0.2	9.44	-2.8
Double gross fee (3)	6.29	-2.8	34.37	+0.0	9.56	-1.5
Female Wage < median , male wage>median[b]						
Initial estimate (1)			40.73		11.21	
Double net cost (2)			40.67	-0.1	10.81	-3.6
Double gross fee (3)			40.74	+0.0	11.04	-1.5
Households with children less than 5 years						
Initial estimate (1)	5.71		38.18		10.56	
Double net cost (2)	5.07	-11.2	38.08	-0.3	9.88	-6.4
Double gross fee (3)	5.09	-10.9	38.18	0.0	10.20	-3.4
Households with children less than 5 years and wages < median wage[b]						
Initial estimate (1)	3.70		34.32		6.88	
Double net cost (2)	3.30	-10.8	34.25	-0.2	6.56	-4.7
Double gross fee (3)	3.16	-14.6	34.34	+0.1	6.64	-3.5
Households with children less than 5 years and Female Wage < median , male wage>median[b]						
Initial estimate (1)			40.79		7.60	
Double net cost (2)			40.69	-0.2	7.07	-7.0
Double gross fee (3)			40.80	+0.0	7.30	-3.9

Note a: For (2), the difference between (2) and (1) and for (3) the difference between (3) and (1) is taken.

b: For all households, the median wage levels used are the following: for lone parents $9.68, for husbands $16.29 and for wives $11.55. For households with children less than 5 years old, the median wage levels used are: for lone parents $9.61, for husbands $15.79, and for wives $11.23.

Compared to the total cost model presented in Section 6, mothers on less than the median wage who are married to men with wages above the median level seem relatively less affected by price changes in the current specification. The reduction in labour supply for married mothers is now around -1.5 per cent for mothers without preschool children and around -3.9 per cent for mothers with preschool children and is similar to the result for other women.

Finally, it should be noted that the results in this section may underestimate labour supply shifts given that the predicted shift from formal to informal care may not be

available forcing individuals to adjust their labour supply rather than the type of child care used.

8.3 Comparison with Other Studies

Studies in the U.S., Canada, the U.K., and Norway have looked at the impact of child care costs and/or child care prices on the probability of employment and the average number of hours worked. Table 14 presents an overview of these results in terms of elasticities. The last few rows present our elasticities (derived from Table 13a) with regard to the net child care cost and the gross child care price. We include both since most other studies report the elasticity with regard to the child care cost.

Compared to the results from other studies, our results for the total samples of women are of the same sign but are quantitatively relatively small. The impacts found for Australia are closer to those found for the U.K. In our study we consistently find much higher elasticities for lone parents and more generally for low-income households. This has also been found for the U.S. in Michalopoulos et al. (1992). The simulation in the latter study examines the effect of introducing a policy that increases child care subsidies for low-income households. They do not present elasticities but the simulations show that child care subsidies aimed at the lower income groups are more effective at stimulating labour supply than subsidies benefiting households on higher incomes. The review paper by Anderson and Levine (1999) also mentions results that suggest that poorer households are more affected by changes in child care cost changes.

Blundell et al. (2000) is one of the few studies to look at married men. Their results (not shown in Table 14) suggest that men are hardly affected at all by child care costs. This is similar to our findings.

There are also interesting differences in the Australian results and other overseas studies. For example, Ribar (1995) finds that in the U.S. the child care cost elasticity is lower for women with children under 6 years of age while we consistently find the impacts on labour supply to be greater in households with pre-school children. Many factors are likely to be involved in explaining the similarities and the differences

between Australia and other countries such as the size of the costs relative to earnings, the prevalence of part-time work, and the availability of care. A careful study comparing these factors would be very helpful in understanding the relationship between labour supply and child care but it is clearly beyond the scope of the present study.

Table 14 Summary of results from other studies on the effects of child care prices/costs on participation and average hours

Reference	Country	Population	Estimated elasticity	
			Participation	**Average hours**
Anderson and Levine (1999)	U.S. (review)	Married women	-0.92 – 0.00	
		Single women	-0.50 – 0.00	
Blau and Hagy (1998)	U.S.	Married and single mothers		-0.20
Blau and Robins (1988)	U.S.	Married women	-0.38	
Conelly (1992)	U.S.	Married women	-0.20	
Ribar (1992)	U.S.	Married women		-0.74
Ribar (1995)	U.S.	Married women		-0.024 to -0.088
Powell (1998)	Canada	Married women	-0.38	-0.32
Powell (2002)	Canada	Married women	-0.16[a]	
Blundell et al. (2000)[b]	U.K.	Married women:		
		-unemp. man	-0.075	-0.084
		-emp. man	-0.066	-0.048
		Single women	-0.021	-0.020
Kornstad and Thoresen (2002)	Norway	Married women	-0.12	-0.14
Our results[c]	Australia	Married women:		
		-total	-0.012 or -0.025	-0.014 or -0.033
		-low wages	-0.014 or -0.029	-0.015 or -0.036
		-preschool child	-0.027 or -0.046	-0.034 or -0.064
		-p.s. child & low wages	-0.032 or -0.051	-0.039 or -0.070
		Lone parents:		
		-total	-0.022 or -0.045	-0.025 or -0.065
		-low wages	-0.026 or -0.050	-0.028 or -0.068
		-preschool child	-0.075 or -0.110	-0.109 or -0.112
		-p.s. child & low wages	-0.130 or -0.072	-0.146 or -0.108

Note: a) This elasticity is derived from the simulation of a decrease in the formal child care price (center price) in Table 4 in Powell (2002).
b) These elasticities are derived from Tables 7 to 9 and 11 in Blundell et al.
c) Both the results from doubling the gross price and doubling the net costs (largest effects) are presented.

9. Discussion of the Modelling of Child Care Subsidies

The previous sections on the re-estimation of labour supply contained a simulation of the effect on labour supply of a doubling in the net child care cost and the gross child

care fee. In these simulations, the Child Care Rebate and Assistance were computed based on the policies in place at the time of the survey. The model of child care demand (cost) implicitly takes these policies into account in the sense that the parameter estimates reflect adjustments in demand (cost) net of any subsidies. Specifically, the amount of child care used depends directly on the gross fees and the household characteristics; the parameters of the child care policies do not enter directly in the model of demand. When major changes are made to the system of child care subsidies one would expect the parameters of the demand for child care to change.[44]

In order to simulate the effects of changes in specific policy parameters one should incorporate these in the demand model directly. In other words the demand should depend explicitly on net child care fees computed from gross fees, the household characteristics and the policy parameters. We could not do this in the current study because the Child Care Survey does not provide enough detail on the household's income to determine the net fees. Specifically we need more detail on the level of income in the household.

