The new National Quality Framework: quantifying some of the effects on labour supply, child care demand and household finances for two-parent households

Robert V. Breunig*, Xiaodong Gong† and Declan Trott‡

26 September 2012

Abstract

New regulations to improve the quality of early childhood education and care came into force in Australia in 2012. Using a simultaneous, structural model of labour supply and child care demand we predict the effects on the labour supply of partnered women, on demand for child care and on household finances for two-parent households in Australia. Using estimated cost impacts of this new National Quality Framework from government and non-government sources, we find modest effects on household behaviour. For a mid-range cost scenario, we find that partnered women's labour force participation will decrease by just over one-half of one percentage point, a change of less than one percent. Working hours for partnered women decrease by 20 minutes or about 2 per cent. Household disposable income decreases by $12.50, a 0.6 per cent decrease. Given widespread agreement about the benefits of investing in children, these quantitatively small effects for two-parent households strengthen the case for the National Quality Framework.

JEL CODES: C15,C35,J22
KEYWORDS: Australia; National Quality Framework; child care price; women's labour supply;

1 Introduction

In December 2007, the Commonwealth Government of Australia and state and territory governments, through the Council of Australian Governments (COAG), agreed to pursue reform in early childhood education and care (ECEC), see The Commonwealth of Australia (2007). A key component of the proposed reform agenda was a commitment to develop and implement improved quality standards for early child-

*Corresponding author: Robert.Breunig@anu.edu.au, Crawford School of Public Policy, Australian National University, Canberra ACT 0200, Australia.
†The National Centre for Social and Economic Modelling, University of Canberra
‡Crawford School of Public Policy, Australian National University

hood education and care in Australia. Subsequently, at their December 2009 meeting, COAG agreed to a new National Quality Framework (NQF) for ECEC.

The aim of this paper is to evaluate the cost and labour supply impacts on two-parent households of the NQF. Specifically, we examine partnered women's labour force participation; household child care demand; household budgets; and government expenditure. Our paper is the only attempt, as far as we are aware, to provide an estimate of the expected effects of these aspects of the reform in a way that accounts for household behavioural responses. As we indicate in the title, we examine *some* effects, not the total impact of the program. We examine a price increase which is the same for all sub-groups of the population, we do not examine how demand may respond to increased quality of child care nor do we examine how supply of child care may respond to the NQF. In section 4.5 we discuss these issues and their relationship to our results. Our estimates provide richer input into a discussion of the costs and benefits of the NQF and one important piece for understanding the reform.

The communique from the 2009 COAG meeting[1] states

> Giving children the best possible start in life provides the foundation for better education in school and later in life, and delivers long-term social benefits. The National Quality Agenda for Early Childhood Education and Care will create new quality standards, including higher staff to children ratios and better trained carers and early childhood teachers with requirements phased in over the next decade. Through a new ratings system, parents will be given better information on the quality of childcare services so that they can make the best decisions for their children. Childcare providers will benefit from streamlined regulatory arrangements ....

There is widespread and growing agreement amongst both medical and social scientists about the important of early childhood development in a whole range of social, psychological, health, and economic outcomes. (For example, see McCain, Mustard and Shanker (2007), Currie (2009), Heckman and Masterov (2007) and Irwin, Siddiqi

[1] See The Commonwealth of Australia (2009a).

and Hertzman (2007).) The consensus view from this literature is that investing in young children helps a society realize its full potential and minimize inequality. Some economic policies present us with a trade-off between growth and equality; investing in children appears to be a win-win situation.[2]

Implementing the NQF will require hiring more staff per children, providing more educational training for those staff and improving physical space and safety standards. All of these imply increased costs which will flow through to some degree as higher prices for child care. Using a model of household behaviour that builds upon a standard labour economics approach (e.g., Killingsworth (1983) and Van Soest (1995)) and a detailed model of the Australian tax and transfer system, we address four questions relating to two-parent households. How will the increased costs: (i) affect women's labour force participation? (ii) affect the amount of child care demanded by households? (iii) affect household budgets? (iv) affect government expenditure? We refer to 'married' women to include both those in legal marriages and those in de facto relationships. We focus on married women, who represent the largest group with care responsibilities for young children at home.[3]

To preview the results, we find negative and statistically significant effects on women's labour supply and on household budgets across a range of cost scenarios. However, we find that these effects are relatively small. In the next section we review the details of the NQF. We then discuss our approach to estimating the effect of child care costs on married women's decisions about how much to work and whether or not to work. In the fourth section we present six different scenarios for child care fee changes and their effects on married women's labour supply. We conclude in the final section and discuss some of the caveats to our conclusions.

[2] An accessible overview of this literature is provided in Appendix 1 of The Commonwealth of Australia (2009b).

[3] It would be inappropriate to apply the model we estimate for two-parent households to lone parents. Kalb (2002), and other research, show that married women's and lone parent's labour supply are dis-similar and need to be modeled separately.

2 The National Quality Framework

The new National Quality Framework (NQF), part of the National Quality Agenda (NQA) for Early Childhood Education and Care, is an attempt by the Australian government to address problems of varying quality across early childhood education and care services, the existence of complex administrative and regulatory arrangements across different states and childcare types, excess state and Commonwealth bureaucracy, and the lack of information available to families about quality and availability of child care and education.[4] The NQA proposes to address these issues by raising standards for early childhood education and care and harmonising them across states and territories; publishing a quality rating system which families can use to assess their childhood care options; and introducing streamlined regulatory arrangements.[5]

The main factor affecting child care costs arising from the NQF is the requirement for more and higher educated staff. Specifically, the NQF proposes moving to a national standard for staff-to-child ratios in preschools and long day care centres of:

- 1:4 staff-to-child ratio for 0-24 month-olds effective from 1 January 2012
- 1:5 staff-to-child ratio for 25-35 month-olds effective from 1 January 2016
- 1:11 staff-to-child ratio for children older than 35 months from 1 January 2016

These changes do not affect all states equally. Victoria already requires a staff-to-child ratio of 1:4 for 25-35 month-olds. New South Wales, Western Australia and Tasmania require a 1:10 staff-to-child ratio for children older than 35 months. In both cases, these stricter requirements are not superseded by the new standards.

