

# **Demands for Childcare and Household Labour Supply in Australia\***

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## **Abstract**

Demands for formal and informal childcare are estimated using a bivariate Tobit model. Predicted costs of childcare are incorporated in the households' budget constraints and a discrete choice labour supply model is estimated. Separate models are estimated for couples and lone parents. Increases in the prices and costs of childcare lead to reductions in labour supply for lone parents and partnered mothers. Results suggest the average elasticities in Australia are closer to those found in the U.K. and are smaller than the estimates for Canada and the U.S. Effects are stronger for single parents and mothers facing low wages.

## 1 Introduction

In Australia as in many other countries, much of public policy concerned with reducing poverty and welfare dependence has focused on promoting individuals' attachment to the labour force. In the last decade, welfare programs have been altered to reduce negative work incentives for those at the bottom of the income distribution. For families with children, the cost of nonparental childcare 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 childcare services. Such policy shifts overseas sparked many studies of the relationship between labour supply and nonparental childcare use. However, to date there has been no formal study of this relationship for Australia.

In this paper, we use a specialised survey on childcare use to estimate demands for formal and informal childcare by households. A bivariate Tobit model is used to allow for interdependence between the two forms of childcare and to model specifically the prevalence of zero hours of childcare. Childcare costs are imputed from these and incorporated in a flexible discrete choice model of household labour supply. The labour supply model is structural and incorporates the details of income taxes and social security payments. Simulations are then performed to look at labour supply responses to changes in the price and costs of childcare for various types of households.

Although there has been no direct estimation of the labour supply effects of childcare costs in Australia, some studies have addressed related issues. One of the earlier policy thrusts by state and federal governments consisted in ensuring the provision of sufficient childcare places to meet demand and this issue has received some attention (e.g. Teal, 1992; Szukalska et al., 1999). Others have been concerned with the imputation and estimation of the costs of childcare using various methodologies.<sup>1</sup> Although there are some disagreements, results mostly suggest that costs of childcare are large and hence should influence the parents' decision to work. It was also suggested that the childcare policies in place in the mid to late nineties did not provide incentives to low-wage mothers with young children to participate in the labour

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<sup>1</sup> For example see Ross (1986), Ross and Saunders (1990), and various researchers at NATSEM (see for example Szukalska et al. (1999) and the references therein). Also in a companion paper, Doiron and Kalb (2002), we estimate childcare cost functions for different types of households.

market. Finally, Cobb-Clark et al. (2000) present direct evidence from non-working partnered mothers who report that childcare problems are not the main factor determining their decision not to participate in the labour market.

Turning to the overseas literature, an important aspect of childcare is the large degree of heterogeneity across types of care. 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. Availability of services differs by age of child and region, and often in ways that are unobserved by the researcher (for example access to cost-free care by relatives or friends.) The existing research has mainly dealt with formal care. Blau and Hagy (1998), Michalopoulos and Robins (2002, 2000) and Michalopoulos et al. (1992) are some of the few studies that model jointly the employment decision and the choice of mode of childcare. In these latter studies, the mode of childcare and the labour supply are discrete choices. Our study is more general in the modelling of the intensity of childcare use since we model formal and informal hours of care as continuous. However, using a bivariate Tobit imposes fairly strong restrictions at the zero hours' choice.

A related difficulty is the modelling of the price. Self-reported prices are likely to be endogenous as parents choose among providers offering different levels of quality and other attributes (usually unobserved) along with differing price structures.<sup>2</sup> Generally the endogeneity in prices for formal care has been addressed by using some of the available 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), Michalopoulos and Robins (2002, 2000), and Ribar (1992, 1995) use regional variations in childcare regulations and/or wage levels; Blau and Robins (1988) and Leibowitz, Klerman and Waite (1992) impute information on wages of childcare workers by state; while Duncan, Paull and Taylor (2001a, b) match information on availability of services by local authority. Other researchers combine information from household surveys and surveys of care

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<sup>2</sup> There are additional problems with the modelling of prices namely that observed prices are frequently zero and generally not constant as often one must buy a fixed number of hours of care in advance. With the exception of selection effects into paid childcare little work has been done on the non-linear pricing schedules offered for childcare services. Exceptions are Ribar (1995) and Walker (1992).

providers; i.e. information from the supply side of the market is used to capture variations in the price-quality packages of childcare services available to households. This approach is used in our study following Walker (1992), Blau and Mocan (1999), Blau and Hagy (1998) and Hagy (1998).

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 childcare induce an increase in both labour supply and childcare 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.<sup>3</sup> Use of childcare by employed mothers is more price sensitive than for unemployed mothers.<sup>4</sup> Formal childcare is also more sensitive to price and wage effects than informal care.

The paper is organised as follows. A discussion of the data and descriptive statistics are presented in the next section. This is followed by the estimation of the childcare demands. Section 4 presents labour supply estimates and responses to childcare costs. Section 5 compares the Australian results with the findings for overseas countries and the final section presents concluding remarks.

## **2. Descriptive Statistics on Childcare**

Information on the use and costs of childcare is collected by the Australian Bureau of Statistics (ABS) in a specialized survey called the Child Care Survey (CCS). 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. As mentioned above, there is limited information on income and no information on education in this survey. Consequently, we impute childcare costs for households in the Survey of Income and Housing Costs (SIHC), using a model estimated from the CCS, for the estimation of a labour supply model. The SIHC is also a large sample and representative of the general population. It offers detailed

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<sup>3</sup> Anderson and Levine (1999) provide a review of econometric studies and conclude that the overall elasticity of labour force participation for mothers with respect to childcare prices lies between -0.05 and -0.35. Highly-skilled women are less affected.

<sup>4</sup> In the empirical work to date many of the data sets only include information on childcare for those households in which mothers work. Explaining the relationship between childcare demand and the decision to participate has been much more difficult because of this feature of the data.

information on income, labour market experience, personal and household characteristics and is often used for labour supply estimation in Australia. The most recent year for which we have both the CCS and the SIHC is 1996.<sup>5</sup>

The 1996 CCS contains information on 11,419 children under 12 living in 6,421 income units. Unlike most of the data sets used overseas, the CCS includes information on childcare for all households regardless of their employment status. Children are grouped in income units and total childcare (across all children in the income unit) is used. All empirical work is conducted separately for lone parents and couples.