The data requirements for a study of both labour supply and child care demand taking into account detailed policies on income taxes and transfers and child care subsidies are great. In this study, we have incorporated specific policy parameters in the labour supply modelling but not in the child care demands due to the aggregated income information in the Child Care Survey. Many researchers have been faced with similar problems. In their simulation, Blundell et al. (2000) only allow hours of child care to depend on hours of work and prices are drawn randomly from a discrete set of possible prices. This means that the demand for child care does not change following an increase in gross or net prices.

Duncan, Paull and Taylor (2001a) use a data set based on a survey containing information on both child care and labour supply. This allows for a simultaneous determination of child care demand and labour supply and a separate estimation of the role of gross hourly child care fees and child care subsidies. However, they must simplify the model in other dimensions: child care subsidies are independent of the

[44] This is the Lucas critique.

hours of use and the hours worked, the number of possible choices of labour supply is set at three and there are only three states of possible child care use (one of them being unknown).

Given the data available to us we have chosen a framework somewhere in between the above two models. Our model of child care demand and labour supply is flexible in allowing many different choices to be made and in explicitly taking into account the substitution between formal and informal care. Price is a factor in our model for the demand for child care unlike in Blundell et al. (2000), but child care subsidies are only implicitly taken into account and not explicitly modelled as in Duncan, Paull and Taylor (2001a). Child care policies are explicitly modelled in the labour supply framework only. This means we cannot simulate changes to the child care subsidies properly.

To illustrate the consequences of ignoring adjustments in demand, we describe the effect of a policy change on child care costs at the different labour supply levels. We examine the changes following the elimination of the Child Care Rebate and the Child Care Assistance schemes. A comparison of predicted child care costs when the Child Care Rebate and the Child Care Assistance schemes are in place with the predicted costs after abolishing these payments shows that the predicted costs increase relatively more at the lower hours points (and thus the lower incomes) than elsewhere. Also the increase in costs is greater for lone parents than for couples. This is not surprising since it indicates that the rebate and assistance had a greater impact on child care costs for the lower income groups. Abolishing the subsidies without adjusting the demand for child care could lead to the counterintuitive effect of households increasing their labour supply because at lower hours, disposable net income has become relatively less attractive. However, it seems unlikely that households who are faced with higher costs of child care −because all subsidies are abolished− would leave the amount of child care they use unchanged.

In the ideal approach, a simultaneous labour supply and child care model would be estimated accounting for disposable net income at all possible combinations of labour supply and child care. If the data were based on one survey only, such a model could allow for correlation in the unobservables affecting household behaviour as well.

However, this requires a data set that incorporates all necessary information on hours of work, detailed income, personal characteristics, household composition and child care use. Alternatively, a somewhat less ideal approach which still allows a proper policy simulation could be used with the existing data if we had the detailed income information to incorporate policy parameters directly in the child care demand model. We would need to know the exact amount of income instead of the broad categories available in the Child Care Survey, and labour income would have to be separated from non-labour income. It would also be helpful to have better information on how much Child Care Assistance and Rebate is included in the observed child care costs.

10. Conclusion

Our findings suggest that nonparental child care costs in Australia are quite low on average mostly because a significant amount of the care is informal with zero monetary cost.[45] The costs vary substantially across households depending on the presence of preschool children and on the labour supply of the parents. In particular, the weekly costs are much higher for lone parents than for couples. The estimation of demand functions shows a substantial and negative price elasticity for formal care. For most households, informal care is a substitute to formal care. Income elasticities are also generally positive and substantial.

Although the analyses in this paper are based on data from 1996/1997, the more general implications from the model can be extrapolated to the current situation under the assumption that individuals' preferences have not changed to a large extent between 1996/1997 and now. That is, the model can inform us on the effect of financial aspects, relating to child care, on the labour supply of different household members, but not on the effect of all specific current policies.

The effect of child care costs on labour supply is seen to be large for one-parent households and for mothers in two-parent households. The demand function results however suggest that changes in the price will lead to a smaller change in costs due to the large substitution out of formal care hours. Although the Child Care Assistance to

[45] These are the child care costs as they were measured in 1996/1997 in the Child Care Survey by the ABS.

parents with preschool children is much higher than for school-going children, simulations show that the presence of preschool children has a large effect on the impact of child care fee increases. The much larger number of hours of child care needed for preschool children is likely to cause this greater impact. For lone parents in particular, doubling the formal child care fees has a relatively small effect on labour supply when no preschool children are present. For mothers in two-parent households, substitution reduces the impact of price changes in labour supply but an effect remains.

Using the estimated models, simulations are performed to evaluate the effects of changes in the gross fees. These could be interpreted as changes in the grants paid directly to the child care providers. Doubling of the gross price of child care reduces the participation rate by around 2.2 per cent for sole parents and 1.2 per cent for married women. The lower effects for married women relative to lone parents is found consistently in the various models we estimate. When increasing net costs instead of gross fees the effects are somewhat higher (-4.5 and -2.5 per cent for lone parents and married women respectively). A comparison of our results with overseas findings show that the sign of the effects are similar but the quantitative results are in the low end of the range. Specifically, the Australian labour supply elasticities relative to child care costs are more similar to those found in the U.K. than the U.S. estimates. For certain subgroups in the population, the responses in labour supply (average hours worked) to increases in child care costs are substantially larger. For sole parents, the average effect of a doubling of the gross child care fee is a fall of 2.2 per cent in expected hours of work. This reduction is close to 11 per cent for those with preschool children and nearly 15 per cent for those with preschool children earning low wages. The effect for married women is lower than for lone parents at an average of -1.4 per cent. A somewhat larger effect of -3.4 and -3.9 per cent is found for married women with preschool children. There are conflicting results from overseas studies on the relative impact of child care costs on the labour supply of households with and without preschool children. However the findings from studies designed to isolate the effects on low-income families tend to support our results on the larger effect for low-wage women. Finally, effects on the labour supply of married men are negligible. This is also found in U.K. data.