The NQF will also raise required minimum educational qualifications of staff working in the early childhood education and care sector. For family day care (FDC), long

[4]The NQF is described in The Commonwealth of Australia (2009b), The Commonwealth of Australia (2009e), and The Commonwealth of Australia (2009a) and summarized in a four-page factsheet in The Commonwealth of Australia (2009d) and in a short information sheet in The Commonwealth of Australia (2011). The National Partnership Agreement on the National Quality Agenda for Early Childhood Education and Care is available in The Commonwealth of Australia (2009c). Our discussion is drawn from these sources as well as from Access Economics (2009).

[5]Access Economics (2009) discusses in some detail the kind of benefits that one might expect from improved childhood outcomes, a streamlined regulatory system and a quality rating system. We refer the interested reader to that report and Appendix 1 of The Commonwealth of Australia (2009b).

day care (LDC) and preschools, by 1 January 2014:

- A degree qualified early childhood teacher will need to be in attendance all of the time when LDC and preschool services are being provided to 25 children or more, and some of the time when services are being provided to less than 25 children.
- Within each LDC centre or preschool, half of all staff will need to have (or be actively working towards) a diploma-level ECEC qualification or above, and the remaining staff will all be required to have (or be actively working towards) a Certificate III level qualification, or equivalent.
- All FDC coordinators will need to have a diploma-level qualification or above.
- All FDC carers will be required to have (or be actively working towards) a Certificate III level qualification, or equivalent.

Also, by 2020, the NQF requires a second early childhood teacher, or another suitably qualified leader, to be in attendance all of the time when LDC and preschool services are being provided to more than 80 children, and at least half of the time when services are being provided to between 60 and 80 children.

The main costs of the NQF will relate to hiring more and better trained staff. Access Economics (2009) states that "labour costs represent[ing] up to 70% of services' total operating costs..." (page 51). We spoke with several long day centres in Canberra including the largest one, and staffing costs make up sixty to ninety per cent of their current operating costs.

We next discuss the model we use to estimate how increased costs of child care associated with the NQF will impact on partnered women's labour supply.

3 Married women's labour supply and child care demand: modeling, estimation and data

The estimates of the effects of cost increases on married women's labour supply and demand for child care in this paper are based upon simulations from a joint, discrete structural labour supply and child care demand model which we develop and estimate in Gong and Breunig (2012). In this section, we discuss the main features of that model

and highlight the innovations which we have made relative to previous research.[6] We then briefly indicate how the model is estimated and describe the data that we use.

3.1 The economic model

We highlight seven key aspects of the economic model and approach we have developed to analyze this question. First, we simultaneously model demand for child care and married women's decisions about whether to work and how much to work. This is important because it allows child care to be used for other purposes besides freeing up time for mothers to work. Secondly, we assume that married women choose working hours and hours of child care for their children from those points which are commonly observed in the data. This makes the model more realistic. Women can not choose to work any amount of hours they want, but must choose from those offered by employers– 35 hours, 20 hours, etc.–which are commonly observed in the data. Likewise, when children are enrolled in a child care centre, hours choices are generally restricted and households must choose a full week, full days, half-days, etc. Hours can not be adjusted in arbitrarily small amounts but must respect the real-life constraints of the labour market and slots typically offered by child care providers. A third important feature of our model is that it includes constraints which require that children be cared for at all times by someone other than the mother while the mother is working. Although this may seem obvious, much of the previous empirical literature in this area does not formally integrate such constraints into model estimation. Such constraints are important to avoid bias in the estimated effects of child care prices. (See Duncan, Paul and Taylor (2001)). A fourth feature is that the model allows hours worked by the mother to exceed hours of formal child care, with the difference being made up by informal and/or paternal care. Again, this is intuitively appealing but the only

[6]The research which we summarize in this section has been the product of multiple collaborations over several years. The original work which provides the background to this section appears in working paper and journal format in Gong, Breunig and King (2010b), Gong, Breunig and King (2010a), Breunig, Gong, Mercante, Weiss and Yamauchi (2011), Gong, Breunig and King (2011) and Gong and Breunig (2011). We refer interested readers to these papers for the technical details.

previous papers that have imposed hours constraints have required that formal hours of child care are greater than or equal to hours worked by the mother. In the data, we observe that this type of restriction is violated in almost one-third of households.

A fifth important aspect of our approach is that we use data that is more detailed than that which has previously been available to construct local child care prices for each Labour Force Survey Region[7]. This is important because it allows us to identify a price of child care that represents the approximate average price that women must pay to send their children to child care in order to work. This price removes, to at least some degree, the variation in price which we observe across families that is driven by different choices of child care quality.

A sixth feature is that we model and include effects of the personal tax system and major transfer payments including Newstart Allowance, Parenting Payment Partnered, Family Tax Benefits, Child Care Rebate, Child Care Benefit and the Low Income Tax Offset. Finally, the combination of directly estimating the utility function and incorporating the non-linearity of the tax and transfer system allows us to estimate net price elasticities. Net price elasticities are essential to evaluate policy changes because they reflect families responses to changes in the actual out-of-pocket costs which they must pay for child care. Any policy which changes out-of-pocket costs can be evaluated using these net price elasticities even if that policy involves changing key programs such as Child Care Benefit or Child Care Rebate.

Early research on child care abstracted from the non-linearity of the tax and transfer system by specifying a linear labor supply model, for example Connelly (1992), or estimated a reduced form model (e.g. Ribar (1995) and Blau and Hagy (1998)). Previous research on Australia by Rammohan and Whelan (2005, 2007) follows this approach. Kalb (2009) and Breunig, Gong and King (2012) both provide lengthier

[7]Labour Force Survey (LFS) Regions are described in Australian Bureau of Statistics (2004). There are 77 LFS regions at the time of our data with size ranging from less than 100,000 to over 1,000,000 individuals in each LFS region.

reviews of the literature on labour supply and child care.

