Child Care Availability, Quality and Affordability: Are Local Problems Related to Labour Supply?

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Abstract

We examine whether responses to survey questions about child care availability, quality, and cost, aggregated at the local geographical level, have any explanatory power in models of partnered female and lone parent labour supply. We find evidence that partnered women and lone parents who live in areas with more reports of lack of availability, low quality, or costly child care work fewer hours and are less likely to work than women in areas with fewer reported difficulties with child care.

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I Introduction

There is broad-ranging concern in Australia about the availability, quality, and price of child care. There have been calls (see ABC, 2009) for additional public funding to increase availability and affordability of child care, particularly following the collapse of ABC Learning[1], a large private child care centre operator. The public debate is often framed around the need for child care policy to be focused on allowing (sometimes even encouraging) women with young children to enter the labour force (see ABC Radio, 2006). Policies such as Child Care Tax Rebate and Child Care Benefit provide subsidies for child care usage primarily for work-related purposes. Australian Human Rights Commission (2009) tells women that "childcare can be expensive and hard to get." Thus, "it is important to think about childcare while you are pregnant to make sure that you can access childcare when you return to work." The Parliament of the Commonwealth of Australia (2006) documents reported problems with quality, accessibility and affordability of child care in Australia and worried about "its impact on women's ability to participate in paid work at an optimum level."

Clearly the availability and quality of child care, in addition to price, could affect parental decision-making about labour supply, particularly in the highly subsidised and regulated child care market. On the one hand, child care is a cost of working. However, parents rarely approach the problem of finding child care as a simple cost-minimisation exercise. Rather, child care is viewed as an important input to child development. Parents who might want to work will be unwilling to leave their child in a poor child care environment. Furthermore, parents who have decided to work and to place their child in care might be willing to spend more than the minimum in order to place their child in high-quality care, available at a convenient location.

But whether availability, quality and affordability of child care are empirically significant issues in Australia in preventing parents from working is not so obvious and there is a paucity of empirical research in Australia which comprehensively investigates these multiple aspects of child care. This paper makes some progress in identifying the role that availability and quality, along with cost, might play in labour supply choices of partnered women and lone parents.

We simultaneously examine these multiple aspects of child care using the Household,

Income and Labour Dynamics in Australia (HILDA) survey which asks some respondents about child care availability, quality, and cost. We expect that in areas where child care supply is lacking that individuals will report more problems with availability than in areas with plentiful supply. Likewise for quality and cost. Our approach will be to take these assessments of child care supply conditions and aggregate them at the local level. In order to purge possible bias from the correlation between an individual's unobserved preferences for working and her evaluation of local child care conditions, the aggregated measures are constructed separately for each individual using responses from other households in the same area. We estimate participation and labour supply models including these local area average responses.[2] The question we address is whether these average responses are correlated with participation and work hours decisions.

For partnered women and lone parents we find robust evidence that local problems with availability, quality and cost are associated with working fewer hours and with being less likely to work. The results contradict the existing consensus that Australian mothers are not very responsive to changes in the child care environment, in particular, to the cost of child care.

The rest of the paper includes a discussion of our data sources in Section III, our estimates of the basic linear labour supply model in Section IV, and the results using the subjective measures of child care availability, quality, and cost in Section V. We conclude in the final section.

II Background

A small empirical literature for Australia has mainly investigated the price elasticity of maternal labour supply, which has been found to be small and often not statistically different from zero. Doiron and Kalb (2005) and Kalb and Lee (2008) find that work hours for partnered women (lone parents) decrease by .02 (.05) per cent in response to a one per cent increase in formal child care prices. Rammohan and Whelan (2005) find slightly larger, but statistically insignificant elasticities while Rammohan and Whelan (2007) find no effect of child care price on the choice between part-time and full-time work. These results have produced a consensus that maternal labour supply is not responsive to the cost of child care in Australia.[3] This is in contrast with the evidence

from other countries, where studies find significant, negative effects of child care price on female labour supply.[4]

None of these studies, nor any Australian study to our knowledge, has attempted to address non-price factors. Outside of Australia, research shows that the importance of non-price factors varies from country to country but given the important differences across countries in child care institutions, it is difficult to generalise from these studies. A handful of papers, exclusively for European countries where child care markets are characterised by low availability of centre-based child care (and high subsidisation), model access restrictions to child care, for example, Gustafsson and Stafford (1992) for Sweden; Kornstad and Thoresen (2007) for Norway; Del Boca and Vuri (2007) for Italy; Wrohlich (2006) for Germany; and Lokshin (2004) for Russia. Most of these papers use the discrete choice labour supply model of Van Soest (1995) and model rationing of formal child care by limiting the choice set of rationed households. A general conclusion from these papers is that lack of availability is a factor hindering labour supply of women with young children and that increased availability of centre-based child care would lead to increases in labour supply of women with young children in these countries.

In Australia, where entry into the child care provision market is free and open as evidenced by the rapid growth of privately provided child care places in the last 10 years, lack of availability is probably not as severe as in Europe. For example, Wrohlich (2006) states that in 2002, there were only 3 slots in child care centres for every 100 children under three in former West Germany. In Australia, although availability of child care makes headlines, about one third of children under three use centre-based care and if children using family day care are included, about half of children under three are in formal child care (based upon the authors' calculation using the three most recent waves of HILDA). However, availability of child care could be a local problem even in the absence of a national-level problem. For example, overall affordability of child care can be affected through transportation costs if a place in a centre is only available in an area far from home.

The other non-price factor which often draws attention is the quality of child care. Early literature, primarily in the US where quality has been of great concern, studied the demand for child care quality by investigating 'choice of mode' (see for examples,

Leibowitz *et al.*, 1988; Lehrer, 1989; Hofferth and Wissoker, 1992; Blau, 1991; and Hagy, 1998). In an influential paper, Blau and Hagy (1998) model labour supply, demand for child care modes, hours, and non-price attributes such as quality simultaneously. They find that a decrease in child care price causes a decrease in the demand for quality-related attributes. Findings from the more recent literature indicate that the price elasticity and income elasticity of quality are low in child care (Blau and Mocan, 2002; Blau, 2001, Chapter 4). Mocan (2007) shows that although consumers attach high importance to child care quality, they often fail to get the right perception of child care quality because of information asymmetry. In particular, child care providers are informed about the level of quality of their services, but the parents have difficulty in distinguishing between the quality levels of alternative centres.