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Appendix Table A1 Variable Means and Estimates from Tobit Regressions of Total Child Care Costs

	Couples				Lone Parents			
Variable	**Mean**	**Coeff**	**P val**	**Marg Eff**	**Mean**	**Coeff**	**P val**	**Marg Eff**
No. Child: aged <1	0.164	-5.341	0.263	-1.316	0.086	-5.212	0.570	-0.937
aged 1	0.155	14.195	0.002	3.497	0.118	13.749	0.059	2.628
aged 2	0.153	33.571	0.000	8.269	0.119	28.732	0.000	5.491
aged 3-4	0.310	63.084	0.000	15.539	0.246	43.162	0.000	8.249
aged 5-9	0.751	-4.992	0.068	-1.230	0.663	-8.037	0.063	-1.536
aged >9	0.289	-36.777	0.000	-9.059	0.309	-24.600	0.000	-4.702
Employed:					0.396	40.891	0.033	9.021
Father	0.886	-9.388	0.427	-2.466				
Mother	0.545	-5.234	0.644	-1.295				
Hours: Father	34.878	1.390	0.072	0.342	1.219	-1.103	0.126	-0.211
Mother	13.587	1.745	0.013	0.430	8.565	-0.561	0.354	-0.107
$(\text{Hours})^2$:Father	1464.435	-0.026	0.044	-0.006				
Mother	443.004	-0.026	0.028	-0.006				
Empl*No.Ch:aged 0-2	0.183	3.044	0.682	0.750	0.077	-6.555	0.722	-1.253
aged 3-4	0.141	-9.820	0.215	-2.419	0.078	-28.813	0.092	-5.507
aged 5+	0.561	5.143	0.291	1.267	0.374	-22.279	0.096	-4.258
Min Hrs*No.Ch:0-2	3.670	1.475	0.000	0.363	1.536	1.288	0.036	0.246
3-4	3.081	0.769	0.003	0.189	1.996	1.452	0.007	0.278
5+	13.267	0.095	0.545	0.023	9.242	1.474	0.001	0.282
Income:					354.897	0.034	0.005	0.006
Father	650.246	0.031	0.000	0.008				
Mother	270.937	0.056	0.000	0.014				
Urban	0.585	12.243	0.000	2.983	0.536	12.638	0.012	2.413
ACT-NT	0.029	14.847	0.011	4.088	0.031	6.386	0.529	1.316
Vic	0.250	-8.138	0.046	-1.921	0.230	3.926	0.586	0.777
Qld	0.187	-3.960	0.355	-0.954	0.210	12.286	0.086	2.613
SA	0.077	-8.236	0.094	-1.916	0.078	5.932	0.465	1.209
WA	0.093	-15.980	0.001	-3.533	0.113	3.621	0.632	0.717
Tas	0.028	-10.032	0.126	-2.288	0.039	-7.742	0.471	-1.356
Age of parent: 15-24					0.154	6.584	0.417	1.341
Mother	0.051	-14.442	0.091	-3.165				
Father	0.028	9.135	0.393	2.428				
Age of Parent: 25-34					0.423	20.407	0.000	4.094
Mother	0.459	-0.357	0.920	-0.088				
Father	0.341	-3.092	0.386	-0.755				
Parent is Male					0.074	20.044	0.083	4.846
Constant		-118.687	0.000			-98.149	0.000	
Variance (σ)		71.559	1.390			50.947	2.290	
Obs Mean, Exp Val		15.867,17.688				9.627,10.615		
Proportion at 0: obs, pred		0.686,0.712				0.729,0.753		
Correlation of pred & obs		0.513				0.436		
Log Likelihood Value		-9965.525				-1798.064		
- χ^2 p-value		0.000				0.000		

Notes: The sample size for couples is 4908 and for lone parents 1079. The marginal effects are computed numerically and evaluated at the mean of the data. For couples, an employment dummy is interacted with the number of children only if both parents are employed; in this case, the minimum across the parents' hours is interacted with the number of children. The reference group for the state dummies is NSW. For the estimate of the standard error on the residuals (σ), the standard error on the coefficient is given instead of the p-value. The observed mean of the dependent variable is computed over all observations including the censored ones. The expected value takes into account the probability of censoring and is averaged over all observations. The observed proportion at 0 is the proportion of observations censored at 0 while the predicted proportion is the predicted probability of a censored value at 0 averaged over all observations. The correlation between predicted and observed is computed over non-zero observations. The p-value corresponds to the χ^2 test that all coefficients except the constant term are jointly 0.

Appendix Table A2 Composition of Samples from the Survey of Income and Housing Costs SIHC) and the Child Care Survey (CCS)

	Couples				Sole parents			
	SIHC		CCS		SIHC		CCS	
	weighted	unwght	weighted	unwght	weighted	unwght	weighted	unwght
Per cent distribution of households by number of children aged 0-2								
0	61.6	63.0	59.6	60.4	73.0	76.0	70.6	71.5
1	32.8	31.7	34.2	33.8	24.7	22.0	26.5	25.5
2 or more	5.7	5.4	6.2	5.8	2.3	2.0	2.9	3.1
Per cent distribution of households by number of children aged 3-4								
0	71.7	72.2	71.0	70.7	76.2	76.7	76.9	76.4
1	26.5	26.1	27.6	27.9	22.5	22.0	22.1	22.5
2 or more	1.8	1.7	1.4	1.3	1.2	1.2	1.0	1.1
Per cent distribution of households by number of children aged 5-9								
0	45.6	45.3	44.0	42.9	50.8	48.5	46.3	45.3
1	38.4	38.0	38.8	39.4	38.1	40.6	41.8	42.3
2	14.1	14.7	15.3	15.8	10.5	9.9	11.1	11.6
3 or more	2.0	2.1	2.0	2.0	0.7	1.0	0.7	0.9
Per cent distribution of households by number of children aged 10 or more[a]								
0	65.0	64.9	71.8	71.72	61.0	61.1	71.2	72.0
1	31.3	31.1	27.1	27.1	32.9	33.4	27.1	26.4
2 or more	3.7	4.0	1.1	1.2	6.1	5.5	1.7	1.5
Per cent distr. of hhlds. by hours of work of the mother[b]					*Per cent distr. by hours of work of the parent*[b]			
0	47.2	45.3	45.5	45.3	62.6	59.9	60.9	60.8
1-15	11.9	11.9	16.8	17.1	7.7	9.8	13.9	13.9
16-24	13.3	13.8	11.7	11.9	5.1	6.6	6.0	6.3
25-34	8.9	9.4	9.3	9.4	5.0	5.3	5.6	5.6
35-39	8.3	8.8	5.9	5.9	11.5	9.8	4.8	4.8
>39	10.5	10.7	10.9	10.4	8.1	8.6	8.7	8.7
Per cent distribution of households by hours of work of the father[b]								
0	12.3	11.5	11.3	11.3				
1-15	2.3	2.0	5.5	5.2				
16-24	1.6	1.7	3.1	3.2				
25-34	2.4	2.3	7.5	8.3				
35-39	18.7	19.0	12.7	12.9				
>39	62.8	63.5	59.9	59.1				
Per cent distribution of households by age of the mother					*Per cent distr. of hhlds. by age of the parent*			
15-24	4.7	4.4	4.9	5.0	13.1	12.1	15.4	15.4
25-34	43.0	42.0	45.6	45.8	42.7	39.9	42.2	42.8
35-44	45.3	46.4	44.2	44.0	37.4	39.9	35.3	35.0
>44	7.0	7.2	5.3	5.2	6.8	8.2	7.1	6.7
Per cent distribution of households by age of the father								
15-24	1.9	1.8	2.7	2.7				
25-34	32.3	32.0	33.4	33.6				
35-44	49.7	49.4	50.0	50.1				
>44	16.1	16.8	13.9	13.7				
ACT/NT (%)	2.53	7.3	2.8	7.2	2.5	7.4	3.1	7.4
Cap city (%)	58.1	56.1	59.9	60.1	56.7	57.7	55.6	55.9

Note: The sample sizes are: for couples, 1281 in the SIHC and 5305 in the CCS, for lone parents, 353 in the SIHC and 1116 in the CCS. a) This includes children 10 to 12 in the SIHC and 10 to 11 in the CC. b) The sample of workers is limited to paid employees in the SIHC since hours of work are not provided for those working on their own account. The sample of workers in the CCS includes all workers as we cannot separate the employees. The proportion of self-employed workers in the SIHC is approximately 7.5 per cent for women and 14 per cent for men in two-parent households and 4 per cent for lone parents.