Our approach of specifying and directly estimating the utility function has also been used by Blau and Robins (1988); Ribar (1992, 1995); Blau and Hagy (1998); Duncan et al. (2001); and Kornstad and Thoresen (2006, 2007). These last three papers incorporate hours restrictions that require formal hours of child care to be greater than hours worked by the mother. As we indicate, this is violated in about one-third of the cases in our data. Our improved hours restrictions, which require that children be cared for at all times but which also allow informal or paternal care to make up for the difference between hours worked by the mother and hours of formal care is an important methodological innovation in the international literature.

Before applying the model to understand the likely effects of increased child care costs, we elaborate on several key aspects. The main difficulty which arises in modeling the effect of changing costs of child care on married women's labour supply is attempting to separate out the two reasons for which people use child care: (1) to free up time to work; and (2) as an input to child development. If child care were only a cost of working the problem would be quite simple and child care costs could simply be added to the standard labour supply model as an additional cost.

This is clearly not the case. We observe that families do not simply choose the least expensive option for child care (which they would do if they were just minimising cost with no regard for the intellectual, social and psychological development of their children) but rather they attempt to balance cost with quality, proximity and other factors. Furthermore, child care is not used exclusively for freeing up time to work. A quick look at the data reveals a rich array of patterns. Some women who do no paid work nonetheless put their children in child care. Some women who engage in paid work use no paid child care. Most use some mix and there is not necessarily a direct match between hours worked and hours in child care.

In order to estimate the effect of changing costs of child care on married women's

labour supply, we need to model both working decisions of women and family child care decisions allowing them to be related to one another but allowing child care to serve multiple purposes. Our model provides this realistic framework, as described in detail above.

Related to this difficulty of modeling the multiple reasons for which people use child care is understanding the price of child care that families face when deciding whether or not to work. The price that we observe an individual family pay for child care can be thought of as having two components–a component which represents the minimal cost of obtaining child care and a discretionary component that represents the price for additional attributes such as quality or proximity. Consider two families which live next door to each other but which pay different amounts for child care even though they have children of the same age using the same amount of child care. We can not reasonably think of them as purchasing their child care in different markets. Rather, the price difference represents a differential bundle of attributes and may reflect a differential valuation of such attributes.

Therefore, it would be incorrect to take the price that a family pays as the cost of working component of child care because we will be confounding the family's preferences about child care quality and proximity with the costs that a family must pay for child care if the mother decides to work. This is important because when we evaluate how changing costs of child care might affect married women's decisions to work, we do not want to impose the preferences of one family on another. In order to evaluate cost changes, we also need to estimate the price which families who do not use child care would pay if they decided to use child care.

To address these problems, we construct local area average prices. Technically, this is a crucial issue. Previous research in Australia using household-level price data (see Rammohan and Whelan (2005, 2007)) found no impact of child care price on married women's labour supply decisions. Similarly, in their report, Access Economics (2009)

states "The findings of research commissioned by the ECDSC (Access Economics) suggest the cost, quality and availability of child care have no statistically significant impact on parents' labour supply decisions." In Breunig et al. (2012), we show that this finding of no significant impact appears to be driven by measurement error in the child care price. When we use local area average prices, we find a statistically significant (and negative) effect of the price of child care on partnered women's labour supply using child-level data that was not available to Rammohan and Whelan.

3.2 Econometric specification

Parameter estimates and the full model specification can be found in Gong and Breunig (2012). The household is assumed to maximize utility by choosing mother's working hours h and formal child care hours c_f of her young children (the average hours if more than one child) from a set of discrete options:

$$\max_{h,c_f} U(v) = v'Av + b'v, \quad v \equiv (\log y, \log l_m, \log c_m) \tag{1}$$

$$s.t. \;\; y \leq \tau(y_0 + wh, X) - N_k\psi(p_f c_f, y_0 + wh, X) - N_s\psi(p_s c_s, y_0 + wh, X) \tag{2}$$

y is general consumption net of child care costs which is determined through the budget constraint (2) by asset income and father's income (both captured in y_0), the mother's wage (w) and working hours, and the tax/welfare system which is captured by the function τ and which depends upon household characteristics which determine tax payments and benefit receipt, X.[8] c_s is formal child care hours of her school aged children, which is assumed to be fixed. N_k and N_s are the number of pre-school and school-aged children and p_f and p_s are prices of formal child care for pre-school and school-aged children, respectively. The function ψ captures child care subsidies which depend upon child care costs (price multiplied by usage) and household characteristics.

The parameters of the utility function are summarized in A, a symmetric 3×3

[8] In τ, we include Newstart Allowance (NSA), Parenting Payment Partnered (PPP), Family Tax Benefits A and B, together with income tax, Medicare Levy, Pharmaceutical Payment and Low Income Tax Rebate (LITO).

parameter matrix with entries A_{ij} , and a vector $b = (b_1, b_2, b_3)'$. b_1 is a constant, but b_2 and b_3 are specified to allow both observed and unobserved individual and household characteristics to affect utility:

$$b_k = \sum_{t=1}^{T_k} \beta_{kt} x_t^k + \epsilon^{p_k}, \quad (k = 2, 3), \tag{3}$$

where $x^k = (x_1^k, \ldots, x_{T_k}^k)'$ are vectors of exogenous characteristics including age, immigrant status and indigenous status of the mother, a dummy if the mother is educated overseas, number of children in age groups 0-4, 5-12 and 13-15, average age of preschool children, age of youngest child, a dummy if there are older children present in the household, a dummy if there are other female adults in the household, dummy variables which capture the father's educational attainment, father's immigrant status and education background (domestic or overseas) and state-level controls for the percentage of child care staff with teaching experience and with formal child care qualifications. Immigrant status and the presence of extra female adults are used as proxies for the presence of other potential care-takers at home (or nearby) which may capture differences in costs and benefits of informal care. We control for child care quality by adding state-level variables from administrative data which capture the average number of qualified staff per child in formal day care centers. The terms ϵ^{p_k} may be interpreted as random preferences due to unobserved characteristics.