Table 1 presents information on childcare use by households according to the employment status of the parents and the age of the youngest child. Approximately 60% of households use childcare services. This proportion is larger for households with working parents: 81% of employed lone parents and 69% of two-worker households use childcare. This proportion rises further when children under 5 are present: nearly all working lone parents and over 80% of working couples use childcare. Among couples, 40% of total childcare hours are in formal arrangements while for lone parents, the proportion is just over 30%. Based on the classification used in the survey, informal childcare includes relative and non-relative care while formal childcare includes: before and after school care, long day care, family day care, occasional care, preschool, and other formal care arrangements. The treatment of preschool care is discussed later in the paper. 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 childcare use. Only 9% of the households state that they require additional childcare but find it is unavailable. (This does not include parents who say they are constrained because of high childcare prices.)

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<sup>5</sup> Until recently no Australian data set provided both information on childcare use and the variables necessary to estimate labour supply functions. The new Household, Income and Labour Dynamics in Australia (HILDA) survey will provide an alternative source of information. However, HILDA is more restrictive in the details available on childcare. This is expected to improve in later waves.

**Table 1 Childcare use by type, parents' employment and age of youngest child**

<b>Couples</b>	<b>Age of youngest child</b>				<b>Total</b>
	<b>10-11</b>	<b>5-9</b>	<b>3-4</b>	<b>0-2</b>	
<i>Two workers</i>					
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
<i>One worker</i>					
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
<i>No workers</i>					
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
<i>All couples</i>					
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
<b>Lone parents</b>					
<i>Worker</i>					
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
<i>Non worker</i>					
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
<i>All Lone Parents</i>					
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

Table 2 presents information on average hourly costs for those households who use childcare. Most households (over 90%) who use formal care pay a positive hourly cost whereas just over 10% 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. This suggests that parents are facing more than one price and a choice is made over prices and other attributes of childcare.<sup>6</sup>

Finally, Table 3 presents information on the different reasons for childcare use. Work is listed as a main reason (for at least one child in the household) for 42% of the

<sup>6</sup> It is likely that these hourly costs incorporate some of the government subsidies paid for childcare. This is another reason why prices will vary by households. See the end of this section for more details.

households who use formal care and 47% of the households who use informal care. For 62% 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. We come back to the treatment of preschool in Section 3.

**Table 2 Summary statistics on costs and usage for households who use childcare**

<b>a. by employment status</b>							
	<b>Couples</b>				<b>Lone parents</b>		
	<b>Two workers</b>	<b>One worker</b>	<b>No workers</b>	<b>Total</b>	<b>Worker</b>	<b>Non worker</b>	<b>Total</b>
Weekly hours of childcare	15.58	7.12	5.73	11.39	23.72	13.66	17.59
Pays for childcare	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>b. by age of youngest child</b>								
	<b>Couples</b>				<b>Lone parents</b>			
	<b>10-11</b>	<b>5-9</b>	<b>3-4</b>	<b>0-2</b>	<b>10-11</b>	<b>5-9</b>	<b>3-4</b>	<b>0-2</b>
Weekly hours of childcare	2.86	5.86	18.27	15.22	8.01	13.45	31.23	20.64
Pays for childcare	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

**Table 3 Main reason for using childcare**

	<b>Formal</b>	<b>Informal</b>
<i>Reason given as main for at least one child in household</i>		
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
<i>Beneficial for child named as main reason by child</i>		
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.

To conclude this section, we provide a brief description of the policies related to childcare in place at the time of the survey in 1996. (More details on childcare

policies and more generally on the Australian tax and transfer system are available from the authors.) Several types of subsidies were available for childcare. Direct funding was provided to help build, equip and operate childcare centres. This was meant to ensure a sufficient number of childcare places. In addition, two kinds of subsidies were available to households. These depended on the family's income, assets, employment status, number of children and childcare expenses. Childcare assistance was means-tested and paid directly to the providers. This reduced the fees paid by eligible families. The childcare rebate was not means-tested and paid to the parents upon receipt of claims for childcare expenses. The rebate could be claimed for work-related expenses only including training and looking for work.

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 childcare 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.

### **3. Estimation of Demands for Childcare**

#### ***3.1 The use of external information on fees***

In order to have some measure of exogenous variations in prices faced by households for childcare services, we use information on fees charged by the service providers and collected by the Department of Family and Community Services through its Census of Child Care Services. This census is conducted regularly and includes all services receiving funding from the Commonwealth Government of Australia. This basically includes all providers of formal childcare except for preschool. Information from the Census is used extensively by government officials to monitor the provision of childcare 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. 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 childcare. 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 type of care to construct weights to be applied to the providers. All fees are converted to hourly rates using information provided by the Department of Family and Community Services. The resulting fees by state and age of child are presented in Table 4.

**Table 4 Hourly fees by state and age of child**

<i>States</i>	<b>Age of Child</b>			
	<b>5 and over</b>	<b>3-4</b>	<b>2</b>	<b>0-1</b>
New South Wales	2.866	3.260	3.463	3.756
Victoria	2.670	3.196	3.226	3.250
Queensland	2.555	2.889	3.031	3.196
South Australia	2.633	3.391	3.399	3.401
Western Australia	2.728	3.154	3.227	3.348
Tasmania	3.041	3.758	3.761	3.885
Northern Territories	2.798	3.083	3.130	3.186
Australian Capital Territory	3.323	3.623	3.723	3.756
Total	2.739	3.173	3.282	3.419

A comparison with the hourly costs of childcare observed in the data (see Table 2) shows that fees are on average a little higher than the paid hourly costs especially for children under school age. This could be due to the Child Care Assistance, which 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 reported by household increases with the age of the youngest child. This could be due to the much lower Childcare Assistance available for school-aged children.