Appendix Table A3 Comparisons of within sample predictions, observed values and imputed values.

	Couples				Lone parents		
	No workers	One worker	Two workers	Total	Non worker	Worker	Total
I. Weekly costs - estimates based on the total cost function model:							
a) Expected costs (including zeroes)							
CCS -observed	4.168	6.576	24.862	15.867	4.117	18.007	9.627
CCS -predicted	6.491	10.089	25.319	17.688	5.494	18.404	10.615
SIHC-simulated	6.020	9.733	28.664	18.380	5.180	23.874	12.142
b) Frequency of zero costs							
CCS –observed	0.811	0.754	0.613	0.686	0.808	0.610	0.729
CCS –predicted	0.854	0.796	0.624	0.712	0.838	0.623	0.753
SIHC-simulated	0.840	0.787	0.623	0.714	0.834	0.634	0.762
II. Weekly gross costs - estimates based on the joint model of demand for formal care and costs for informal care:							
a) Expected costs (including zeroes)							
CCS-observed	15.385	12.008	36.912	25.242	15.385	42.008	25.946
CCS-predicted	13.674	17.086	36.832	27.047	16.804	43.017	27.202
SIHC-simulated (gross)	7.378	9.189	25.537	16.763	20.947	42.628	29.021
SIHC-simulated (net)	2.767	6.178	19.504	12.204	7.708	32.487	16.936
b) Frequency of zero costs							
CCS -observed	0.806	0.746	0.607	0.679	0.802	0.601	0.722
CCS -predicted	0.814	0.769	0.619	0.695	0.809	0.611	0.731
SIHC-simulated (gross)	0.874	0.822	0.664	0.752	0.793	0.657	0.742
SIHC-simulated (net)	0.874	0.822	0.664	0.752	0.793	0.657	0.742
III. Weekly hours demanded - estimates based on the joint demand model:							
a) Expected demands (including zeroes)- total care							
CCS -observed	6.409	7.431	15.375	11.469	14.309	24.364	18.298
CCS -predicted	6.294	8.997	16.837	12.834	15.894	29.330	21.224
b) Frequency of zero demands- total care							
CCS -observed	0.636	0.515	0.296	0.412	0.481	0.189	0.365
CCS -predicted	0.633	0.534	0.355	0.450	0.502	0.307	0.425
c) Expected demands (including zeroes)- formal care							
CCS -observed	2.619	1.683	5.450	3.722	2.722	7.367	4.564
CCS -predicted	2.016	2.201	5.372	3.833	2.660	7.676	4.650
d) Frequency of zero demands- formal care							
CCS -observed	0.864	0.859	0.735	0.796	0.865	0.693	0.797
CCS -predicted	0.868	0.860	0.734	0.795	0.862	0.700	0.797
c) Expected demands (including zeroes)- informal care							
CCS -observed	3.790	5.748	9.925	7.748	11.587	16.998	13.733
CCS -predicted	4.278	6.796	11.465	9.002	13.234	21.654	16.574
d) Frequency of zero demands- informal care							
CCS -observed	0.716	0.587	0.414	0.508	0.546	0.287	0.442
CCS -predicted	0.735	0.630	0.485	0.563	0.588	0.434	0.527

Note: CCS denotes the Child Care Survey and SIHC the Survey of Income and Housing Costs. The results in panel I are based on the estimates of the total cost function described in section 5. The model is estimated on observed costs, which are in between net and gross costs (it is not clear from the survey question whether all child care rebates and assistance are included). Panel II is based on the joint estimation of hours of care in the formal sector (excluding preschool) and the sum of costs of informal and preschool. The predicted and actual hours for formal care are multiplied by an average fee for the household corresponding to the schedule of fees given in Table 6 and the household composition. The resulting costs should be interpreted as gross costs before child care rebates and assistance. For more details, please see section 8.1 of the paper. Panel III is based on the model with joint demand equations, one for formal hours of child care excluding preschool and one representing the demand for hours of informal care plus preschool. For more details, please see section 7.3 of the paper.

Appendix Table A4a Labour supply estimates for couples using expected child care costs (2662 observations)[a]

	No child care costs		Cost equation	
Preference parameters	**Estimates**	**p-value**	**Estimates**	**p-value**
Squared terms & cross products				
Income sq. × 100,000	-0.0042	0.5916	-0.0031	0.6875
Labour supply man sq. *× 100*	-0.5955	0.0000	-0.6000	0.0000
Lab. supply woman sq. *× 100*	-0.1972	0.0000	-0.1994	0.0000
Inc. & l.s. man × 10,000	-0.2850	0.0000	-0.2807	0.0000
Inc. & l.s. woman *× 10,000*	-0.1758	0.0000	-0.1711	0.0000
l.s. man & woman *× 100*	-0.0414	0.0001	-0.0394	0.0001
Linear terms:				
Income: constant	0.7052	0.0000	0.7108	0.0000
Number of children	-0.0064	0.2277	-0.0066	0.2145
Lab.sup. man: constant	0.3395	0.0000	0.3422	0.0000
Youngest child 0-2 yrs old	0.0051	0.3437	0.0054	0.3115
Youngest child 3-4 yrs old	-0.0042	0.5118	-0.0041	0.5179
Youngest child 5-9 yrs old	-0.0056	0.2847	-0.0055	0.2928
Number of children	0.0012	0.5449	0.0012	0.5497
Age/10	0.0626	0.0000	0.0627	0.0000
Age squared/100	-0.0086	0.0000	-0.0086	0.0000
Vocational education	0.0118	0.0005	0.0117	0.0005
diploma	0.0128	0.0129	0.0128	0.0134
degree	0.0068	0.1969	0.0067	0.2039
Voc. education (partner)	0.0102	0.0135	0.0102	0.0136
diploma (partner)	0.0026	0.6474	0.0026	0.6522
degree (partner)	0.0030	0.5792	0.0030	0.5848
Lab.sup. woman: constant	0.0580	0.0246	0.0570	0.0272
Youngest child 0-2 yrs old	-0.0676	0.0000	-0.0599	0.0000
Youngest child 3-4 yrs old	-0.0445	0.0000	-0.0398	0.0000
Youngest child 5-9 yrs old	-0.0269	0.0000	-0.0261	0.0000
Number of children	-0.0053	0.0010	-0.0051	0.0018
Age/10	0.0409	0.0006	0.0416	0.0005
Age squared/100	-0.0073	0.0000	-0.0074	0.0000
Voc. education (partner)	-0.0017	0.6035	-0.0016	0.6320
diploma (partner)	0.0034	0.4179	0.0035	0.4044
degree (partner)	-0.0083	0.0686	-0.0080	0.0811
Vocational education	0.0070	0.0603	0.0069	0.0635
diploma	0.0151	0.0019	0.0151	0.0020
degree	0.0298	0.0000	0.0300	0.0000
Fixed cost man/100	14.8652	0.0000	14.8026	0.0000
Fixed cost woman/100	5.7147	0.0000	5.6913	0.0000