The choice set for working hours and formal child care hours can be described by:

$$h \in 0, s, 2s, \ldots, (m-1)s, \tag{4}$$

and

$$c_f \in 0, r, 2r, \ldots, (g-1)r, \tag{5}$$

We create 48 combinations of working hours/child care sessions formed by setting $s = m = 8$ and $r = 10$ to reflect the typical length of child care sessions in this age group. We set $g = 6$. These settings allow a wide range of part-time and half-day possibilities for both work and formal care.

To the utility of each alternative in the choice set, we add random disturbances μ_j which are independently and identically distributed with a type I extreme value distribution, and are independent of all X and the other unobservable terms in the model. This creates a multinomial logit type setup where the mother chooses alternative j if U_j is the largest among all the alternatives.

To predict wage rates for non-workers and workers whose wages are missing in the data and to allow for correlation between wage rates and unobserved utility preferences (ϵ^{p_k}), a standard wage equation is simultaneously estimated with (1) and specified as:

$$\log w = \pi' z + \epsilon^w \tag{6}$$

where z is a vector of the mother's characteristics including educational attainment, a dummy equal to one if the mother obtained her education overseas, potential experience, immigrant and indigenous status. We also include a variable equal to one if the mother lived with both of her parents when she was 14 and current area of residence measured by capital city and state variables which are omitted from the utility function and serve the role of exclusion restrictions. π is a vector of parameters to be estimated. ϵ^w is an unobserved term, assumed to be normally distributed with mean zero, independent of z, but is allowed to be correlated with ϵ^{p_k}.

The three error terms ϵ^w, ϵ^{p_2}, and ϵ^{p_3} are specified to follow a joint normal distribution of which the parameters are to be estimated:

$$\begin{pmatrix} \epsilon^w \\ \epsilon^{p_2} \\ \epsilon^{p_3} \end{pmatrix} \sim N(0, \Sigma), \text{ where } \Sigma = \begin{pmatrix} \sigma_w^2 & & \\ \sigma_{wp_2} & \sigma_{p_2}^2 & \\ \sigma_{wp_3} & 0 & \sigma_{p_3}^2 \end{pmatrix} \tag{7}$$

The numerical multi-dimensional integral is approximated by a simulated mean: for each individual, we take R draws from the joint distribution of ϵ^w, ϵ^{p_2}, and ϵ^{p_3} and compute the average of the R likelihood values conditional on these draws.

3.3 Data

We use Household Income and Labour Dynamics in Australia (HILDA) data, described in Wooden and Watson (2007). We take advantage of data which has only been available since wave five (2005) in which households were asked about child care expenditure for specific types of care and for specific age ranges of children. Further, we use the in-confidence version of the data which allows us to match households to the Australian Bureau of Statistics Labour Force Survey Region to construct our key variable, local area child care price. By averaging across households in each Labour Force Region, we eliminate the effect of the family's decision about how much quality to purchase. Our modeling assumption is that households react to the average (median) price level irrespective of the quality they choose. This is akin to assuming that shifts in median prices affect all quality levels. We eliminate measurement error by using actual hours spent in child care to construct prices rather than hours worked by the mother as some studies have done. Our model is estimated pooling waves five through seven of HILDA.[9]

HILDA provides a very rich set of variables that we can use to model child care demand and married women's labour supply. A final consideration which favours using post-2005 data is that the Australian Bureau of Statistics (2010) created a gross child care price index from 2005, which we use to make the price comparable across waves and to project prices for future years.

3.4 Estimates

Table 2 of Gong and Breunig (2012) provides the parameter estimates of equations (3) and (6). Table 1 presents the main elasticities of interest from the model using probability weighted sums of hours over each possible choice. Standard errors are from 100 Monte Carlo repetitions. One caveat is that we do not account for the

[9]Sample descriptive statistics can be found in Table 1 of Gong and Breunig (2012).

clustering in the data which results from pooling over three years of panel data. Some individuals appear more than once in the data and this will cause our standard errors, which treat the data as a random sample, to be understated. In order to account for clustering, we would need to draw from an array of multi-dimensional matrices like equation (7) rather than a single matrix. This additional computational complexity makes estimation infeasible. We think that the effect of this is small for two reasons: the average number of appearances in the data per individual is close to one and a half so the degree of clustering is fairly small; secondly, in previous work (see Breunig et al. (2012)), where we similarly pool across three waves of data but estimate a linear labour supply model where it is possible to correct for clustering, we find that the correction for clustering changes the standard errors by very little.

Table 1. Elasticities (average over whole sample)

	Labour supply		Child care demand	
With respect to:	Hours	employment	Hours	Use of formal care
Gross child care price	-0.135(0.04)	-0.085(0.02)	-0.287(0.05)	-0.169(0.03)
Net child care price	-0.099(0.03)	-0.063(0.01)	-0.217(0.05)	-0.129(0.02)
Wage	0.475(0.11)	0.299(0.06)	0.329(0.07)	0.213(0.04)
Income	-0.126(0.05)	-0.090(0.04)	-0.128(0.05)	-0.100(0.04)

Standard errors in parentheses
All estimates are significant at 5% level or smaller
Table taken from Gong and Breunig (2012)

Our estimates fall within the range of many recent studies. The literature over the last 15 years shows that female labor supply and child care demand respond negatively to child care prices, but the range of estimated elasticities is quite wide. Labor supply elasticities are estimated to be between 0 and -1.26 (see Blau (2003) or Breunig et al. (2012)). Estimates of own price elasticities for child care vary equally widely, ranging from -0.07 in Blau and Hagy (1998) to -1.0 or more in, for example, Connelly and Kimmel (2003), Powell (2002), and Cleveland, Gunderson and Hyatt (1996).[10] Blau (2003) notes that the variation in estimates is likely a result of differences in specification and estimation. The complexity of the underlying economic problem and

[10]See Baker, Gruber and Milligan (2008) and Kalb (2009) for additional references and discussion.

inadequate data both contribute to the specification and estimation issues. Appendix A1 in Gong et al. (2010a) provides a table summarizing the approach and results of 20 international and Australian studies on child care and labour supply.