Mocan's results might suggest that our measures of child care quality, based on parental perception, may not reflect quality as assessed by education experts. However, as we show below, the measures of child care availability, affordability and quality are highly correlated with each other, suggesting that the measures are informative about the overall severity of an underlying problem with the supply of satisfactory child care.

III Data

We use data from the in-confidence version of the Household, Income and Labour Dynamics in Australia Survey (HILDA).[5] The HILDA Survey is an annual panel survey of Australian households and we use the first seven waves of the data covering the period 2001 - 2007. There are approximately 7,000 households and 13,000 individuals who respond in each wave. We use the HILDA data in two ways. Data on wages and hours are used to estimate labour supply models for partnered women and lone parents. We also use HILDA to generate local, geographical averages of responses to questions on child care availability, quality and cost. We first describe the data we use for the labour supply models and then the data we use on subjective child care questions.

(i) Partnered Females

The sample used for analysis is all partnered women pooled across all seven waves of the HILDA data. We use information on household type and relationship with other people

in the household to select all individuals who are living in partnered relationships. We drop households which have unrelated individuals living together (group households), multi-family households, and those individuals for whom there is no partner information available. For example, in wave seven, there are 7,809 persons who report being in couple households. From this group, we remove 55 persons who live in households where there are unrelated people living together, 182 persons who live in multi-family households and 400 persons without matching partner information. For same sex female couples, we randomly pick one of the two women for inclusion in the analysis sample. We are left with 3,574 household which contain partnered women.

In order to ignore the decisions to study and to retire in our modeling, we further restrict the sample by removing households where either partner is less than 25 years of age or greater than 59 years of age; where either partner is retired; where either partner is a full-time student; where either partner is disabled; where either partner is self-employed or works in a family business; or where either partner reports working, but has zero wage. We further made the decision to drop observations where the woman reports working more than 60 hours per week.[6] After making these sample exclusions, our sample size across all seven waves of data is 11,103 partnered women.[7]

(ii) Lone Parents

We apply the same sample exclusion rules as described for partnered women to the sample of lone parent households. Our analysis sample consists of 3,297 lone parents, of whom 401 are men. While our primary focus in this paper is on *maternal* labour supply, we do include both male and female lone parents in our study as single fathers are likely to face the same difficulties in balancing work and child care as single mothers. Only 12 per cent of lone parent households are headed by a male and dropping them does not fundamentally change the results presented in Sections IV and V below.

Table 1 presents the labour force status of our final sample of 11,103 partnered women and 3,297 lone parents. Table 2 presents definitions of the variables used in estimating the labour supply models of Sections IV and V. Table 3 provides descriptive statistics separately for our sub-samples of partnered women and lone parents.[8]

Table 1
Sample Sizes by Labour Force Status

Labour force status	**Partnered women**	**Lone parents**
Employed	8,118	2,152
Unemployed and not in the labour force	2,985	1,145
Total	11,103	3,297 (including 401 males)

Table 2
Definition of Variables Used in Labour Supply Models

Variable	**Definition**
$ln\,(wage_i^*)$	natural log of shadow price of time
$ln\,(wage_i)$	natural log of hourly wage
age	$age/100$
kidspreschool	=1 if household has preschool age child
schoolkids	=1 if household has school age child
olderkids	=1 if children over 18 in household
nonreskids	=1 if household has non-resident children (under age 18)
homeowner	=1 if own home or paying off mortgage
wage_p	partner's gross weekly wage earnings divided by 1000
poorenglish	=1 if self-assessed English ability is poor
university	=1 if university graduate
schoolincomp	=1 if did not complete year 12
exper	$experience/100$
$exper^2$	$(experience/100)^2$

Table 3
Descriptive Statistics: Analysis Sample from HILDA Waves 1 Through 7 Pooled

Variable	**Partnered Women**	**Lone parents**
hours	23.1 (17.6)	21.6 (19.0)
hours (workers only)	31.6 (12.5)	33.0 (13.1)
$ln\,(wage_i)$ (workers only)	2.99 (0.43)	2.92 (0.45)
age	0.40 (0.085)	0.42 (0.084)
kidspreschool	0.27	0.18
schoolkids	0.44	0.61
olderkids	0.25	0.43
nonreskids	0.14	0.26
homeowner	0.26	0.18
partner's wage ($wage\_p$)	1.11 (0.72)	n/a
poorenglish	0.014	0.017
university	0.30	0.20
schoolincomp	0.30	0.36
experience ($exper$)	0.16 (0.089)	0.17 (0.10)
Sample size	11,103	3,297

Notes: Means with standard errors in parentheses. Standard errors suppressed for indicator variables. For wage and partner wage data we use the imputed gross weekly salary and wage income for all jobs. *Source*: #WSCEI variable in HILDA.

(iii) Child Care Data

There are three questions on quality, four on availability and one on cost that are asked of a sub-sample of respondents (families with children under age 15 who either used or considered, in the previous twelve months, using child care so that both caregivers could undertake paid work) and we use the data from *all* respondents who answer these questions. The data contain four additional questions that we did not use because they related to situations which some or many families might not experience.[9] The questions are asked on the household questionnaire, so we only have a response from the individual who fills out that part of the questionnaire.

Possible responses to each question range from 0 ("Not a problem at all") to 10 ("Very much a problem"). Table 4 provides the mean response for each question. Across the seven waves of data, there are 6,721 households who are in-scope for these questions (about 950 households per wave), but not all households responded to all questions,

thus the sample size varies on a question-by-question basis.[10] Figure 1 provides an example of the distribution of responses for the question about whether households had any difficulty with the cost of child care. Thirty per cent of the 6,193 responses to this question reported "no difficulty" whereas nine per cent indicated that cost was "very much a problem", a response of 10. "No difficulty" (0) is the most common response for every question. The mean level of reported difficulties with cost is much higher than for quality or availability. This may be evidence that these non-price factors may not be as serious a problem as in some other countries. For all questions, we observe similar patterns of the middle response (5) being chosen more frequently than its neighbours (4) or (6) and the most extreme response (10) being chosen more than (8) or (9).[11]

In Table 4 we also present the mean for the three additional variables which we create using averages across multiple questions. The 'any quality question' is the average across all responses to the three quality questions; the 'any availability question' is the average across all responses to the four availability questions; and the 'any child care difficulty question' is the average across all responses to any of the questions.