[a] Six discrete points of labour supply are distinguished for each man: 0 hours for non-participants and people working less than 2.5 hours, 10 hours for people working from 2.5 to 15 hours, 20 hours for people working from 15 to 25 hours, 30 hours for people working from 25 to 35 hours, 40 hours for people working from 35 to 45 hours, and 50 hours for people working more than 45 hours. Eleven discrete points of labour supply are distinguished for each woman: 0 hours for non-participants and people working less than 2.5 hours, 5 hours for people working from 2.5 to 7.5 hours, 10 hours for people working from 7.5 to 12.5 hours, 15 hours for people working from 12.5 to 17.5 hours, 20 hours for people working from 17.5 to 22.5 hours, 25 hours for people working from 22.5 to 27.5 hours, 30 hours for people working from 27.5 to 32.5 hours, 35 hours for people working from 32.5 to 37.5 hours, 40 hours for people working from 37.5 to 42.5 hours, 45 hours for people working from 42.5 to 47.5 hours, and 50 hours for people working more than 47.5 hours.

Appendix Table A4b Labour supply estimates for couples using 10 draws from child care costs and prices respectively (2662 observations)[a]

	No child care costs		Cost equation		Hours equation* price	
Preference parameters	**Estimates**	**p-value**	**Estimates**	**p-value**	**Estimates**	**p-value**
Squared terms & cross products						
Income sq. × 100,000	-0.0042	0.5916	-0.0014	0.8496	-0.0022	0.7699
Labour supply man sq. *×100*	-0.5955	0.0000	-0.6005	0.0000	-0.5991	0.0000
Lab. supply woman sq. *×100*	-0.1972	0.0000	-0.1998	0.0000	-0.1986	0.0000
Inc. & l.s. man × 10,000	-0.2850	0.0000	-0.2707	0.0000	-0.2755	0.0000
Inc. & l.s. woman *×10,000*	-0.1758	0.0000	-0.1682	0.0000	-0.1696	0.0000
l.s. man & woman *×100*	-0.0414	0.0001	-0.0396	0.0001	-0.0404	0.0001
Linear terms:						
Income: constant	0.7052	0.0000	0.6982	0.0000	0.7003	0.0000
Number of children	-0.0064	0.2277	-0.0068	0.1958	-0.0067	0.2056
Lab.sup. man: constant	0.3395	0.0000	0.3434	0.0000	0.3424	0.0000
Youngest child 0-2 yrs old	0.0051	0.3437	0.0053	0.3171	0.0052	0.3259
Youngest child 3-4 yrs old	-0.0042	0.5118	-0.0042	0.5147	-0.0040	0.5335
Youngest child 5-9 yrs old	-0.0056	0.2847	-0.0055	0.2924	-0.0056	0.2865
Number of children	0.0012	0.5449	0.0011	0.5876	0.0011	0.5718
Age/10	0.0626	0.0000	0.0628	0.0000	0.0627	0.0000
Age squared/100	-0.0086	0.0000	-0.0086	0.0000	-0.0086	0.0000
Vocational education	0.0118	0.0005	0.0118	0.0005	0.0118	0.0005
diploma	0.0128	0.0129	0.0129	0.0124	0.0129	0.0124
degree	0.0068	0.1969	0.0069	0.1888	0.0069	0.1897
Voc. education (partner)	0.0102	0.0135	0.0102	0.0135	0.0102	0.0138
diploma (partner)	0.0026	0.6474	0.0026	0.6493	0.0026	0.6514
degree (partner)	0.0030	0.5792	0.0030	0.5880	0.0030	0.5840
Lab.sup. woman: constant	0.0580	0.0246	0.0575	0.0260	0.0567	0.0280
Youngest child 0-2 yrs old	-0.0676	0.0000	-0.0603	0.0000	-0.0638	0.0000
Youngest child 3-4 yrs old	-0.0445	0.0000	-0.0399	0.0000	-0.0412	0.0000
Youngest child 5-9 yrs old	-0.0269	0.0000	-0.0261	0.0000	-0.0262	0.0000
Number of children	-0.0053	0.0010	-0.0052	0.0014	-0.0052	0.0015
Age/10	0.0409	0.0006	0.0418	0.0005	0.0419	0.0005
Age squared/100	-0.0073	0.0000	-0.0074	0.0000	-0.0074	0.0000
Voc. education (partner)	-0.0017	0.6035	-0.0015	0.6339	-0.0016	0.6222
diploma (partner)	0.0034	0.4179	0.0036	0.3988	0.0036	0.3980
degree (partner)	-0.0083	0.0686	-0.0080	0.0820	-0.0080	0.0798
Vocational education	0.0070	0.0603	0.0070	0.0602	0.0068	0.0648
diploma	0.0151	0.0019	0.0152	0.0018	0.0151	0.0018
degree	0.0298	0.0000	0.0304	0.0000	0.0303	0.0000
Fixed cost man/100	14.8652	0.0000	15.1270	0.0000	15.0556	0.0000
Fixed cost woman/100	5.7147	0.0000	5.8120	0.0000	5.7797	0.0000

[a] Six discrete points of labour supply are distinguished for each man: 0 hours for non-participants and people working less than 2.5 hours, 10 hours for people working from 2.5 to 15 hours, 20 hours for people working from 15 to 25 hours, 30 hours for people working from 25 to 35 hours, 40 hours for people working from 35 to 45 hours, and 50 hours for people working more than 45 hours. Eleven discrete points of labour supply are distinguished for each woman: 0 hours for non-participants and people working less than 2.5 hours, 5 hours for people working from 2.5 to 7.5 hours, 10 hours for people working from 7.5 to 12.5 hours, 15 hours for people working from 12.5 to 17.5 hours, 20 hours for people working from 17.5 to 22.5 hours, 25 hours for people working from 22.5 to 27.5 hours, 30 hours for people working from 27.5 to 32.5 hours, 35 hours for people working from 32.5 to 37.5 hours, 40 hours for people working from 37.5 to 42.5 hours, 45 hours for people working from 42.5 to 47.5 hours, and 50 hours for people working more than 47.5 hours.