4 Results

In this section we first present the various price change scenarios that we consider. We then look at four types of effects: the effect on married women's labour supply, the effect on child care demand and expenditure, the effect on household disposable income and the effect on government balances including child care subsidy costs and the net effect on government expenditure.

It is important to first note that the Australian government assumes, in its modeling of the NQF, that labour supply is unaffected by the child care price. The Regulation Impact Statement for Early Childhood Education and Care Quality Reforms (The Commonwealth of Australia (2009e)) notes "...there is no reliable evidence to suggest that incremental increases in the quality of ECEC results in significant behavioural responses of parents (when both quality and the countervailing impacts of price are considered), including workforce participation." They quote Access Economics (2009) who state that "...it is assumed that the NQA will have no statistically significant impact on the workforce participation of parents, and therefore no impacts have been modelled in this regard." These propositions are relying on the previous Australian literature, notably Doiron and Kalb (2005), Rammohan and Whelan (2005) and Rammohan and Whelan (2007), which find no statistically significant effect of child care price on married women's labour supply. As we discuss above, our solution to the mismeasurement of child care price using newly available data and our improved modeling and estimation strategy explain why we find significant effects.

To summarize our results before passing to the details, we find modest but statistically significant effects. If we assume an increase of $13 per child per day in the

costs and gross price of child care (a 17% increase in gross costs), we find that married women's labour force participation decreases by just over one-half of one percentage point. Without the change, married women's labour force participation is 61.1 per cent. We find that hours worked decreases by 20 minutes per week (on a base of 15.5 hours per week) on average across the population of married women. In interpreting these numbers it is important to remember that many households will not change at all while some households may have changes much larger than the average.

Demand for formal child care goes down as the price goes up. For a price increase of $13 per child per day, we find a decrease in formal child care demand of 25 minutes per week (on a base of 9.6 hours per week) and a decrease in formal child care usage of three-quarters of one percentage point. Without the change, 50.4 per cent of households use child care. Average household disposable income decreases by $12.50 per week and net government expenditure increases by $10.82 per week (this includes reduced tax revenue as well as the effect of subsidies on child care being paid out against higher gross prices.) Household disposable income without the change is $1,888.59, thus this represents a 0.6 per cent decrease in average household disposable income.

4.1 Price change scenarios

We consider three scenarios for the effect on child care prices of the NQF. For each scenario, we consider two possibilities which we refer to as *total impact* and *initial impact*. The *total impact* calculation is as an estimate of the full impact of the NQF if it were fully implemented in 2012. We also consider an *initial impact* as roll-out of some of the NQF reforms is scheduled for post-2012 and there is a possibility that even the 2012 reforms may take time to be implemented fully.[11] The *initial impact* is calculated as being just over one-half of the *total impact*. We take this from the estimates of Access Economics (2009). Together they provide six different cost scenarios.

[11] Access Economics (2009) assumes that the NQF reforms will only be gradually implemented due to lack of qualified staff.

The three 'total impact' scenarios are as follows:

1. Gross child care price increases by $4.02 per day.[12]
   This corresponds to cost scenarios two and three in Access Economics (2009) and is also quoted in The Commonwealth of Australia (2009e).

2. Gross child care price increases by $13 per day.
   Based upon 'average' expected cost increase, see Australian Childcare Alliance (2011), The Daily Telegraph (2011) and Tweed Daily News (2011).[13]

3. Gross child care price increases by $25 per day.
   An upper bound for maximum daily price increases from Australian Childcare Alliance (2011) and quoted in The Daily Telegraph (2011) and Tweed Daily News (2011).

The three 'initial impact' scenarios are scaled versions of scenarios 1 through 3 which consider gross child care price increases of $2.13 per day (this corresponds to scenario three in Access Economics (2009)), $6.89 per day and $13.25 per day.

Scenarios one and three represent lower and upper bounds that we have found in our survey of available sources. Scenario three appears to be a worst case scenario, as Australian Childcare Alliance (2011) states "25% of centre providers say their parents will be hit by cost increases of $25 per child per day." Importantly, these price changes are changes *in addition to* the normal trend of child care prices.[14]

Our model estimates are, as discussed above, net of current policy settings so they are appropriate for estimating the impact of a policy change. The assumptions we make to generate predictions are:

- As the baseline price, we use the child care price that we estimate from the HILDA data
- We inflate this child care price in our sample to 2012 using the average annual growth rate calculated with the gross child care price index.[15] For 2011 and 2012, we use the average inflation rate over the past five years.

[12]Costs from Access Economics (2009) are in 2009 dollars–we translate these to 2012 dollars as described below.

[13]Tweed Daily News (2011) names the Productivity Commission, but this appears to be a miscitation. The Daily Telegraph (2011) reports similar information but only quotes 'an industry report.' The industry report would appear to be from Australian Childcare Alliance (2011) who also quote Productivity Commission (2011). The Productivity Commission report mentions the possibility of increased costs from the NQF, but from our reading appears to contain no quantitative estimates.

[14]In our modeling, the average price per hour paid in the sample from HILDA is inflated using the child care price index as described below to give an average projected child care price in 2012 of $7.59 per hour or $75.90 for a full day. Our sample average price corresponds roughly with prices from the child care census if we compare years where both are available. The results in this section are insensitive to a reasonable range of base prices.

[15]See Australian Bureau of Statistics (2010).

- We assume that real wage and non-labour income grow at an annual rate of 2 per cent and then inflate to 2012 dollars.
- We assume that the per-day cost is applied to a base of 10 hours per day. The full-day rate at many child care centres covers a 10-hour slot.