### ***3.2 The treatment of preschool in the model***

The use of fees charged by providers of childcare 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 CCS and includes preschools. However, preschools are not considered

childcare service providers from the point of view of the Department of Family and Community Services and instead form part of the formal education system. The fees presented in Table 4 do not include fees charged by preschools. These latter fees are usually lower. From the CCS, we find an average hourly cost of \$1.77 per child for preschool compared to \$2.50 per hour for other formal childcare for 3 to 5 years old.<sup>7</sup>

There are other issues involving the treatment of preschool. 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. Furthermore, the main reason given for preschool usage is that it is beneficial to the child (see Section 2). In many ways, preschool can be regarded more as education than childcare although it is not compulsory. From a modelling standpoint, this suggests that preschool should be treated separately from both formal and informal care and possibly represented as a discrete choice (i.e. use versus no use). Given the relatively small sample of households who use preschool, the use of a trivariate model of childcare is not practical here. However, we estimate various specifications for preschool to check on the sensitivity of the main results.

### ***3.3 Specification of the demand for childcare model***

The framework used for the estimation of the system of demands for formal and informal care is a bivariate Tobit. The model takes into account the correlation between unobservables affecting formal and informal demands. In particular, 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

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<sup>7</sup> These averages are computed for weekly usage of childcare/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.

hours of care (if positive). A selection-type model was also estimated 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. This is not surprising given the lack of an instrument to help identify the choice of entering the childcare market separately from the choice of hours of care.

For informal care, a zero fee is payable for 90% of households. 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. An alternative explanation is that the availability of informal care is likely to vary across households. Information on the proximity to other family members would be an important component in the explicit modelling of this feature of childcare. This information is generally not available in childcare surveys. Although we do not have direct information on availability of relative care we believe that some of the explanatory variables in our model capture some of the variation in this determinant of childcare.

Appendix Table A1 presents the results of the bivariate Tobit model for the demand for childcare. 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 childcare fees captures most of these effects. The particular specification used for the explanatory variables (that is nonlinearities and interactions) remains an empirical matter.

We began with specifications that included many interactions and nonlinearities and tested down. In the specification presented in Appendix Table A1, fees are interacted with indicator dummies for the presence of children in three age groups. Fees multiplied by the number of children in the household in the age groups 0 to 2 and 3 to 4 are included as well. (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.) Interactions of childcare fees with household income and in particular

with income groupings corresponding to policy parameters were insignificant. 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 childcare but not for formal childcare. Finally, the results presented in Appendix Table A1 correspond to a model in which preschool hours are included in informal rather than formal care. (See the end of the section for more discussion on the treatment of preschool.)

Various measures of fit are provided in Appendix Table A1. Overall the models perform well in the sense that they explain over 50% of the variation in formal care demands and 20 to 34% for informal care. Also, the average predicted probability of zero hours is within 1 percentage point of 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 A2 presents the average predicted and observed demand for childcare in 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. Although employment is treated in a flexible manner in the model, some aspects of the relationship are not fully captured.

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. (P-values are 0.001 and 0.000 respectively.) 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.

### ***3.4 Marginal effects***

To facilitate the discussion of the results of the bivariate demand model, we compute and present marginal effects of all explanatory variables in Table 5. For continuous variables (hours of work, income, fees, number of children) these are the derivatives of the predicted dependent variable (the expected hours of childcare including the probability of zero hours) with respect to the variable in question. For indicator variables, they are the differences in the expected hours of childcare with the indicators set alternatively at one and zero. In all cases, the marginal effects are computed at each data point and averaged over the sample. Standard errors are computed on these averages with a bootstrap estimator using 200 replications.

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

Parents' employment generally increases usage of both formal and informal childcare but the effects are 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 childcare 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 childcare 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 childcare and 17.5 additional hours of informal care

**Table 5. Marginal Effects on Formal and Informal Childcare Demands, Pre - school Hours Included in Informal Care (standard errors in parentheses)**

	Couples		Lone Parents	
	Formal	Informal	Formal	Informal
<b>Income:</b>			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)		
<b>Hours of work:</b>				
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)
<b>Employment:</b>				
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)
<b>Fees:</b>				
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)
<b>No. Children:</b>				
< 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)
<b>Capital City:</b>	0.378 (0.234)	0.675 (0.390)	1.144 (0.540)	-2.020 (1.419)
<b>ACT&amp;NT:</b>	1.773 (0.526)	-1.093 (0.663)		
<b>Parents' age:</b>				
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)		
<b>Parent is male:</b>			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 childcare 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 (Australian Capital Territory) or Darwin. The ACT&NT dummy is set at one for all observations in the ACT or NT. We must group the Northern Territories (NT) 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.

compared to a non-working lone mother. (The median hours of work for a working mother, single or coupled, is 20 hours per week.)

Increasing hours of work by working mothers in couples is related to a similar increase in both formal and 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 childcare 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 childcare but no significant effects were found for formal care. The parents' age is possibly an indication of the availability of informal care from grandparents. Male lone parents use more formal care and less informal care; however the latter effects have high standard errors probably due to the small sample size (only 7 % of lone parents are male). Families living in urban areas (excluding the Australian Capital Territory (ACT)) use more formal care, however this effect has a large standard error as well. Couples living in the ACT or Northern Territory (NT) use over one and a half hours per week more in formal childcare compared to couples living in one of the 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 childcare use.

Income increases usage of both formal and informal childcare. Note that these income effects are computed keeping labour supply fixed hence they should be interpreted as pure income effects. The results suggest that childcare 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 childcare 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, but 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 childcare 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 (see at the end of this section).

### *3.5 Price elasticities of the demand for formal and informal childcare*

To facilitate the interpretation of the income, price and hours of work effects, we present these in the form of elasticities in Table 6. 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 6 Elasticities for Formal and Informal Childcare Demands  
(standard errors in parentheses)**

	<b>Couples</b>		<b>Lone Parents</b>	
	<b>Formal</b>	<b>Informal</b>	<b>Formal</b>	<b>Informal</b>
<b>Income:</b>			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)		
<b>Hours of work:</b>				
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)
<b>Fees:</b>				
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. It implies that a 1% increase in

childcare fees will cause a reduction in demand for formal care of 0.34 to 0.64% for couples. For lone parents the results are more variable with effects ranging from 0.04 to 3.43%. As for the marginal effects, the standard errors on the average elasticities are 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 1% increase of the mothers' income (at constant labour supply) would result in an increase of 0.20% in formal care usage and no significant change in informal care. A similar increase in the fathers' income would raise both formal and informal care by 0.19%. For lone parents, it would cause an increase of 0.42% in formal care and just over 0.10% in informal care.