Appendix Table A4c Labour supply estimates for lone parents for expected child care costs (456 observations)[a]

	No child care costs		Cost equation	
Preference parameters	**Estimates**	**p-value**	**Estimates**	**p-value**
Squared terms & cross products				
Income squared *×100,000*	-1.1699	0.1574	-0.9260	0.1564
Labour supply squared *×100*	-0.0519	0.3872	-0.0365	0.5243
Inc. & lab. sup. *×10,000*	-1.1701	0.2907	-1.5839	0.1036
Linear terms				
Income				
constant	6.8925	0.0019	6.5526	0.0006
Youngest child 0-2 yrs old	-1.4606	0.0192	-1.8050	0.0015
Youngest child 3-4 yrs old	-2.1883	0.0000	-2.1429	0.0000
Youngest child 5-9 yrs old	-0.5184	0.1803	-0.5299	0.1336
Number of children	0.4956	0.0143	0.4105	0.0073
Age/10	-2.1001	0.0535	-1.9725	0.0356
Age squared/100	0.2285	0.0923	0.2119	0.0697
Vocational education	0.5061	0.1250	0.5806	0.0710
Diploma or degree	-0.1968	0.4816	-0.1116	0.6687
female	1.0636	0.0341	1.0492	0.0150
Labour supply				
constant	-0.2400	0.0310	-0.2077	0.0416
Youngest child 0-2 yrs old	0.0501	0.0896	0.0562	0.0274
Youngest child 3-4 yrs old	0.0282	0.3313	0.0260	0.3385
Youngest child 5-9 yrs old	0.0033	0.8700	0.0087	0.6307
Number of children	-0.0050	0.5003	0.0029	0.6569
Age/10	0.1430	0.0044	0.1278	0.0061
Age squared/100	-0.0183	0.0037	-0.0169	0.0038
Vocational education	0.0028	0.8025	0.0041	0.6893
Diploma or degree	0.0224	0.1159	0.0208	0.0969
female	-0.0947	0.0001	-0.0855	0.0000
Fixed cost				
Constant	2.4623	0.0011	2.5627	0.0004
Live in capital city	0.1051	0.1922	0.0959	0.2730
Children 0-4 yrs old	0.9240	0.0158	1.0099	0.0138
Youngest child 5-9 yrs old	0.0679	0.6916	0.0747	0.6612
Live in NSW	0.1321	0.1427	0.1441	0.1387
Female	-1.3431	0.0462	-1.3987	0.0257

[a] Eleven discrete points of labour supply are distinguished for each person: 0 hours for non-participants and people working less than 2.5 hours, 5 hours for people working from 2.5 to 7.5 hours, 10 hours for people working from 7.5 to 12.5 hours, 15 hours for people working from 12.5 to 17.5 hours, 20 hours for people working from 17.5 to 22.5 hours, 25 hours for people working from 22.5 to 27.5 hours, 30 hours for people working from 27.5 to 32.5 hours, 35 hours for people working from 32.5 to 37.5 hours, 40 hours for people working from 37.5 to 42.5 hours, 45 hours for people working from 42.5 to 47.5 hours, and 50 hours for people working more than 47.5 hours.

Appendix Table A4d Labour supply estimates for lone parents using 10 draws from child care costs and prices respectively (456 observations)[a]

	No child care costs		Cost equation		Hours equation* price	
Preference parameters	**Estimates**	**p-value**	**Estimates**	**p-value**	**Estimates**	**p-value**
Squared terms & cross products						
Income squared *×100,000*	-1.1699	0.1574	-0.8063	0.1241	-0.4802	0.0454
Labour supply squared *×100*	-0.0519	0.3872	-0.0312	0.5655	-0.0174	0.7537
Inc. & lab. sup. *×10,000*	-1.1701	0.2907	-1.6890	0.0297	-2.0237	0.0001
Linear terms						
Income						
constant	6.8925	0.0019	6.2533	0.0004	5.8222	0.0004
Youngest child 0-2 yrs old	-1.4606	0.0192	-1.8720	0.0005	-2.0246	0.0000
Youngest child 3-4 yrs old	-2.1883	0.0000	-2.0995	0.0000	-1.9569	0.0000
Youngest child 5-9 yrs old	-0.5184	0.1803	-0.6019	0.0761	-0.6018	0.0548
Number of children	0.4956	0.0143	0.3725	0.0086	0.3785	0.0072
Age/10	-2.1001	0.0535	-1.8337	0.0370	-1.7901	0.0326
Age squared/100	0.2285	0.0923	0.1939	0.0766	0.1858	0.0705
Vocational education	0.5061	0.1250	0.5499	0.0743	0.6305	0.0310
Diploma or degree	-0.1968	0.4816	-0.1379	0.5729	-0.2026	0.4234
female	1.0636	0.0341	0.9922	0.0133	1.1759	0.0012
Labour supply						
constant	-0.2400	0.0310	-0.2037	0.0359	-0.2150	0.0252
Youngest child 0-2 yrs old	0.0501	0.0896	0.0511	0.0417	0.0414	0.1198
Youngest child 3-4 yrs old	0.0282	0.3313	0.0244	0.3519	0.0180	0.4559
Youngest child 5-9 yrs old	0.0033	0.8700	0.0103	0.5601	0.0117	0.4635
Number of children	-0.0050	0.5003	0.0031	0.6160	0.0041	0.4821
Age/10	0.1430	0.0044	0.1252	0.0042	0.1332	0.0022
Age squared/100	-0.0183	0.0037	-0.0165	0.0024	-0.0174	0.0012
Vocational education	0.0028	0.8025	0.0053	0.5928	0.0046	0.6404
Diploma or degree	0.0224	0.1159	0.0235	0.0506	0.0276	0.0285
female	-0.0947	0.0001	-0.0817	0.0000	-0.0828	0.0000
Fixed cost						
Constant	2.4623	0.0011	2.6436	0.0003	2.9594	0.0001
Live in capital city	0.1051	0.1922	0.0985	0.2907	0.0906	0.3476
Children 0-4 yrs old	0.9240	0.0158	1.1009	0.0076	1.1204	0.0025
Youngest child 5-9 yrs old	0.0679	0.6916	0.0977	0.5816	0.0931	0.5777
Live in NSW	0.1321	0.1427	0.1482	0.1524	0.1389	0.1993
Female	-1.3431	0.0462	-1.4569	0.0200	-1.7631	0.0067

[a] Eleven discrete points of labour supply are distinguished for each person: 0 hours for non-participants and people working less than 2.5 hours, 5 hours for people working from 2.5 to 7.5 hours, 10 hours for people working from 7.5 to 12.5 hours, 15 hours for people working from 12.5 to 17.5 hours, 20 hours for people working from 17.5 to 22.5 hours, 25 hours for people working from 22.5 to 27.5 hours, 30 hours for people working from 27.5 to 32.5 hours, 35 hours for people working from 32.5 to 37.5 hours, 40 hours for people working from 37.5 to 42.5 hours, 45 hours for people working from 42.5 to 47.5 hours, and 50 hours for people working more than 47.5 hours.