In 4.5 we discuss how altering these assumptions may affect our results.

4.2 Labour supply effects

Table 2: 'Total impact'[(a)] of National Quality Framework (NQF)
Table reports average weekly changes per household

Price increase per child per day	**Baseline**	**Scenario 1** $4.02	**Scenario 2** $13.00	**Scenario 3** $25.00
Married women's labour supply effects				
Change in hours worked	15.534	−0.087 (0.022)	−0.294 (0.074)	−0.584 (0.145)
Change (%) in participation	61.1%	−0.162% (0.038)	−0.573% (0.132)	−1.192% (0.265)
Child care demand effects				
Change in hours of formal care	9.552	−0.121 (0.035)	−0.410 (0.111)	−0.816 (0.206)
Change (%) in participation in formal care	50.4%	−0.214% (0.041)	−0.760% (0.139)	−1.600% (0.275)
Change in gross costs ($) of formal child care	95.384	4.658 (0.811)	14.212 (2.624)	25.322 (5.013)
Change in net costs ($) of formal child care	12.784	2.169 (0.807)	7.252 (2.588)	14.142 (4.854)
Change in hours of informal care	6.032	*0.034* (0.041)	*0.113* (0.132)	*0.224* (0.252)
Income and program effects				
Change in disposable income ($) (less child care costs)	$1,888.594	−1.576 (0.403)	−5.290 (1.329)	−10.422 (2.566)
Change in disposable income ($) (including child care costs)	$1,901.378	−3.745 (0.509)	−12.542 (1.614)	−24.564 (3.029)
Change in child care subsidy ($) received	82.601	2.489 (0.297)	6.960 (0.920)	11.180 (1.620)
Change in government expenditure ($) (net of child care subsidies)	408.337	3.632 (0.460)	10.821 (1.494)	18.801 (2.797)

Numbers in parentheses are standard errors
All estimated effects are statistically significant at 5 per cent level except for informal care hours
Net government expenditure is income support, family tax benefit and child care subsidies (Child Care Benefit and Child Care Rebate) less tax revenue
[(a)] The effect in 2012 of 'total impact' costs of the NQF (see Section 4.1)

Labour supply effects are modest, but statistically significant at the five per cent level or smaller. If the NQF were completely adopted in 2012, we find that married women's labour force participation would decrease somewhere between 0.16 and 1.2 percentage points depending upon the size of the price increase. Average hours worked

would decrease by between five and thirty-five minutes per week. If we consider the scenario of only partial compliance with the NQF in 2012, we find effects about half that size. Tables 2 and 3 present the *total* and *initial* impacts, respectively. The second column of Table 2 provides the baseline levels of variables in the data from which the changes are calculated.

Table 3: 'Initial impact'$^{(b)}$ of National Quality Framework (NQF)
Table reports average weekly changes per household

	Scenario 4	**Scenario 5**	**Scenario 6**
Price increase per child per day	\$2.13	\$6.89	\$13.25
Married women's labour supply effects			
Change in hours worked	−0.045 (0.012)	−0.151 (0.039)	−0.300 (0.076)
Change (%) in participation	−0.084% (0.020)	−0.287% (0.067)	−0.585% (0.134)
Child care demand effects			
Change in hours of formal care	−0.063 (0.019)	−0.211 (0.060)	−0.419 (0.113)
Change (%) in participation in formal care	−0.111% (0.022)	−0.380% (0.072)	−0.776% (0.141)
Change in gross costs (\$) of formal child care	2.499 (0.429)	7.837 (1.391)	14.462 (2.675)
Change in net costs (\$) of formal child care	1.135 (0.427)	3.772 (1.382)	7.397 (2.636)
Change in hours of informal care	*0.018* (0.022)	*0.058* (0.070)	*0.115* (0.135)
Income and program effects			
Change in disposable income (\$) (less child care costs)	−0.825 (0.212)	−2.741 (0.697)	−5.396 (1.355)
Change in disposable income (\$) (including child care costs)	−1.960 (0.271)	−6.513 (0.868)	−12.792 (1.644)
Change in child care subsidy (\$) received	1.364 (0.158)	4.065 (0.505)	7.066 (0.936)
Change in government expenditure (\$) (net of child care subsidies)	1.962 (0.243)	6.060 (0.794)	11.004 (1.522)

See footnotes to Table 2

In Table 4 we consider the effects for the *initial* impact of the intermediate price scenario (an increase of \$6.89 per day per child) by population sub-group. Columns 2 and 3 of Table 4 compare the effects for households with multiple children to those with only one child. Unsurprisingly, the effects are nearly double for those households with multiple children compared to those with only one child. Participation of married women decreases 0.4 percentage points in response to the price increase in multiple child households whereas in those households with only one child, participation de-

creases by 0.23 percentage points.

Table 4: 'Initial impact'$^{(c)}$ of National Quality Framework (NQF)
Response to price increase of $6.89 per day by population sub-group
Table reports average weekly changes per household

Population sub-group	**Households with multiple children**	**Households with one child**	**Women with above median wages**	**Women with below median wages**
Married women's labour supply effects				
Change in hours worked	−0.182 (0.049)	−0.135 (0.035)	−0.166 (0.043)	−0.137 (0.035)
Change (%) in participation	−0.402% (0.097)	−0.226% (0.053)	−0.309% (0.071)	−0.265% (0.064)
Child care demand effects				
Change in hours of formal care	−0.240 (0.091)	−0.196 (0.047)	−0.241 (0.059)	−0.181 (0.064)
Change (%) in participation in formal care	−0.440% (0.102)	−0.348% (0.060)	−0.441% (0.081)	−0.319% (0.066)
Change in gross costs ($) of formal child care	10.226 (2.177)	6.563 (1.050)	8.879 (1.447)	6.797 (1.375)
Change in net costs ($) of formal child care	4.095 (2.112)	3.599 (1.045)	4.907 (1.407)	2.638 (1.397)
Change in hours of informal care	*0.055* (0.103)	*0.054* (0.060)	*0.074* (0.067)	*0.042* (0.074)
Income and program effects				
Change in disposable income ($) (less child care costs)	−3.462 (0.910)	−2.357 (0.597)	−3.617 (0.934)	−1.867 (0.466)
Change in disposable income ($) (including child care costs)	−7.558 (1.464)	−5.956 (0.659)	−8.524 (0.782)	−4.506 (1.059)
Change in child care subsidy ($) received	6.130 (0.968)	2.964 (0.284)	3.971 (0.455)	4.159 (0.564)
Change in government expenditure ($) (net of child care subsidies)	8.864 (1.313)	4.565 (0.544)	6.574 (0.874)	5.546 (0.736)