Positive and significant effects of hours of work on childcare use are found for mothers. Increasing hours of work among working mothers in two-parent households by 1% would cause an increase of 0.36% in formal care and 0.23% in informal care. Among working lone mothers, a similar increase in working hours would increase the hours of formal care by almost 1% while also causing a 0.21% 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 1% in their hours would lead to a reduction in formal care of around 1 hour per week while having no significant effects on informal care. Note that working hours are already very high for this group and even a small increase leads to a very high level of work.

### ***3.6 Predicted demand for childcare***

Finally, in Table 7 we present estimates of total weekly demands for childcare (formal and informal) by employment status, income and presence of young children. The household types in Table 7 are chosen to illustrate the separate effects of the presence of young children, hours of work and income on childcare demands.

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

**Table 7 Predicted Total Weekly Demand for Childcare Hours (including zero hours)**

Households	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
<i>No workers</i>	2.819	4.592	6.054	9.514	14.377	32.339
<i>One parent works (father works in couples):</i>						
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
<i>Both parents work- father has median hours and income and mother has:</i>						
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			
<b>Values used for income and hours:</b>						
	<b>Income</b>	<b>Hours</b>		<b>Income</b>	<b>Hours</b>	
<i>No workers</i>				275	0	
Father	140	0				
Mother	225	0				
<i>One worker (father's values for couples)</i>						
Low values	450	37		350	8	
Median values	650	45		450	20	
High values	900	45		550	37	
<i>Two workers (mother's values for couples)</i>						
Low values	225	8				
Median values	350	20				
High values	550	37				

Notes: 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 specific to the employment profile of the household. Low values correspond to the 25<sup>th</sup> percentile while high values are the 75<sup>th</sup> 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.

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 childcare 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 childcare 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 that is the main determinant of childcare demand. For example in the case of lone parents, raising hours of work from 8 to 37 increases childcare 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<sup>th</sup> and 75<sup>th</sup> 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.

### ***3.7 Alternative specifications with regard to preschool***

In the results presented so far preschool has been included in informal care. The main reason for this is the exclusion of preschool in the fees for formal care. Table 8 provides marginal effects of fees for formal care on the quantity of childcare demanded for three different specifications of the treatment of preschool hours. Other than the treatment of preschool hours, the specifications are the same as presented in Appendix Table A1. The largest changes in the three specifications concern the effects of fees. The previous discussion on the effects of other characteristics applies to the other two models.

Since preschool affects children aged 3 to 4 only, we expect the impact of excluding preschool hours from formal care to be stronger for that group. The results in Table 8 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 of children between 0 and 2 years old. With the inclusion of preschool in formal care, the interpretation of the price effect becomes 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.

**Table 8 Marginal Effects of Fees on Formal and Informal Childcare Demands, Various Specifications (standard errors in parentheses)**

	Couples		Lone Parents	
	Formal	Informal	Formal	Informal
<b>Preschool hours are included in formal care:</b>				
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)
<b>Preschool hours are included in informal care:</b>				
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)
<b>Preschool hours are excluded:</b>				
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: Please see the notes to Table 5 for a definition of marginal effects and the calculation of standard errors. Other than the treatment of preschool, the specifications are identical in the three models and correspond to the one presented in Appendix Table A1.

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.<sup>8</sup>

<sup>8</sup> Although results for the model with preschool excluded from the analysis are included for comparison, this model is not preferred since it reduces the ability of the model in predicting the total costs of childcare that are to be used in the labour supply framework.

## 4. Childcare Costs and Labour Supply Estimates

### 4.1 *The cost of childcare*

Since we are combining information from two different data sources, childcare use affects labour supply through the household budget constraint only. Specifically we cannot model the correlation in unobservables between labour supply choices and childcare use. This is the cost of using a more sophisticated model and a richer data set for the analysis of labour supply. From the estimated demands, we need to derive costs of childcare for different types of households at all possible values of labour supply.

One possibility is the use of the system of demands presented in the previous section. Costs could be estimated by multiplying the predicted demands by hourly fees for the different types of households. Since observed costs for informal care are zero for most households, this would mean essentially using zero costs for that type of care. We choose a different approach. We estimate a model similar to the bivariate Tobit described in Section 3 with informal care costs replacing the hours of informal care demanded. All explanatory variables in this specification are the same as those used in the joint demand model. Costs of preschool are included in informal costs for the reasons given in the previous section. Although harder to interpret, 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 self-reported prices.

Overall the fit of this new model and the results are similar to that of the previous framework. The approach provides a reasonable prediction of both formal and informal childcare costs. We compare within sample predictions with observed costs in Appendix Table A2 Panel II. Observed costs for formal care are computed as observed hours of formal care (excluding preschool) multiplied by the average fee for the household. These costs are added to observed informal care costs (including preschool) to form the total given in Table A2. Predicted costs are computed similarly with the use of predicted formal care demands and predicted informal care costs. Since we are using the fees charged by providers, the costs should be interpreted as gross costs before childcare rebates and assistance. 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.

The marginal effects for this model are presented along with standard errors in Appendix Table A3. Briefly, there is little change in the results for the formal care demand equation. Some differences are found in the effects on informal costs for lone parent households. In particular, 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. Also, an increase in formal care fees is 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. The effect of the parents' age on costs is more likely to be negative possibly also an indication that the increase in informal hours is often at zero cost

#### ***4.2 The imputation of childcare costs***

The predicted gross costs are used to impute childcare costs for households in the SIHC sample for different labour supply choices. First, for each labour supply choice, a gross income level (including all transfers and taxes) is computed within the MITTS model. Then, for each household with children of 12 years or younger in the Survey of Income and Housing Costs 1996/1997 (SIHC) a predicted cost of childcare is imputed based on the characteristics of the household (state, urban, number and age of children, couples versus lone parents, calculated gross income). This childcare cost is generated for each possible labour supply choice allowed in the model.