Correlation between individual responses to the questions about difficulties with child care is very high. For example, correlation between responses to "Difficulty finding a place in the child care centre of choice" and "Difficulty finding child care in the right location" is .81. Even across broad categories (quality, availability, cost) correlation is high. The correlation between the response to "Difficulty in finding quality child care" and "Difficulty finding child care in the right location" is .68. The weakest correlations are between the response to the cost question and the responses to the other questions, but even then the correlations remain relatively high. Correlations between the cost question and the availability and quality questions range from .39 to .50.

Table 4
Average Responses to Questions About Child Care Difficulties
Waves 1 Through 7 Pooled

Question	Number of Observations	Mean response
Questions relating to quality		
Difficulty in finding quality child care	6284	2.72
Difficulty in finding right person to care for my child	6388	2.85
Difficulty in finding care that my children are happy with	6224	2.38
Any quality question	18896	2.65
Questions relating to availability		
Difficulty in finding care for hours needed	6470	3.08
Difficulty juggling multiple child care arrangements	4766	2.84
Difficulty finding a place in the child care centre of choice	5173	2.74
Difficulty finding child care in the right location	5297	2.45
Any availability question	21706	2.79
Question relating to cost		
Difficulty with the costs of child care	6193	3.93
Average over all questions		
Any child care difficulty question	46795	2.89

We use the in-confidence version of HILDA which includes data on respondents' post-code. We match this postcode to the Australian Bureau of Statistics 3-digit Statistical Division (SD) (1-digit state/territory code combined with 2-digit SD code).[12] The 6,721 household-level responses to the child care questions of Table 4 are distributed across 54 SDs. For each wave and for each SD, we calculate, for each respondent in HILDA, the average response to the child care questions from Table 4 for all *other* respondents in the same SD. For each wave, this gives us five or more responses to each child care question for 37 to 42 of the 54 SDs. (39 out of 54 SDs on average, across the seven waves, have five or more responding households per SD.) For between three and six SDs per wave (less than four per wave on average), we only have one response, and thus we can not create average responses for other respondents for these SDs. We explore below the consequences of dropping and of using observations from these SDs. By construction, these local averages may differ for individuals in the same wave and in the same SD.

It is important to note that we are not assuming that individuals in HILDA have a particular reference SD in mind when responding to the child care questions. We view our constructed aggregate as a proxy for local conditions. Some individuals will have a much smaller geographical area in mind, some a much larger one. We discuss further the appropriate level of geographical aggregation in Section V(iii) below.

As with the individual responses, the correlation between average responses within the geographical aggregates to the different child care questions is also very high. So, for example, the average response to the "any quality question" and the average response to the "any availability question" within SD is .81. The correlation between the question about cost and the "any quality question" is .54.[13] In the models of Section V where we include these variables simultaneously, we will need to exercise caution in interpreting the results given the high degree of co-movement between these local area averages.

IV Baseline Labour Supply Models

In what follows, we group the unemployed, marginally attached and not in the labour force into one group of non-workers for the purpose of estimating models of the probability of working and of labour supply.[14] The main results in section V below are invariant to exclusion of one or the other group of non-employed.

(i) Probability of working

We first estimate a simple reduced form probit model for the probability of working excluding any information about child care. Table 5 presents the results of this model for partnered women and for lone parents. Because we are pooling waves of data which sometimes contain repeated observations on the same households, we correct the variance matrix of the coefficients for clustering. The estimates correspond to typical results from participation models in the Australian literature and the variables have the expected signs and magnitudes.

Table 5
Probit Results: Probability of Working
Marginal Effects (Standard Errors)
Waves 1 Through 7 Pooled

Variable	Partnered Women	Lone Parents
Age[(a)]	-0.021^{**} (0.0015)	-0.15^{**} (0.0029)
Poor English	-0.34^{**} (0.086)	-0.44^{**} (0.10)
University	0.13^{**} (0.014)	0.12^{**} (0.038)
School incomplete	-0.095^{**} (0.018)	-0.082^{**} (0.032)
Experience[(b)]	0.025^{**} (0.0014)	0.024^{**} (0.0018)
Preschool kids	-0.35^{**} (0.017)	-0.32^{**} (0.038)
School age kids	-0.024^{*} (0.014)	-0.15^{**} (0.029)
Older children	0.097^{**} (0.015)	0.037 (0.032)
Non-resident kids	0.059^{**} (0.019)	-0.015 (0.032)
Home owner/paying mortgage	-0.013 (0.016)	-0.040 (0.038)
Partner's earnings	-0.031^{**} (0.0093)	
Male		-0.063 (0.055)
Dummy variables for each wave		
Wave 2	-0.025^{**} (0.012)	0.0021 (0.024)
Wave 3	-0.017 (0.013)	0.044^{*} (0.025)
Wave 4	0.013 (0.013)	0.032 (0.028)
Wave 5	0.039^{**} (0.013)	0.069^{**} (0.028)
Wave 6	0.038^{**} (0.013)	0.14^{**} (0.027)
Wave 7	0.055^{**} (0.013)	0.13^{**} (0.028)
Sample size	11,103	3297
Log likelihood value	-4612.3	-1485.7

Notes: ** statistically significant at the 5 per cent level (or higher).
* statistically significant at the 10 per cent level (or higher).
Standard errors are calculated taking into account clustering from inclusion of multiple observations on same individuals across waves.
[(a)] Marginal effect for a one year increase in age. $\frac{Age}{100}$ is used in regression.
[(b)] Marginal effect for a one year increase in experience. $\frac{Exper}{100}$ and its square are used in regression.

(ii) Labour Supply

To obtain a baseline model of labour supply, we estimate the model of Heckman (1974). The main drawback of this model is that it assumes that hours adjust freely such that reservation wages and actual wages are equal for those who chose to work. We discuss this further below. Recently, discrete hours models (for Australia, see Breunig *et al.*, 2008) have become popular because they restrict hours choices to frequently observed points (20 hours, 40 hours, etc.).

We prefer the Heckman (1974) model for this paper because we think it is appropriate to address the question of interest, simpler than the discrete choice hours models, and more easily reproduced. The Heckman (1974) model is estimated by maximum likelihood allowing our results to be easily reproduced. Discrete choice hours models involve more computer programming and, as they are estimated by simulated maximum likelihood using repeated draws from a particular statistical distribution, they generate results which are more difficult to reproduce. Finally, we note that the Heckman (1974) model is widely applied, well-understood, and tends to give reasonable estimates across a wide range of countries and time periods. In our experience, variables which are significant in one model (such as presence of young children) are significant in the other model. We are confident that the main results relating to inclusion of child care variables in Section V(ii) are not sensitive to our choice of labour supply model.