See footnotes to Table 2

Columns 4 and 5 of Table 4 compare the effects for high and low wage women (defined relative to median wages). Interestingly, we find slightly larger effects on households with high-wage women compared to low-wage women. This could be because higher wage women work more to begin with and are using more child care so the impact on them is greater. Because of means-testing of child care benefit, the net price impact on higher wage women (who live in wealthier households) is also larger. We also split the sample by education levels of women, education levels of men, and level

of unearned income in the household. The relative impacts across these sub-groups is very similar to columns 4 and 5 of Table 4.[16] Households with higher educated husbands, higher educated wives, and which are wealthier are all affected more than their counterparts. In this respect, the increases in costs which we model appear to be slightly more favorable to the less well-off.[17] This relies upon a homogeneous price increase. If prices increase more for those who are less well-off, this conclusion would change as we discuss in section 4.5 below.

4.3 Effects on child care demand

The second panel of Tables 2 through 4 presents the effect on demand and expenditure for child care. We find that formal care decreases between seven and forty-nine minutes per week on average across the scenarios with the 'initial 2012 impact' half of these amounts. Again, we find a larger effect in wealthier and better-educated households.

Net, out-of-pocket costs on child care can be expected to increase between $2.17 and $14.14 per week per household. Again the 'initial 2012 impact' is approximately half of these amounts. Informal care increases, as expected. As formal child care becomes more expensive, informal care becomes a more attractive alternative. However our estimates for the change in informal care are not statistically different from zero. In our estimates, these are the only quantities that are not statistically different from zero at the five per cent level.

4.4 Effects on income and expenditure of households and government

We find that household disposable income decreases between $3.75 and $25.56 per week under the total cost change scenarios. These results are in the third panel of Tables 2 and 3. The effect is larger in wealthier and better-educated households (Table 4). In the Tables, we provide these figures including and excluding child care costs to show

[16] A table of these results is available upon request from the authors.

[17] This is true in both absolute and percentage terms–households with women below median wages have -$4.51 change in disposable income whereas those above median wage are -$8.52. These correspond to decreases of .28% and .39%, respectively.

which part of this decrease in disposable income is generated by labour force behaviour and which part is generated by higher child care prices.

If the government were to compensate households for this lost income, one possibility would be to increase Child Care Benefit (CCB) and Child Care Rebate (CCR). Gong and Breunig (2012) show that increasing CCB is more beneficial for low-income households while increasing CCR is more beneficial to higher-income households.

The NQF will affect both the revenue and expenditure sides of the government balance sheet. As married women work less, tax revenue will decrease. As gross child care price increases, CCB and CCR payments will increase. We find that the overall effect is an increase in net government expenditure (benefits less tax) of between $3.63 and $18.80 per household per week.

4.5 Caveats

There are several important caveats to our results. Perhaps the biggest caveat is that our analysis is partial equilibrium; we assume the macro-economic environment remains the same. The effects of the NQF are small relative to, for example, the resources boom or the effect of global financial shocks. We take the cost estimates as given as we have no way of generating our own estimates. As most labour supply literature does, we ignore the demand side of the labour market. Just because the discrete hours points are the most common in the data, does not mean that they are necessarily available at a micro level for each individual.

We are unable to quantify the effects of improved child care quality on child care demand. There is evidence in Australia that families care about quality and that local self-reported levels of satisfaction with child care quality are related to women's labour supply and participation. However, it's impossible to separate these out from concerns about cost and availability (see Breunig et al. (2011)). One could estimate, using existing (but not publicly available) administrative data, the response of women's

labour supply to changes in measurable quality indices such as staff-to-child ratios or staff qualification levels. This would then provide a 'quality elasticity' that could be used to evaluate the NQF changes. We do not know of any such quantitative estimates.

We believe the child care demand response to quality improvements is likely to be small based upon the international literature. Blau and Mocan (2002) and Blau (2001, Chapter 4) find small income and price elasticities of quality and this is confirmed in Mocan (2007) who finds that while parents claim they care about quality they have difficulty in distinguishing between the quality levels of alternative child care providers. If child care demand increases in response to the quality improvements of the NQF, then our estimates above will over-estimate the negative impact on child care demand. Our estimates of the change in the government budget will be an underestimate. The effect on labour supply is ambiguous. Our model would allow inclusion of a quality elasticity if one were available.

Our price change assumptions are based upon a common price increase across all types of child care. One might argue that the reforms are likely to have a larger impact on the price of lower quality child-care centres than on higher-quality ones. Our approach would allow for modeling the effects of a heterogenous price increase, but we have chosen not to do this as we do not have any good estimates of how price increases might differ across different child care centres. We think the homogeneous price increase that we have modeled is easier to interpret and understand. How might this assumption affect our results? If price increases are larger for those paying less for child care, then our estimates of the effect for low wage women might be underestimated. Their labour supply and child care demand might fall more than we have indicated. Government expenditure would increase by more than we have estimated. It is important to note that price increases are mitigated for those at the bottom of the income distribution as the government subsidies are most generous at this income level. So the effect on government expenditure would certainly be larger, but the

changes for labour supply and child care demand might be fairly small.