Since we combine information from two surveys based on the characteristics of the households, we need to verify that the samples of households are similar overall. Appendix Table A4 shows the weighted and unweighted distributions of the main variables used in modelling childcare demands for the CCS 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 age and number of children,<sup>9</sup> the distribution by age of the parents, geographical location, and the level of participation in the labour market. The largest differences are found in the distribution of hours of work. There is a smaller proportion of full-time workers in the CCS than in the SIHC. This difference remains even after weighting to represent the population distribution. For mothers (fathers) in couples the respective proportions are 16.8 (72.6) compared to 18.8 (81.5) while for lone parents the figures are 13.5 compared to 19.6.

We believe the discrepancy in the distribution of hours is mainly due to the treatment of the self-employed. In the CCS we cannot adequately identify the self-employed while 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 the labour supply estimation. The proportion of self-employed workers in the SIHC is approximately 7.5 % for women and 14 % for men in two-parent households and 4 % for lone parents. If self-employed parents with young children are more likely to work part time than salaried workers, their exclusion from the SIHC sample would result in greater hours of work on average for households with young children.

Net costs are calculated from the predicted gross costs of childcare and the predicted levels of Childcare Assistance and Rebate. These are calculated within MITTS based on the characteristics of the households and the predicted formal childcare costs. The subsidies are deducted from the formal costs, before adding the formal and informal costs together.<sup>10</sup> The result is a predicted net childcare cost based on predicted formal demands, average fees per household, total predicted informal care costs and calculated subsidies.

### ***4.3 The labour supply model***

Rather than associating to each household the predicted childcare cost, we use a simulation technique to improve the efficiency of the model. This consists of predicting childcare costs including an error term drawn from a distribution with

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<sup>9</sup> 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 slightly larger in this survey than in the CCS.

<sup>10</sup> It is assumed that all people paying for formal childcare are eligible for the rebate (that is they are either working or in training or searching for a job). This will understate the childcare cost to some extent, although given the statistics on reasons for childcare presented previously, we expect that most families with children in formal childcare (which excludes preschool) use this type of care for employment or education reasons.

characteristics equal to those estimated as part of the cost model, so we draw from the distribution of childcare costs. 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 childcare costs estimates. This method provides a more efficient prediction of the childcare costs since it incorporates the variation in unobservables affecting costs based on the estimated variance of these unobservables. A further advantage is that the calculation of Childcare Assistance and Childcare Rebate is more accurate in this approach, given that the subsidy payable for the average childcare cost is not the same as the average Childcare Assistance and Rebate over all possible childcare cost levels. 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 and cost of informal care.

The labour supply model is described in detail in Kalb (2002a, 2002b) and we provide a brief overview only. Households are assumed to maximize a household utility function of household consumption (assumed to equal net incomes) and leisure hours of the adults subject to a time constraint for each adult and a household budget constraint. This budget constraint includes all main tax and transfer programs in place at the time of the survey. It is assumed that individuals participate in all benefit programs for which they are eligible. Household composition, non-labour incomes and wages are treated as exogenous. Wages are predicted for non-workers based on a selection model. Separate wage equations are estimated for married men, married women, and sole parents.

A discrete choice model is specified (similar to Van Soest, 1995; Keane and Moffitt, 1998). Married women and sole parents choose between 11 labour supply levels while married men choose among 6 points. The utility function is specified as a quadratic in leisure and net income. An error term with an extreme value distribution is added to the utility. The parameters of the utility function depend on individual and household characteristics and on random terms capturing unobserved heterogeneity and are assumed to be normally distributed. Parameters representing fixed costs of working

are included in the utility when positive labour choices are made. Finally, the model is estimated using simulated maximum likelihood.

The results of the labour supply estimation including the childcare costs are given in the last two columns of Appendix Tables A5 and A6. These tables include the parameter estimates for the labour supply model estimated without childcare costs for comparison. The overall results are similar to the original estimates in the direction and the relative size of the parameters. 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 childcare 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.

#### ***4.4 Elasticity of labour supply to childcare fees and costs***

Table 9 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 childcare costs estimated from the formal demand/informal costs model. In order to facilitate the interpretation of the results we look at labour supply responses following two types of changes in childcare costs. First, we look at the changes in expected labour supply resulting from a 10% increase in net costs of childcare. This increases the costs directly and incorporates any changes in the demands. The second experiment increases the price of formal childcare by 10%. Demands adjust downward resulting in a smaller increase in total gross costs. The government subsidies are recomputed after the cut in price to calculate the net costs.

Table 9 presents the simulated elasticity measures averaged over all households in the sample. The increased costs of childcare reduce participation and hours of work by a modest amount. The effects are larger for lone parents than partnered women. The impacts on fathers in two adult households are negligible. Also as expected, an increase in costs generates a larger effect than a rise in the price due to adjustments in demands. For lone parents, the elasticity in hours of work is  $-0.15$  with respect to costs and  $-0.05$  with respect to prices. For partnered women, the figures are  $-0.03$  and  $-0.02$  respectively.

**Table 9 Labour supply estimates and changes for households with children accounting for childcare assistance and childcare rebate**

	Lone parents		Couples			
			Fathers		Mothers	
	Exp hrs	Part.	Exp hrs	Part.	Exp hrs	Part.
<b>Labour Supply Estimates -childcare costs not included</b>						
Initial Estimates:						
- predicted values	11.39	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		45.33		37.22		30.40
<b>Labour Supply Estimates -childcare costs included</b>						
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		44.48		37.20		30.34
Add 10% to net costs, no adjustments in demand:						
-predicted values	11.18	0.394	38.24	0.901	14.47	0.504
-change	-1.5%	-0.4ppt	0.0%	0.0ppt	-0.3%	-0.1ppt
Add 10 % to gross prices allowing for adjustments in demand:						
-predicted values	11.29	0.396	38.25	0.901	14.49	0.504
-change	-0.5%	-0.2ppt	+0.0%	0.0ppt	-0.2%	-0.1ppt

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

The labour supply effects not only vary with the number of adults in the households but also with income levels and the age of children. Table 10 illustrates these results. Lone parents, particularly those with preschool children, are most affected. For these households, the elasticity in hours of work to a change in the price of childcare is  $-0.18$ . When restricting the sample to those earning less than the median wage, the effect increases to  $-0.22$ . Labour supply decreases substantially when preschool children are present (5.71 versus 11.35 hours per week). The effect is larger for those facing wages below the median wage for the group (3.70 hours per week.) It is interesting to note that an increase in the fee has a greater impact on sole parents with preschool children earning low wages than an increase in net costs. At the original fee, they already receive close to the maximum amount of rebate and assistance so that the increase in the fee causes an even relatively larger increase in the net cost; the lower demand for childcare is not sufficient to counteract this completely.