Appendix Table A5 Estimation Results for Child Care Demands (where preschool is included in informal care). Bivariate Tobit Models.

	Couples				Lone Parents			
	Formal		Informal		Formal		Informal	
Variable	**Coeff**	**P val**	**Coeff**	**P val**	**Coeff**	**P val**	**Coeff**	**P val**
No. Child: aged <1	5.615	0.595	-4.133	0.612	57.264	0.064	-18.597	0.588
aged 1	18.169	0.083	-4.375	0.589	71.370	0.019	-25.193	0.458
aged 2	26.156	0.010	-3.349	0.671	89.517	0.002	-35.114	0.280
aged 3-4	20.722	0.095	-19.261	0.055	23.592	0.453	4.864	0.902
aged 5-9	-0.151	0.916	2.720	0.004	2.869	0.446	5.160	0.144
aged >9	-8.681	0.000	0.747	0.540	-11.658	0.016	0.327	0.937
Employed:					24.390	0.046	9.363	0.460
Father	-11.907	0.017	6.735	0.055				
Mother	-1.710	0.717	2.561	0.437				
Hours: Father	0.888	0.007	-0.145	0.534	-0.595	0.197	0.368	0.470
Mother	0.726	0.013	0.431	0.043	-0.128	0.738	0.064	0.881
$(Hours)^2$:Father	-0.015	0.006	0.002	0.560				
Mother	-0.009	0.056	-0.005	0.134				
Empl*No.Ch:aged 0-2	-2.093	0.496	0.046	0.984	-20.509	0.083	16.169	0.225
aged 3-4	-1.444	0.669	-2.777	0.270	-6.121	0.566	-1.684	0.891
aged 5+	2.555	0.203	0.977	0.491	-14.027	0.093	-0.182	0.984
Min Hrs*No.Ch:0-2	0.360	0.001	0.282	0.001	0.835	0.029	0.071	0.880
3-4	0.203	0.059	0.212	0.013	0.491	0.145	0.195	0.635
5+	0.009	0.892	0.023	0.629	0.684	0.012	0.219	0.478
Income:					0.018	0.013	0.010	0.240
Father	0.004	0.003	0.005	0.000				
Mother	0.011	0.000	0.002	0.368				
Fees*Pres.Ch: aged 0-2	1.089	0.221	1.336	0.051	8.530	0.002	2.187	0.460
aged 3-4	4.707	0.000	1.723	0.101	6.421	0.086	5.582	0.225
aged 5+	-2.582	0.001	-0.217	0.700	-2.487	0.229	4.346	0.046
Fees*No.Ch: aged 0-2	-3.566	0.251	0.948	0.536	-23.439	0.011	7.884	0.643
aged 3-4	-6.241	0.119	1.486	0.005	-6.427	0.550	0.236	0.426
Urban	1.862	0.133	8.956	0.079	5.824	0.046	-4.250	0.986
ACT-NT	7.611	0.000	-2.603	0.120				
Age of parent: 15-24							12.850	0.018
Mother			3.551	0.153				
Father			6.415	0.037				
Age of Parent: 25-34							8.677	0.013
Mother			2.073	0.053				
Father			2.660	0.015				
Parent is Male					9.419	0.222	-5.789	0.480
Constant	-40.719	0.000	-31.229	0.000	-57.549	0.000	-37.528	0.000
σ	27.400	0.000	25.013	0.000	29.818	0.000	42.136	0.000
Correlation in error terms	-0.265 (p-value=0.000)				-0.173 (p-value=0.001)			
Obs Mean, Exp Val	3.722,3.833		7.748,9.002		4.564,4.650		13.733,16.574	
Proportion at 0: obs, pred	0.797,0.796		0.509,0.565		0.798,0.799		0.444,0.528	
Correlation of pred & obs	0.538		0.337		0.504		0.212	
Log Likelihood Value	-18465.961				-4665.046			
- χ^2 p-value	0.000				0.000			

Notes: The sample size for couples is 4908 and for lone parents 1079. For couples, an employment dummy is interacted with the number of children only if both parents are employed; in this case, the hours interacted with the number of children are those for the parent with the smallest hours of work. For couples the urban dummy does not include ACT-NT areas while for lone parents the urban dummy variable is set at one for all observations in the ACT – NT areas. The observed mean of the dependent variable is computed over all observations used in the regression including the censored ones. The expected value takes into account the probability of censoring and is averaged over all observations used in the regression. The observed proportion at 0 is the proportion of observations censored at 0 while the predicted proportion is the predicted probability of a censored value at 0 averaged over all observations used in the regression. The correlation between predicted and observed is computed over all non-zero observations. The p-value corresponds to the χ^2 test that all coefficients except the constant term are jointly 0.

Table A6 Marginal Effects on Formal and Informal Child Care Demands, Preschool Hours are Included in Formal Care (standard errors in parentheses)

	Couples		Lone Parents	
	Formal	**Informal**	**Formal**	**Informal**
Income:			0.004 (0.001)	0.005 (0.003)
Father	0.001 (0.000)	0.002 (0.000)		
Mother	0.003 (0.001)	0.001 (0.001)		
Hours of work:				
Father	-0.050 (0.027)	0.021 (0.043)	0.150 (0.172)	0.521 (0.216)
Mother	0.124 (0.019)	0.180 (0.026)	0.251 (0.046)	0.166 (0.080)
Employment:				
Father	0.638 (0.551)	3.114 (0.910)	4.936 (3.394)	18.805(4.094)
Mother	4.014 (0.341)	6.555 (0.471)	2.597 (1.987)	21.519(5.514)
Fees:				
Children 0-2	-0.029 (0.986)	0.382 (1.321)	-5.262 (3.463)	4.910 (5.935)
Children 3-4	-0.442 (1.532)	5.498 (1.822)	-4.122 (3.891)	7.463 (8.273)
Children 5+	-0.431 (0.135)	-0.041 (0.266)	-0.391 (0.310)	2.729 (1.485)
No. Children:				
< 1 Yr.	0.642 (0.441)	3.608 (0.685)	0.912 (1.295)	12.528(3.771)
1 Yr.	3.095 (0.402)	3.629 (0.678)	4.025 (0.981)	8.457 (3.003)
2 Yrs.	5.163 (0.380)	3.514 (0.574)	7.858 (0.987)	4.155 (2.346)
3-4 Yrs.	4.096 (0.562)	3.513 (0.818)	6.311 (1.132)	5.598 (2.406)
5-9 Yrs.	-0.109 (0.211)	1.192 (0.350)	0.321 (0.607)	6.621 (1.418)
10 + Yrs.	-2.947 (0.433)	0.695 (0.580)	-2.921 (1.098)	6.654 (2.595)
Capital City:	0.720 (0.242)	0.335 (0.363)	0.749 (0.603)	-2.028 (1.330)
ACT&NT:	1.627 (0.536)	-0.978 (0.691)		
Parents' age:				
15-24:				6.838 (2.431)
Mother		2.144 (1.390)		
Father		2.600 (1.635)		
25-34:				3.198 (1.627)
Mother		0.940 (0.436)		
Father		1.515 (0.510)		
Parent is male:			3.729 (1.825)	-5.388 (3.161)