The model we estimate is

$$\begin{aligned} ln\left(wage_i^*\right) =& \alpha_1 + \alpha_2 hours_i + \alpha_3 kidspreschool_i + \alpha_4 schoolkids_i + \alpha_5 olderkids_i \\ &+ \alpha_6 nonreskids_i + \alpha_7 homeowner_i + \alpha_8 wage\_p_i + u_i \qquad (1) \\ ln\left(wage_i\right) =& \beta_1 + \beta_2 age + \beta_3 poorenglish + \beta_4 university + \beta_5 schoolincomp \\ &+ \beta_6 exper + \beta_7 exper^2 + \epsilon_i \qquad (2) \end{aligned}$$

where the variables are as defined in Table 2 and $wage^*$ is the 'shadow' or reservation wage. Hours and participation are jointly estimated by assuming that $wage^* = wage$ for individuals who work and $wage^* > wage$ for individuals who do not work. The model further assumes that adjustment, for workers, takes place by hours varying continuously; see also endnote 15 below. Wage estimates are produced as part of this joint estimation process directly from equation (2). Variables such as the presence of children in the

household and partner's wage would be expected to have a positive impact on the reservation wage and thus a negative impact on hours and participation. We estimate the models by full information maximum likelihood. The likelihood function is formed by assuming that u_i and ϵ_i are jointly normally distributed and the correlation between the two is allowed to vary freely. For details, see Heckman (1974). We again correct the standard errors for the clustering created by the pooling across waves.

For lone parents, there is no partner so the variable relating to partner's income is excluded from equation (1). We do add a control for whether the lone parent is male or not. For lone parents we thus estimate a system defined by equation (2) and

$$\begin{aligned} ln\left(wage_i^*\right) =& \alpha_1 + \alpha_2 hours_i + \alpha_3 kidspreschool_i + \alpha_4 schoolkids_i + \alpha_5 olderkids_i \\ &+ \alpha_6 nonreskids_i + \alpha_7 homeowner_i + \alpha_9 male_i + u_i \end{aligned} \tag{3}$$

The results for partnered women and lone parents are presented in Table 6.

The signs of the coefficients are in line with what is found in the Australian literature and in keeping with our a priori expectations. The labour supply elasticity of hours with respect to wages can be derived from the estimates of the coefficient on $hours$. An exogenous wage increase is equivalent to a shift in the intercept of the market wage equation. For women who work (where $wage_i^* = wage_i$),

$$\frac{\partial hours_i}{\partial \beta_1} = \frac{1}{\alpha_2}. \tag{4}$$

For partnered women, our estimate of this partial effect is $\frac{1}{.0191} = 52.36$. 52.36 is the increase in hours from an increase of one unit in the natural log of wage. If wages increase by one per cent (a change of .01 units of the log of natural wage), labour supply increases by 0.52 hours per week.[15] The same partial effect for lone parents is 0.61. Elasticities for lone parents are larger than those for partnered women and this is consistent with what is generally found in the literature.

Table 6
Labour Supply Results: Coefficient Estimates (Standard Errors)
Waves 1 Through 7 Pooled

Parameter	**Variable**	Partnered Women	Lone Parents
β_1	Constant	3.11 ** (0.021)	2.82 ** (0.044)
β_2	Age	− 1.73 ** (0.060)	−1.19** (0.11)
β_3	Poor English	− 0.23 ** (0.030)	− 0.32 ** (0.055)
β_4	University	0.22 ** (0.0081)	0.17 ** (0.016)
β_5	School incomplete	− 0.093 ** (0.0067)	−0.069** (0.012)
β_6	Experience	3.62** (0.14)	3.52** (0.27)
β_7	Experience squared	−4.14** (0.31)	−4.10** (0.52)
α_1	Constant	2.38 ** (0.023)	2.47 ** (0.039)
α_2	Hours	0.0188** (0.0006)	0.0149** (0.0010)
α_3	Preschool kids	0.36 ** (0.014)	0.24 ** (0.025)
α_4	School age kids	0.11 ** (0.0081)	0.14 ** (0.017)
α_5	Older children	− 0.053 ** (0.0085)	−0.0056 (0.014)
α_6	Non-resident kids	−0.0032 (0.011)	0.0049 (0.014)
α_7	Home owner/paying mortgage	0.058 ** (0.0085)	0.034** (0.015)
α_8	Partner's earnings	0.053 ** (0.0054)	
α_9	Male		−0.089** (0.019)
σ_u		.388 ** (0.0031)	.411 ** (0.0001)
σ_ϵ		.537 ** (0.0083)	.507 ** (0.0001)
ρ		.777 ** (0.012)	.806 ** (0.0006)
	Wave 2	−0.0051 (0.0092)	0.013 (0.018)
	Wave 3	0.010 (0.0093)	0.060** (0.019)
	Wave 4	0.039 ** (0.0095)	0.064** (0.019)
	Wave 5	0.070 ** (0.0096)	0.10 ** (0.019)
	Wave 6	0.095 ** (0.0097)	0.14 ** (0.020)
	Wave 7	0.13 ** (0.010)	0.15 ** (0.021)
Sample size		11,036	3,281
Log likelihood value		-41123.6	-11406.9

Notes: α_j and β_k refer to the coefficients from equations (1)/(3) and (2). σ_u and σ_ϵ are the estimated standard deviations of the error terms in these two equations and ρ is the estimate of the correlation between these two error terms. Standard errors are calculated taking into account clustering from inclusion of multiple observations on same individuals across waves. Also, see notes to Table 5.

V Models Augmented with Child Care Data

Difficulty finding child care, concerns about child care quality, and affordability problems all raise the cost of working. We thus expect participation to be negatively correlated with responses to the questions of Table 4 regarding quality, availability and cost.

One might consider using a woman's own response to these questions directly in her own labour supply equation. The problem with this approach is that there is likely to be correlation between the unobservables which determine the response to questions about difficulty, quality, and cost and the decision about whether or not to work. Someone for whom child care quality is never good enough for their child, for example, is also very likely to be not working outside the home.

We avoid this endogeneity problem by using average responses to the child care questions within the Statistical Division (SD) in which the person lives. To avoid the reflection problem, we create the average response variable for each individual separately, leaving out her own response, as described in Section III(iii) above. Thus, an individual's labour supply will be modeled as depending upon the average response in that individual's SD constructed without her own response. SD-level averages are therefore constructed separately for each individual. As child care supply conditions may change over the seven years covered by the data, these SD-level averages are calculated separately for each wave. For some SDs (three to six per wave), the only respondent to the child care questions is the individual whose labour supply we are modeling and in that case we drop all observations from that SD from our estimation sample.[16] For individuals who have no resident children under the age of 15, we set the child care variable equal to zero since child care problems in their geographical area should have no effect on their labour supply decisions. This is equivalent to imposing that the coefficients of the child care variables are zero for these individuals.