For partnered women, the effect of a 1% price increase on hours increases from  $-0.02\%$  to  $-0.05\%$  when preschool children are present. As for lone parents, the

labour supply of partnered women is substantially affected by the presence of young children (hours per week decline from 14.52 to 10.56.) Women with young children and facing low wages work less especially if their partner is a high-wage worker (6.88 hours per week.)

**Table 10 Labour supply effects for households with children under 12 years of age**

	Lone parents		Couples			
	Expected hours		Expected hours men		Expected hours women	
<b>All in sample</b>	Hours	% diff. <sup>a</sup>	hours	% diff. <sup>a</sup>	hours	% diff. <sup>a</sup>
Initial estimate (1)	11.35		38.24		14.52	
Net cost +10 % (2)	11.18	-1.5	38.24	0.0	14.47	-0.3
Gross fee + 10% (3)	11.29	-0.5	38.25	+0.0	14.49	-0.2
<b>Wages &lt; median wage<sup>b</sup></b>						
Initial estimate (1)	6.47		34.36		9.71	
Net cost +10 % (2)	6.30	-2.6	34.35	-0.0	9.68	-0.3
Gross fee + 10% (3)	6.43	-0.6	34.36	0.0	9.69	-0.2
<b>Female Wage &lt; median , male wage&gt;median<sup>b</sup></b>						
Initial estimate (1)			40.73		11.21	
Net cost +10 % (2)			40.72	-0.0	11.16	-0.4
Gross fee + 10% (3)			40.73	0.0	11.18	-0.3
<b>Households with children less than 5 years</b>						
Initial estimate (1)	5.71		38.18		10.56	
Net cost +10 % (2)	5.55	-2.8	38.17	-0.0	10.49	-0.7
Gross fee + 10% (3)	5.61	-1.8	38.18	0.0	10.51	-0.5
<b>Households with children less than 5 years and wages &lt; median wage<sup>b</sup></b>						
Initial estimate (1)	3.70		34.32		6.88	
Net cost +10 % (2)	3.68	-0.5	34.31	-0.0	6.84	-0.6
Gross fee + 10% (3)	3.62	-2.2	34.33	+0.0	6.85	-0.4
<b>Households with children less than 5 years and Female Wage &lt; median , male wage&gt;median<sup>b</sup></b>						
Initial estimate (1)			40.79		7.60	
Net cost +10 % (2)			40.78	-0.0	7.54	-0.8
Gross fee + 10% (3)			40.79	0.0	7.56	-0.5

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.

Males in two-parent households are hardly affected by childcare 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 level however is 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).

## 5. Comparison with Other Studies

Studies in the U.S., Canada, the U.K., and Norway have looked at the impact of childcare costs and/or childcare prices on the probability of employment and the average number of hours worked. Table 11 presents an overview of these results presented in the form of elasticities. The last few rows present our results with regard to the net childcare cost and the gross childcare price. We include both since most other studies report the elasticity with regard to the childcare cost.

**Table 11 Summary of results from other studies on the effects of childcare prices/costs**

Reference	Country	Population	Estimated elasticity	
			Participation	Average hours
Anderson and Levine (1999)	U.S. (review)	Married women Single women	-0.92 – 0.00 -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 <sup>a</sup>	
Blundell et al. (2000) <sup>b</sup>	U.K.	Married women: -unemp. man -emp. man Single women	-0.075 -0.066 -0.021	-0.084 -0.048 -0.020
Kornstad and Thoresen (2002)	Norway	Married women	-0.12	-0.14
Michalopoulos and Robins (2000) <sup>c</sup>	Canada and U.S.	Married mothers with children under 5	-0.16	
Michalopoulos and Robins (2002) <sup>c</sup>	Canada and U.S.	Single parents with children under 5	-0.26	
Our results <sup>d</sup>	Australia	Married women: -total -low wages -preschool child -p.s. child & low wages Lone parents: -total -low wages -preschool child -p.s. child & low wages	 -0.020 or -0.020 -0.023 or -0.047 -0.050 or -0.050 -0.031 or -0.061  -0.050 or -0.100 -0.038 or -0.189 -0.136 or -0.136 -0.126 or -0.000	 -0.021 or -0.034 -0.027 or -0.045 -0.048 or -0.066 -0.053 or -0.079  -0.053 or -0.150 -0.062 or -0.263 -0.175 or -0.280 -0.216 or -0.054

Note: a) This elasticity is derived from the simulation of a decrease in the formal childcare 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) This elasticity is for a price change in the base model (see Table 5, page 486.)

d) Both the results from doubling the gross price and doubling the net costs (largest effects) are presented.

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 childcare subsidies for low-income households. They do not present elasticities but the simulations show that childcare 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 childcare cost changes.

Blundell et al. (2000) is one of the few studies to look at married men. Their results (not shown in Table 11) suggest that men are hardly affected at all by childcare 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 childcare 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 preschool 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 childcare but it is clearly beyond the scope of the present study.

## **6. Conclusion**

The first stage in the empirical work conducted in this paper is the estimation of joint demands for formal and informal childcare conditional on the observed labour supply of the household. Information from the Child Care Survey (CCS) conducted by the Australian Bureau of Statistics (ABS) in 1996 is used. The sample is representative of the population of Australian families with children and includes employed and non-

employed parents. We use data on fees charged by childcare centres to capture exogenous variations in prices in the market for childcare services. Lone parent and two-parent households are analysed separately.