Notes: Marginal effects are computed for each data point and averaged over the samples. Standard errors are computed on these averages with a bootstrap estimator using 200 replications. Income is measured in dollars per week. Hours of work are measured in hours per week and marginal effects are averaged over the samples of workers only. Employment refers to the labour force status during the reference week. The counterfactuals for the change in employment are as follows: for those observed working, they are given hours of zero and income equal to the average income observed among non-workers when evaluating the expected value for employment set at zero. For non-workers, they are given average hours of work and income observed among workers when evaluating the expected hours of child care for employment set at one. The averages for the counterfactuals are computed separately for males and females and for the two types of households. Fees are measured in dollars per hour and marginal effects are averaged over the samples of households with children in the age group under consideration. The parents' age groups are relative to the 35 and over group. For couples, the capital city dummy does not include the ACT or Darwin. The ACT&NT dummy is set at one for all observations in the ACT or NT. We must group the Northern Territories with the ACT because this is how the data are grouped in the IDS survey. For sole parents, the capital city dummy is also set at one for all ACT and NT observations.

Appendix Table A7 Estimation Results for Child Care Costs Based on Formal Demands and Informal Costs (where preschool costs are included in informal costs). Bivariate Tobit Models.

	Couples				Lone Parents			
	Formal		Informal		Formal		Informal	
Variable	**Coeff**	**P val**	**Coeff**	**P val**	**Coeff**	**P val**	**Coeff**	**P val**
No. Child: aged <1	4.121	0.700	-98.755	0.014	52.541	0.087	-156.924	0.144
aged 1	16.700	0.116	-100.278	0.012	65.346	0.030	-178.339	0.101
aged 2	24.885	0.016	-88.875	0.023	83.666	0.004	-193.496	0.063
aged 3-4	22.008	0.078	89.984	0.027	21.446	0.492	186.849	0.057
aged 5-9	-0.145	0.921	5.379	0.267	2.605	0.490	-4.841	0.687
aged >9	-8.702	0.000	-22.859	0.000	-12.523	0.011	-6.827	0.649
Employed:					24.339	0.048	94.595	0.013
Father	-11.665	0.021	9.242	0.586				
Mother	-1.365	0.775	11.672	0.475				
Hours: Father	0.882	0.008	0.034	0.975	-0.558	0.229	-1.121	0.408
Mother	0.686	0.020	0.589	0.551	-0.129	0.739	-1.416	0.207
$(\text{Hours})^2$:Father	-0.015	0.007	-0.003	0.880				
Mother	-0.008	0.093	-0.009	0.589				
Empl*No.Ch:aged 0-2	-2.190	0.481	10.766	0.310	-19.824	0.094	19.048	0.603
aged 3-4	-0.684	0.841	-24.766	0.026	-5.726	0.592	-85.643	0.010
aged 5+	2.784	0.170	4.853	0.478	-14.536	0.086	-44.389	0.094
Min Hrs*No.Ch:0-2	0.369	0.000	1.131	0.002	0.819	0.032	0.439	0.714
3-4	0.180	0.097	0.217	0.533	0.468	0.166	1.429	0.145
5+	0.006	0.925	0.195	0.371	0.694	0.012	2.164	0.009
Income:					0.019	0.009	-0.001	0.969
Father	0.004	0.003	0.036	0.000				
Mother	0.011	0.000	0.040	0.000				
Fees*Pres.Ch: aged 0-2	1.124	0.212	-0.030	0.993	8.278	0.002	-19.853	0.030
aged 3-4	4.931	0.000	24.927	0.000	6.309	0.089	15.917	0.104
aged 5+	-2.640	0.001	-2.083	0.424	-2.246	0.278	-7.364	0.259
Fees*No.Ch: aged 0-2	-3.172	0.314	0.948	0.536	-21.389	0.018	65.190	0.038
aged 3-4	-6.804	0.091	29.136	0.013	-5.495	0.607	-45.005	0.168
Urban	1.626	0.194	-18.728	0.148	5.996	0.040	3.655	0.689
ACT-NT	7.855	0.000	8.878	0.241				
Age of parent: 15-24							-10.348	0.554
Mother			-43.686	0.002				
Father			33.536	0.038				
Age of Parent: 25-34							28.647	0.012
Mother			-3.993	0.417				
Father			-5.421	0.278				
Parent is Male					9.102	0.240	5.937	0.794
Constant	-41.162	0.000	-200.073	0.000	-58.523	0.000	-160.369	0.000
σ	27.555	0.000	81.792	0.000	29.849	0.000	73.327	0.000
Correlation in error terms	-0.228 (p-value=0.000)				-0.316 (p-value=0.000)			
Obs Mean, Exp Val	3.722,3.825		5.975,7.349		4.564,4.654		3.086,3.810	
Proportion at 0: obs, pred	0.797,0.798		0.846,0.860		0.798,0.799		0.902,0.910	
Correlation of pred & obs	0.541		0.390		0.506		0.237	
Log Likelihood Value	-11204.375				-2032.349			
- χ^2 p-value	0.000				0.000			

Notes: The sample size for couples is 4908 and for lone parents 1079. For couples, an employment dummy is interacted with the number of children only if both parents are employed; in this case, the hours interacted with the number of children are those for the parent with the smallest hours of work. For couples the urban dummy does not include ACT-NT areas while for lone parents the urban dummy variable is set at one for all observations in the ACT – NT areas. The observed mean of the dependent variable is computed over all observations used in the regression including the censored ones. The expected value takes into account the probability of censoring and is averaged over all observations used in the regression. The observed proportion at 0 is the proportion of observations censored at 0 while the predicted proportion is the predicted probability of a censored value at 0 averaged over all observations used in the regression. The correlation between predicted and observed is computed over all non-zero observations. The p-value corresponds to the χ^2 test that all coefficients except the constant term are jointly 0.