We re-estimate the probability of working model and the labour supply model, incorporating the child care questions. We do this in three ways: (a) we include the 'any difficulty' question which combines information from all three quality questions, all four availability questions, and the cost question; (b) we simultaneously include the 'any availability', 'any quality', and cost questions; and (c) we introduce each question one-by-one in the models. For the models where we include all three variable simultane-

ously, we will be interested in the joint significance of the three variables. The individual coefficients and their $t-$values are not very informative due to the high correlation (see discussion in Section III(iii) and Appendix Table A2) between the three variables. This high correlation does not create any model instability problems, as the Hessian matrix is full rank in both the probit models and the labour supply models. However, the problem is one of interpretation. Given that the variables are highly correlated, it is not appropriate to conduct a thought experiment in which one of the variables changes while the others stay the same.

The three panels of Table 7 present these results for the reduced form probit model of working. Table 8 presents the results for the structural labour supply model. Tables 7 and 8 only present the coefficients from the child care variables. We do not report the coefficients on the other variables in the model as they are essentially unchanged from those reported in the baseline models of Tables 5 and 6. None of the coefficients previously reported change sign or significance. In the labour supply model, for example, the hours coefficient which determines the elasticity never changes by more than .0005 in any of the models which include the child care difficulty questions.

We briefly discuss the results in the following two sub-sections and provide a more comprehensive discussion in Section VI.

(i) The Probability of Working

We find strong evidence that local difficulties with child care have a negative effect on the decision to work (Table 7) for partnered women and lone parents. All of the child care difficulty variables, when included in the model one-by-one, are statistically significant and negative. When we simultaneously include cost, quality and availability problems in the model, the three are jointly statistically significant at less than the one per cent level.

Table 7

Effect of SD Average Responses to Questions about Child Care on Decision to Work Waves 1 to 7 Pooled ; Marginal Effects (Standard Errors)

Question	Average response within SD: Partnered women	Average response within SD: Lone parents
Results with one summary measure of any difficulty		
Any difficulty question	−.031 ** (.0059)	−.043** (.012)
Results with simultaneous controls for availability, quality and cost		
Any quality question	−.010 (.011)	−.019 (.025)
Any availability question	−.0088 (.011)	−.017 (.022)
Difficulty with the costs of child care	−.012 * (.0064)	−.0069 (.012)
p-value for test of joint significance	0.000**	0.004**
Results with variables introduced one-by-one into model		
Questions relating to quality		
Difficulty in finding quality child care	−.027 ** (.0054)	−.034** (.010)
Difficulty in finding right person to care for my child	−.0027** (.0053)	−.034** (.011)
Difficulty in finding care that my children are happy with	−.0027** (.0056)	−.044** (.011)
Any quality question	−.030 ** (.0058)	−.042** (.012)
Questions relating to availability		
Difficulty in finding care for hours needed	−.026 ** (.0052)	−.038** (.010)
Difficulty juggling multiple child care arrangements	−.021 ** (.0049)	−.029 ** (.0093)
Difficulty finding a place in the child care centre of choice	−.018 ** (.0045)	−.020 ** (.0091)
Difficulty finding child care in the right location	−.023 ** (.0047)	−.026** (.010)
Any availability question	−.028 ** (.0056)	−.038** (.011)
Question relating to cost		
Difficulty with the costs of child care	−.023 ** (.0046)	−.025 ** (.0094)
Sample sizes	11,049 to 11,056	3,286 to 3,290

Notes: ** statistically significant at the 5 per cent level (or lower).
* statistically significant at the 10 per cent level (or lower).
Standard errors are calculated taking into account clustering from inclusion of multiple observations on same individuals across waves.

Table 8

Effect of SD Average Responses to Questions about Child Care on Shadow Price of Women's Time

Coefficient Estimates (Standard Errors)

Waves 1 to 7 Pooled

Question	Partnered women	Lone parents
Results with one summary measure of any difficulty		
Any difficulty question	.035 *** (.0041)	.026 ** (.0072)
Results with simultaneous controls for availability, quality and cost		
Any quality question	.015 * (.0097)	.022 (.016)
Any availability question	.0001 (.0269	.0024 (.014)
Difficulty with the costs of child care	.018 ** (.0045)	.0029 (.0069)
Likelihood ratio test of joint significance (p-value)	85.2** (.00)	11.04** (.012)
Results with variables introduced one-by-one into model		
Questions relating to quality		
Difficulty in finding quality child care	.029 *** (.0038)	.022 ** (.0063)
Difficulty in finding right person to care for my child	.029 ** (.0038)	.022 ** (.0066)
Difficulty in finding care that my children are happy with	.033 ** (.0043)	.028 ** (.0074)
Any quality question	.034 ** (.0042)	.027 ** (.0072)
Questions relating to availability		
Difficulty in finding care for hours needed	.029 ** (.0036)	.026 ** (.0062)
Difficulty juggling multiple child care arrangements	.026 ** (.0034)	.022 ** (.0059)
Difficulty finding a place in the child care centre of choice	.018 *** (.0032)	.0057 (.0052)
Difficulty finding child care in the right location	.021 ** (.0035)	.012 ** (.0057)
Any availability question	.030 ** (.0039)	.023 ** (.0067)
Question relating to cost		
Difficulty with the costs of child care	.027 ** (.0031)	.015 ** (.0053)
Sample sizes	11,036	3,281

Notes: See notes to Table 7.

To get some sense of the magnitude of these effects, consider the cost question. If the level of reported difficulty with costs decreases by one (i.e. if average responses drop from 3.93 to 2.93–a decrease of about $\frac{1}{4}$ of a standard deviation), we can expect, for partnered women, a 2.3 percentage point increase in the probability of working. The effects are quite large for both partnered women and lone parents. Many households already report zero problem with costs. What if only households who currently report at least some difficulty with costs reduce their response by one unit? In this case, we can expect a 1.6 percentage point increase in the probability of working.