Our findings suggest that nonparental childcare costs in Australia are low on average, mostly because a significant amount of the care is informal with zero monetary cost. 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 results for the demand functions show a substantial and negative price elasticity for formal care. For most households, informal care is a substitute for formal care. Own price elasticities of demand for formal care range from -0.3 to -0.6 for couples depending on the age of the child. For lone parents the estimates are more imprecise and more variable although still negative. Income elasticities are also generally positive and substantial. Both formal and informal care are normal goods with income elasticities ranging from 0.2 to 0.4 for formal care and with the primary earner's income elasticity ranging from 0.1 to 0.2 for informal care.

These estimates are used to impute a cost of childcare based on the household characteristics for all possible values of labour supply choices. Imputed childcare costs taking into account childcare subsidies are incorporated in the calculation of net household incomes. A structural labour supply model is then estimated based on these adjusted net incomes using information from the 1996/1997 Survey of Income and Housing Costs (SIHC). The reason for this two-stage approach is that the CCS does not include many of the variables known to be important in labour supply modelling (such as detailed data on income or education) while the SIHC does not include childcare information. The labour supply is modelled as a discrete choice following the approach of Van Soest (1995) and Duncan and MacCrae (1999) and estimated by simulated maximum likelihood methods. The budget constraint incorporates all main features of the tax and transfer system in place at the time of the surveys.<sup>11</sup>

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<sup>11</sup> The modelling of the budget constraint and more generally the labour supply form part of the Melbourne Institute Tax and Transfer Simulator (MITTS) which has been used to study various policy reforms in Australia. Please see Section 4 for more discussion.

The impacts of childcare price and cost increases on household labour supply are simulated using the model estimates. A 10% increase in the price of childcare reduces the participation rate by around 0.5% for sole parents and 0.2% for married women. The smaller effect for married women relative to lone parents is consistent across various specifications. 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 elasticities relative to childcare 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 childcare costs or fees are substantially larger. For sole parents, the average effect of an increase of 10% in the price of childcare is a fall of 0.5% in expected hours of work. This labour supply reaction is close to -1.8% for those with preschool children and -2.2% for those with preschool children and earning low wages. The effect for married women is smaller than for lone parents at an average of -0.2%. A larger effect of -0.5% is found for married women with preschool children. There are conflicting results from overseas studies on the relative impact of childcare 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.

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**Appendix Table A1 Estimation Results for Childcare Demands (where preschool is included in informal care). Bivariate Tobit Models.**

Variable	Couples				Lone Parents			
	Formal		Informal		Formal		Informal	
	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) <sup>2</sup> : 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 <sup>2</sup> 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  $\chi^2$  test that all coefficients except the constant term are jointly 0.

**Appendix Table A2 Comparisons of within sample predictions, observed values and imputed values. Weekly Costs and Hours of Care.**

	Couples				Lone parents		
	No workers	One worker	Two workers	Total	Non worker	Worker	Total
<b>I. Weekly hours demanded:</b>							
<i>a) Expected demands (including zeroes)- total care</i>							
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
<i>b) Frequency of zero demands- total care</i>							
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
<i>c) Expected demands (including zeroes)- formal care</i>							
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
<i>d) Frequency of zero demands- formal care</i>							
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
<i>c) Expected demands (including zeroes)- informal care</i>							
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
<i>d) Frequency of zero demands- informal care</i>							
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
<b>II. Weekly gross costs - estimates based on the joint model of demand for formal care and costs for informal care:</b>							
<i>a) Expected costs (including zeroes)</i>							
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
<i>b) Frequency of zero costs</i>							
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

Note: CCS denotes the Child Care Survey and SIHC the Survey of Income and Housing Costs. Panel I is based on the model with joint demand equations, one for formal hours of childcare excluding preschool and one representing the demand for hours of informal care plus preschool. The estimates in Panel II are based on a bivariate Tobit with hours demanded for formal care on one branch and the costs of informal care on the other branch. 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 4 and the household composition. The resulting costs for the CCS should be interpreted as gross costs before childcare rebates and assistance. For more details, please see the main text.

**Appendix Table A3 Marginal Effects on Formal Demand and Informal Gross Costs, Preschool Costs Included in Informal Costs (standard errors in parentheses)**

	Couples		Lone Parents	
	Formal	Informal	Formal	Informal
<b>Income:</b>			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)		
<b>Hours of work:</b>				
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)
<b>Employment:</b>				
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)
<b>Fees:</b>				
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)
<b>No. Children:</b>				
< 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)
<b>Capital City:</b>	0.328 (0.255)	1.852 (0.574)	1.175 (0.529)	0.327 (0.757)
<b>ACT&amp;NT:</b>	1.823 (0.562)	1.312 (1.167)		
<b>Parents' age:</b>				
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)		
<b>Parent is male:</b>			2.090 (2.264)	0.561 (2.220)

Notes: Marginal effects are computed for each data point and averaged over the samples. The predicted costs for formal care are computed as the predicted demand times the average hourly fee for the household based on the number and age of the children and the state of residence. Predicted informal costs are computed in the usual manner based on the estimation results. Predicted informal and formal costs are added to yield predicted total childcare costs. 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 childcare 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.

**Appendix Table A4 Composition of Samples from the Survey of Income and Housing Costs (SIHC) and the Child Care Survey (CCS)**

	Couples				Lone parents			
	SIHC		CCS		SIHC		CCS	
	weighted	unwght	weighted	unwght	weighted	unwght	weighted	unwght
<i>% distribution of households by number of children aged 0-2</i>								
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
<i>% distribution of households by number of children aged 3-4</i>								
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
<i>% distribution of households by number of children aged 5-9</i>								
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
<i>% distribution of households by number of children aged 10 or more<sup>a</sup></i>								
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
<i>% distr. of hhlds. by hours of work of the mother<sup>b</sup></i>				<i>% distr. by hours of work of the parent<sup>b</sup></i>				
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
<i>% distribution of households by hours of work of the father<sup>b</sup></i>								
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				
<i>% distribution of households by age of the mother</i>				<i>% distr. of hhlds. by age of the parent</i>				
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
<i>% distribution of households by age of the father</i>								
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 % for women and 14 % for men in two-parent households and 4 % for lone parents.

**Appendix Table A5 Labour supply estimates for couples using 10 draws from childcare costs and prices respectively (2662 observations)<sup>a,b</sup>**

Preference parameters	No childcare costs		With childcare costs	
	Estimates	p-value	Estimates	p-value
<i>Squared terms &amp; cross products</i>				
Income sq. $\times 100,000$	-0.0042	0.5916	-0.0022	0.7699
Labour supply man sq. $\times 100$	-0.5955	0.0000	-0.5991	0.0000
Lab. supply woman sq. $\times 100$	-0.1972	0.0000	-0.1986	0.0000
Inc. & l.s. man $\times 10,000$	-0.2850	0.0000	-0.2755	0.0000
Inc. & l.s. woman $\times 10,000$	-0.1758	0.0000	-0.1696	0.0000
l.s. man & woman $\times 100$	-0.0414	0.0001	-0.0404	0.0001
<i>Linear terms:</i>				
<i>Income:</i> constant	0.7052	0.0000	0.7003	0.0000
Number of children	-0.0064	0.2277	-0.0067	0.2056
<i>Lab.sup. man:</i> constant	0.3395	0.0000	0.3424	0.0000
Youngest child 0-2 yrs old	0.0051	0.3437	0.0052	0.3259
Youngest child 3-4 yrs old	-0.0042	0.5118	-0.0040	0.5335
Youngest child 5-9 yrs old	-0.0056	0.2847	-0.0056	0.2865
Number of children	0.0012	0.5449	0.0011	0.5718
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	0.0118	0.0005
diploma	0.0128	0.0129	0.0129	0.0124
degree	0.0068	0.1969	0.0069	0.1897
Voc. education (partner)	0.0102	0.0135	0.0102	0.0138
diploma (partner)	0.0026	0.6474	0.0026	0.6514
degree (partner)	0.0030	0.5792	0.0030	0.5840
<i>Lab.sup. woman:</i> constant	0.0580	0.0246	0.0567	0.0280
Youngest child 0-2 yrs old	-0.0676	0.0000	-0.0638	0.0000
Youngest child 3-4 yrs old	-0.0445	0.0000	-0.0412	0.0000
Youngest child 5-9 yrs old	-0.0269	0.0000	-0.0262	0.0000
Number of children	-0.0053	0.0010	-0.0052	0.0015
Age/10	0.0409	0.0006	0.0419	0.0005
Age squared/100	-0.0073	0.0000	-0.0074	0.0000
Voc. education (partner)	-0.0017	0.6035	-0.0016	0.6222
diploma (partner)	0.0034	0.4179	0.0036	0.3980
degree (partner)	-0.0083	0.0686	-0.0080	0.0798
Vocational education	0.0070	0.0603	0.0068	0.0648
diploma	0.0151	0.0019	0.0151	0.0018
degree	0.0298	0.0000	0.0303	0.0000
Fixed cost man/100	14.8652	0.0000	15.0556	0.0000
Fixed cost woman/100	5.7147	0.0000	5.7797	0.0000

<sup>a</sup> 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.

<sup>b</sup> The unobserved heterogeneity terms were found to be insignificant and are left out of these specifications.

**Appendix Table A6 Labour supply estimates for lone parents using 10 draws from childcare costs and prices respectively (456 observations)<sup>a,b</sup>**

Preference parameters	No childcare costs		With childcare costs	
	Estimates	p-value	Estimates	p-value
<i>Squared terms &amp; cross products</i>				
Income squared $\times 100,000$	-1.1699	0.1574	-0.4802	0.0454
Labour supply squared $\times 100$	-0.0519	0.3872	-0.0174	0.7537
Inc. & lab. sup. $\times 10,000$	-1.1701	0.2907	-2.0237	0.0001
<i>Linear terms</i>				
<i>Income</i>				
constant	6.8925	0.0019	5.8222	0.0004
Youngest child 0-2 yrs old	-1.4606	0.0192	-2.0246	0.0000
Youngest child 3-4 yrs old	-2.1883	0.0000	-1.9569	0.0000
Youngest child 5-9 yrs old	-0.5184	0.1803	-0.6018	0.0548
Number of children	0.4956	0.0143	0.3785	0.0072
Age/10	-2.1001	0.0535	-1.7901	0.0326
Age squared/100	0.2285	0.0923	0.1858	0.0705
Vocational education	0.5061	0.1250	0.6305	0.0310
Diploma or degree	-0.1968	0.4816	-0.2026	0.4234
female	1.0636	0.0341	1.1759	0.0012
<i>Labour supply</i>				
constant	-0.2400	0.0310	-0.2150	0.0252
Youngest child 0-2 yrs old	0.0501	0.0896	0.0414	0.1198
Youngest child 3-4 yrs old	0.0282	0.3313	0.0180	0.4559
Youngest child 5-9 yrs old	0.0033	0.8700	0.0117	0.4635
Number of children	-0.0050	0.5003	0.0041	0.4821
Age/10	0.1430	0.0044	0.1332	0.0022
Age squared/100	-0.0183	0.0037	-0.0174	0.0012
Vocational education	0.0028	0.8025	0.0046	0.6404
Diploma or degree	0.0224	0.1159	0.0276	0.0285
female	-0.0947	0.0001	-0.0828	0.0000
<i>Fixed cost</i>				
Constant	2.4623	0.0011	2.9594	0.0001
Live in capital city	0.1051	0.1922	0.0906	0.3476
Children 0-4 yrs old	0.9240	0.0158	1.1204	0.0025
Youngest child 5-9 yrs old	0.0679	0.6916	0.0931	0.5777
Live in NSW	0.1321	0.1427	0.1389	0.1993
Female	-1.3431	0.0462	-1.7631	0.0067

<sup>a</sup> 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.

<sup>b</sup> The unobserved heterogeneity terms were found to be insignificant and are left out of these specifications.