(ii) Labour Supply

We augment the model of equation (1) with information about the quality/availability/cost of child care in the same way as we did for the participation models of the previous section. The model of equation (1) becomes

$$ln\,(wage_i^*) = \alpha_1 + \alpha_2 hours_i + \alpha_3 kidspreschool_i + \alpha_4 schoolkids_i + \alpha_5 olderkids_i + \alpha_6 nonreskids_i + \alpha_7 homeowner_i + \alpha_8 wage\_p_i + \alpha_{10} AVG_{SD,(-i)} + u_i \quad (5)$$

where $AVG_{SD,(-i)}$ is the average response level (leaving out the ith person's response) in the SD for those cases where there are at least two responses to the question. The wage equation (2) remains unchanged. For lone parents, the shadow wage equation, (3), is transformed in similar fashion. If child care difficulties matter for labour supply, we expect α_{10} to be positive, as difficulties with child care make going to work relatively less attractive, equivalent to raising the reservation wage.

Results for partnered women and lone parents are presented in Table 8. Again, we only present the coefficient estimates for the child care variables. The coefficient estimates for the other variables, in all cases, are very similar to those reported in Table 6. For partnered women and for lone parents, the child care variables are positive and significant in the structural labour supply model. Local difficulties with child care raise the cost of working (reservation wage). The any difficulty question is significant at the one per cent level. The three variables on availability, quality and cost, when included simultaneously, are significant at the one per cent level.

The effects are statistically significant, but they are also large. For partnered women, if average complaints about the cost of child care decrease by one, the model results imply

that the probability of working increases by 1.7 per cent (the predicted probability of working, from the model, increases from 90.1 per cent to 91.7 per cent) and that hours worked (for workers) will increase by 1.4 hours per week. Predicted hours for workers increases from 24.3 to 25.7 (per week).[17] If average complaints decrease by one only for those who previously report some difficulty, we find a 1.1 percentage point increase in the probability of working and 0.98 hours per week increase in hours of labour supplied.

The results are consistent across the two models, with the predicted change in participation being slightly smaller in the structural model than in the reduced form model.

(iii) Robustness of Results

We estimated the participation and labour supply models with a wider set of explanatory variables including a squared term in age, household wealth variables, additional educational categories, and public tenancy. These were all insignificant in the models of Section IV and V and do not affect the results of Section V. We also estimated the baseline model with dummy variables for the different states/territories and capital city. None of these were significant. We did not include them in subsequent models. This latter result does provide some assurance that results from the local averages of responses to child care questions are not being driven simply by state or capital city differences.

We re-estimated the models of Tables 7 and 8 using three alternative levels of aggregation, 9-digit Statistical Local Area (SLA), 5-digit Labour Force Region (LFR), and a combination of Major Statistical Region (MSR) and Section of State (SOS) information.[18] SLAs are quite small and for half of all SLAs we only have one response to the child care questions forcing us to use only half the sample. Nonetheless, when we pool across all seven waves, we find statistically significant effects of the child care variables on participation and labour supply similar to what is reported here. Results for LFR and MSR/SOS are very similar to what is reported here for SD. Our preferred level of aggregation from a theoretical point of view is SD. SLA is clearly too small. People seek and obtain work well outside of the SLA in which they live, but almost never outside of the SD in which they live (except for boundary cases.) There appears to be a misconception that LFR is designed to capture the geographical area in which people

look for work. However, LFRs are chosen such that they have equal sample sizes and with no reference to natural areas in which people live and work (and seek child care).[19] A quick inspection of LFRs in the major cities around Australia show that they make arbitrary divisions between neighbouring suburbs which are clearly in the same region when it comes to commuting for work or choosing a school or a child care centre. The main advantage of SDs is that they treat the main urban centres as a single unit. While the SD is fairly wide and may include areas that are far from where a person lives, they are usually within commuting distance and at least some people seek child care close to work when they work far from home. Lastly, we believe that SD is the right level of aggregation to capture local supply and demand forces which determine quality, availability, and cost of child care.

We re-estimated all of the models of Tables 7 and 8 including the SDs where we only have one response to the child care questions. In this case, we set the response equal to zero for that individual (since when we use our leave-one-out calculation there are zero observations) and we include a dummy variable equal to one if an observation is in an SD with only one response to the child care questions. The results are virtually unchanged and we can conclude that dropping these few observations does not have an important impact on the outcomes.

VI Discussion and Conclusion

In this paper we show a significant statistical relationship between reports of difficulties, aggregated at the local level, with child care–affordability, quality, and availability–and the labour supply of partnered women and lone parents. Partnered women and lone parents in areas which have higher average reports of problems with quality, availability and cost work fewer hours and are less likely to work relative to their counterparts in areas with lower average reports of child care difficulties. By using average reports on subjective measures of difficulties with obtaining child care and excluding the own individual's response, we avoid the problem of correlation between an individual's work choices and her reported problems with child care.

Interestingly, reports of problems with availability, quality and cost are highly correlated and all of the questions appear to have a very strong common element to them.

We take this as evidence that people respond to these questions on the basis of overall difficulty with obtaining child care and do not cleanly separate out quality from cost from availability. This makes sense. Imagine a case where a person must choose from a low-quality centre near home and a similarly-priced but high-quality centre far from home. The problem could be expressed as one of quality, one of availability (the unavailability of a high-quality centre near home), or one of cost (the additional expense of commuting to the high-quality centre).

This paper was motivated by two concerns. The first is scepticism about the consensus in the Australian literature that women's labour supply is not very responsive to the child care environment, particularly with respect to the price of child care. The second concern is the lack of research on non-price factors of child care such as quality and availability and the relationship of these non-price factors to labour supply decisions. Our results, while exploratory in nature, lead us to question whether the consensus is in fact correct and indicate that further research on non-price factors is likely to be rewarding.

There are several caveats to our results. The first important caveat is that, since the measures we use appear to indicate the overall difficulty in finding satisfactory child care in a convenient location with a reasonable price, the measures do not allow us to clearly separate the issues of child care availability, affordability and quality. Secondly, we are unable to interpret these results with respect to specific policy initiatives which might be considered.

However, an indirect implication can be derived using the estimates from Yamauchi (2010). These indicate that an increase in the number of child care places per 100 children aged 0-4 from zero to the range of 15-25 is associated with a decline in the measure indicating the difficulty in 'finding good quality' care by about one point, or a 0.3 standard deviation. This estimate, coupled with our results on the structural labour supply model, implies that, if some policy could induce an increase in child care availability of this magnitude, our results imply that the probability of working will increase by 1.8 percentage points and that the number of hours worked per week will increase, on average, by 1.5.

Nonetheless, our results serve two important purposes in advancing the literature

on child care in Australia. Firstly, many of the studies mentioned in Section 2 above find no significant effect on labour supply of child care price. Rammohan and Whelan (2007), for example, find no significant effect on the propensity to work part-time in response to higher child care prices. Doiron and Kalb (2005) find a very small elasticity of work hours with respect to the price of child care among married mothers. These studies have led to a consensus that labour supply is not very responsive to child care affordability in Australia. Our paper would suggest that in fact there is something going on between maternal labour supply choices and child care cost, availability and quality, contradicting that consensus.

Secondly, this study shows that subjective evaluations of quality, availability and cost are correlated with maternal labour supply. These descriptive results indicate that future research based on accurate, objective measures of quality, availability, and cost is likely to be fruitful in understanding the relationship between child care and labour supply. Such research could be done with existing administrative data if it were made available to researchers. Data about staff qualifications, length of waiting lists, physical location and number of places would all provide more objective measures of quality and availability. The child care census data, held by the Commonwealth Department of Education, Employment and Workplace Relations has exactly the information that is needed. This information, aggregated to an appropriate geographic level such as SD, and matched to survey data would provide a powerful way to address very specific questions about chid care availability, quality and cost and their relationship to people's decisions about working. Making use of the potential of this kind of detailed, administrative data is in the interest of both academics and policy-makers as it would significantly help improve our understanding of the relationship between child care and labour supply.

References

ABC (2009). Councils urge child care funding boost. Last accessed March 24, 2009. Available at http://www.abc.net.au/news/stories/2009/02/25/2500918.htm.

ABC Radio (2006). Childcare rebate to stay: Costello. Transcript available at http://www.abc.net.au/worldtoday/content/2006/s1590212.htm. Last accessed March 20, 2009.

Anderson, P. M. and Levine, P. B. (1999). Child care and mothers' employment decisions. NBER Working Paper No. W7058. Available at SSRN: http://ssrn.com/abstract=227421.

Australian Bureau of Statistics (2004). Labour force survey regions. Technical report, Australian Bureau of Statistics. Catalogue Number 6105.0 Available at http://www.abs.gov.au/AUSSTATS/abs@.nsf/94713ad445ff1425ca25682000192af2/44a9700b59346b98ca256f5600768aac!OpenDocument. Last accessed on June 10, 2009.

Australian Bureau of Statistics (2005). Australian Standard Geographical Classification (ASGC). Technical report, Australian Bureau of Statistics. Catalogue number 1216.0. Available at http://www.abs.gov.au/AUSSTATS/abs@.nsf/lookup/1216.0Contents12005. Last accessed on March 13, 2009.

Australian Human Rights Commission (2009). Get the facts–know your rights. fact sheet 9: Returning to work. Last accessed March 24, 2009. Available at http://www.hreoc.gov.au/sex_discrimination/publication/get_the_facts/fact_sheet9.html.

Baker, M., Gruber, J., and Milligan, K. (2008). Universal childcare, maternal labor supply and family well-being. *Journal of Political Economy*, 116(4):709–745.

Blau, D. M. (1991). *The economics of child care*. Russell Sage Foundation, New York, NY.

Blau, D. M. (2001). *The child care problem: an economic analysis*. Russell Sage Foundation, New York, NY.

Blau, D. M. and Currie, J. (2006). Pre-school, day care, and after-school care: Who's minding the kids? In Hanushek, E. and Welch, F., editors, *Handbook of the Economics of Education*, volume 2, chapter 20, pages 1163–1278. North-Holland.

Blau, D. M. and Hagy, A. P. (1998). The demand for quality in child care. *Journal of Political Economy*, 106(1):104–146.

Blau, D. M. and Mocan, N. (2002). The supply of quality in child care centers. *Review of Economics and Statistics*, 84(3):483–496.

Breunig, R., Cobb-Clark, D., and Gong, X. (2008). Improving the modeling of couples' labour supply. *Economic Record*, 84(267):466–485.

Breunig, R. and Mercante, J. (2010). The accuracy of predicted wages of the non-employed and implications for policy simulations from structural labour supply models. *Economic Record*, 86(272):49–70.

Cassells, R., McNamara, J., Lloyd, R., and Harding, A. (2005). Perceptions of child care affordability and availability in Australia: what the HILDA survey tells us. Unnumbered NATSEM Working Paper. Canberra, Australia: National Centre for Social and Economic Modeling.

Del Boca, D. and Vuri, D. (2007). The mismatch between employment and child care in Italy: the impact of rationing. *Journal of Population Economics*, 20(4):805–832.

Doiron, D. J. and Kalb, G. R. (2005). Demands for childcare and household labour supply in Australia. *Economic Record*, 81(254):215–236.

Gustafsson, S. and Stafford, F. (1992). Child care subsidies and labor supply in Sweden. *Journal of Human Resources*, 27(1):204–230.

Hagy, A. P. (1998). The demand for child care quality: An hedonic price theory approach. *Journal of Human Resources*, 33(3):683–710.

Heckman, J. J. (1974). Shadow prices, market wages and labor supply. *Econometrica*, 42(4):679–694.

Hofferth, S. L. and Wissoker, D. A. (1992). Price, quality, and income in child care choice. *Journal of Human Resources*, 27(1):70–111.

Kalb, G. R. (2002). Estimation of labour supply models for four separate groups in the Australian population. Melbourne Institute Working Paper No. 24/02. Available at `http://melbourneinstitute.com/wp/wp2002n24.pdf`.

Kalb, G. R. and Lee, W.-S. (2008). Childcare use and parents labour supply in Australia. *Australian Economic Papers*, 47(3):272–295.

Kornstad, T. and Thoresen, T. O. (2007). A discrete choice model for labour supply and childcare. *Journal of Population Economics*, 20:781–803.

Lehrer, E. L. (1989). Preschoolers with working mothers: an analysis of the determinants of child care arrangements. *Journal of Population Economics*, 1:251–268.

Leibowitz, A., Waite, L. J., and Witsberger, C. (1988). Child care for preschoolers: differences by child's age. *Demography*, 25:205–220.

Lokshin, M. (2004). Household childcare choices and women's work behavior in russia. *The Journal of Human Resources*, 39(4):1094–1115.

Mocan, N. (2007). Can consumers detect lemons? an empirical analysis of information asymmetry in the market for child care. *Journal of Population Economics*, 20(4):743–780.

Rammohan, A. and Whelan, S. (2005). Child care and female employment decisions. *Australian Journal of Labour Economics*, 8(2):203–225.

Rammohan, A. and Whelan, S. (2007). The impact of childcare costs on the full-time/part-time employment decisions of australian mothers. *Australian Economic Papers*, 46(2):152–169.

The Parliament of the Commonwealth of Australia (2006). Balancing work and family: Report on the inquiry into balancing work and family. Technical report, Commonwealth of Australia. Canberra, Australia.

Van Soest, A. (1995). Structural models of family labour supply–a discrete choice approach. *The Journal of Human Resources*, 30:63–88.

Watson, N. and Wooden, M. (2002). The Household, Income and Labour Dynamics in Australia (HILDA) survey: wave 1 survey methodology. Technical report. HILDA Project Technical Paper Series, No. 1/02.

Wrohlich, K. (2006). Labor supply and child care choices in a rationed child care market. IZA Discussion Paper number 2053.

Yamauchi, C. (2010). The availability of child care centers and parental perceived accessibility and life satisfaction. *Review of Economics of the Household*, 8(2):231–253.

Appendix

Table A1: Correlation between Individual-level Responses to Child Care Difficulty Questions: HILDA Respondents with Children Under age 15 who used or Considered using Child Care
Waves 1 Through 7 Pooled

	qual1	qual2	qual3	avail1	avail2	avail3	avail4	cost1	anyqual	anyavail
qual2	0.82									
qual3	0.68	0.68								
avail1	0.70	0.70	0.57							
avail2	0.49	0.50	0.51	0.55						
avail3	0.71	0.62	0.62	0.61	0.48					
avail4	0.68	0.61	0.63	0.58	0.47	0.81				
cost1	0.45	0.46	0.44	0.45	0.50	0.41	0.39			
anyqual	0.92	0.93	0.87	0.73	0.55	0.72	0.71	0.50		
anyavail	0.77	0.73	0.69	0.85	0.77	0.89	0.87	0.52	0.81	
anydiff	0.87	0.86	0.81	0.82	0.72	0.84	0.82	0.66	0.93	0.94

Table A2: Correlation between SD-level Average Responses to Child Care Difficulty Questions: HILDA Respondents with Children Under age 15 who used or Considered using Child Care
Waves 1 Through 7 Pooled

	qual1	qual2	qual3	avail1	avail2	avail3	avail4	cost1	anyqual	anyavail
qual2	0.79									
qual3	0.68	0.69								
avail1	0.76	0.70	0.63							
avail2	0.31	0.43	0.45	0.44						
avail3	0.68	0.54	0.52	0.62	0.26					
avail4	0.59	0.55	0.50	0.58	0.27	0.78				
cost1	0.46	0.49	0.49	0.43	0.39	0.37	0.29			
anyqual	0.92	0.90	0.87	0.78	0.43	0.66	0.61	0.54		
anyavail	0.78	0.70	0.67	0.87	0.54	0.84	0.81	0.47	0.81	
anydiff	0.88	0.84	0.81	0.86	0.53	0.78	0.73	0.63	0.94	0.94

Notes

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[1]The Australian Broadcasting Corporation (ABC) is unrelated to ABC learning.

[2]We estimate separate models for partnered women and lone parents. This follows most Australian studies which estimate labour supply separately for partnered women, partnered men, lone parents, and singles. We include partnered women without children in the model for comparability with other studies (e.g. Kalb, 2002; Breunig *et al.*, 2008) of partnered women's labour supply. We assume that labour supply of women without children is unaffected by local child care supply conditions.

[3]We are grateful to a referee for pointing out that part of the explanation in Australia may be related to the very low cost per hour of child care which is found in datasets such as HILDA–see Rammohan and Whelan (2007).

[4]A recent example is Baker *et al.* (2008) for Canada. Anderson and Levine (1999) and Blau and Currie (2006) review the international literature.

[5]See Watson and Wooden (2002) for more details.

[6]Wages of these individuals are well below the average wage for partnered women and are probably the result of positive measurement error in hours. This measurement error induces a negative correlation in observed hours and wages (because the measurement error affects hours positively and wages negatively) and such extreme observations can introduce large bias into our labour supply estimates.

[7]Details of wave-by-wave exclusions are available from the authors.

[8]Wave-by-wave versions of Tables 1 through 4 are available upon request from the authors.

[9]Specifically, these questions relate to 'care for a sick child', 'care during the school holidays', 'care for a difficult or special needs child', 'care at short notice'. For families for whom these concerns are not relevant, it is unclear how they would form their opinion about these types of care.

[10]We use all household responses to these questions, pooling across all household types. These responses include households which are neither in our analysis sample for partnered women nor for lone parents. For example, couple-headed households where data for the partnered female is missing would not be included in our analysis sample but could be included in our aggregate child care data if responses to these questions were provided on the household form.

[11]See Cassells *et al.* (2005) for a detailed, and very informative, descriptive study of the HILDA child care data.

[12]SD are described in Australian Bureau of Statistics (2005).

[13]The household correlations are documented in Appendix Table A1 and the correlations within SD are presented in Appendix Table A2.

[14]Partnered women who are defined as "not in the labour force" transition to employment at fairly high rates, but only about half as much as partnered women who are defined as "unemployed". They also tend to take up employment at higher wages than the unemployed, so there appears to be something fundamentally different about their

non-employed status. See Breunig and Mercante (2010) who document these facts for this data set.

[15]This represents a 1.5 to 2 per cent increase in hours, which is fairly large. The Heckman (1974) model, which assumes that hours freely adjust so that $wage = wage^*$ for workers (see equations (1) and (2), tends to produce fairly large estimates of labour supply elasticities. Models which restrict working hours to commonly observed discrete points (for Australia, see Breunig *et al.*, 2008) tend to produce smaller labour supply elasticities.

[16]We drop the individual who responded to the child care question *and also* any other observations in the SD. This latter group includes households who do not use child care and who did not respond to the child care questions. Excluding some observations from an SD on the basis of whether or not households used child care would introduce selection, so it is cleaner to simply drop all observations from these SDs. This involves dropping at most (depending upon the question) 11 out of 3,297 observations from the lone parent sample and dropping at most 54 out of 11,103 observations from the partnered women sample. We report on what happens if we include these observations in Section V(iii) below.

[17]These changes are calculated numerically from the model estimates.

[18]See Australian Bureau of Statistics (2005) for definitions of these local regions. These results are available in a detailed working paper available at `http://econrsss.anu.edu.au/Staff/breunig/workpapers_bb.htm`.

[19]Australian Bureau of Statistics (2004) documents how LFRs are chosen.