We ignore further repercussions from the supply side of the child care market which may also determine price changes. For example, child care centres altering the number of places in response to changed demand by parents. Access Economics (2009), in generating their cost scenarios, assumes no further supply side effects. In section 5.3.3, they write "the NQA reforms are assumed to not deviate growth in ECEC places from its projected path". They further justify the assumption of no supply side reaction by quoting a survey that finds "95.3% of services ... would increase staff costs rather than decrease places." The assumption of no additional supply side response relies on a low price elasticity of demand. We find a net price elasticity of demand of -0.25, which is slightly higher (in absolute value) than previous research. Thus, the ability of child care centres to fully pass increased costs to parents may not be as great as is assumed by Access Economics (2009). We do not know what the other studies have assumed.

In general in the literature, our understanding of the supply side is not as developed as that of the demand side. What determines the opening of a new child care centre, the closing of one, the number of places offered? What is the nature of competition in the child care industry? Quantitative work on the supply side of the child care industry should be an important priority for future research.

Lastly, we have focused on partnered women and provided estimates for that sub-population. Lone parents and their response are important aspects to consider in understanding the full effects of the NQF but is beyond the scope of the current paper. This is a priority for future research.

5 Conclusion

We find that the increase in child care costs associated with the implementation of the National Quality Framework (NQF) is likely to have modest negative effects on

the labour supply of married women. Assuming that the NQF causes an increase in the gross price of $13.00 per child per day (a mid-range price scenario out of the range considered in the paper), we find that average hours worked will decrease by about 20 minutes per week while participation in work will decrease by a little over one-half of one percentage point. Child care demand will decrease by slightly larger amounts while out-of-pocket child care costs for families will increase by $7.25 per week after accounting for off-setting government subsidies to child care. Overall, household disposable income will decrease by $12.54 per week which comprises both increased child care costs and reduced income from working less. Net government expenditure, taking into account decreased tax revenues, increased child care subsidies and changes to income support and family tax benefit payments caused by changing working hour patterns will increase by $10.82 per household per week. The effects are statistically significant.

In the introduction we highlighted the widespread agreement amongst educators, psychologists, economists and health professionals about the importance of and potential gains from investment in children. The NQF represents an investment in children which is hoped to bring long-term benefits. We have tried to quantify the costs which relate to two-parent households in four dimensions–labour supply, child care demand, household income and government balance sheet; these do not represent all the costs.

Our analysis excludes lone parents. We might expect a slightly larger labour supply response for lone parents relative to two-parent households (see Kalb (2010)), although cost increases group will be mitigated by higher benefit levels. Government costs will thus likely be larger for this group, on average, than for two-parent households.

Given expected future benefits for Australia's children, the costs outlined here seem relatively small, at least for two-parent households. Our intuition tells us that the investment is worth it. This of course is a matter of judgement. The main contribution here is to provide estimates of behavioural responses to better inform the debate.

Acknowledgements

In the course of our research on child care in Australia, the list of people to whom we are indebted has grown quite large. At the risk of omitting key people, we would like to thank Patricia Apps, Richard Blundell, Mark Bott, Rebecca Cassels, Véronique Danjou, Mary Welsh, Guyonne Kalb, Anthony King, Gordon Leslie, Laura Llewellyn, Joseph Mercante, Maryanne Mrakovcic, Mike Power, Leo Vance, Christopher Vas, Andrew Weiss, Stephen Whelan and Chikako Yamauchi. Comments of the editor and two anonymous referees have helped us to improve the paper.

This paper has been made possible by the support of Mark Matthews and the H.C. Coombs Policy Forum. Their generous support is gratefully acknowledged.

Part of this research was undertaken when Xiaodong Gong was an employee of the Australian Treasury. Robert Breunig has also received support from the Australian Treasury. Both of us are grateful to the Australian Treasury and the research environment they provide and in particular to the support of Anthony King.

The views in the paper are those of the authors and do not represent the views of the H.C. Coombs Policy Forum nor the Australian Treasury nor any one else mentioned in these acknowledgements.

This paper makes reference to research which uses unit record data from the Household, Income and Labour Dynamics in Australia (HILDA) Survey. The HILDA Project was initiated and is funded by the Australian Government Department of Families, Housing, Community Services and Indigenous Affairs (FaHCSIA) and is managed by the Melbourne Institute of Applied Economic and Social Research (Melbourne Institute). The findings and views reported in this paper, however, are those of the authors and should not be attributed to either FaHCSIA or the Melbourne Institute.

References

Access Economics (2009). An economic analysis of the proposed ECEC National Quality Agenda. Canberra, Australia. Report by Access Economics Pty Limited for The Department of Education, Employment and Workplace Relations. July 2009. Available at `http://www.coag.gov.au/coag_meeting_outcomes/2009-07-02/docs/National_Quality_Agenda.pdf`. Last accessed 27 October 2011.

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 (2010). Consumer Price Index, Australia, Sep 2010, *Technical report*, Australian Bureau of Statistics. Catalogue Number 6401.0. Available at `http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6401.0Sep%202010?OpenDocument`. Last viewed 21 July 2011.

Australian Childcare Alliance (2011). Productivity Commission says families right to be worried about cost of Child Care Reforms. Media release. July 21, 2011. Available at `http://www.acwa.asn.au/email/downloads170/18201021.pdf`. Last accessed 7 November 2011.

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

Blau, D. M. (2003). Child care subsidy programs, *Means Tested Transfer Programs in the United States*, University of Chicago Press for the National Bureau of Economic Research, chapter 7.

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.

Blau, D. M. and Robins, P. K. (1988). Child-care costs and family labour supply, *The Review of Economics and Statistics* **70**(3).

Breunig, R., Gong, X. and King, A. (2012). Partnered women's labour supply and child care costs in Australia: measurement error and the child care price, *Economic Record* **88**(Issue Supplement s1): 51–69. June.

Breunig, R., Gong, X., Mercante, J., Weiss, A. and Yamauchi, C. (2011). Child care availability, quality and affordability: Are local problems related to labour supply, *Economic Record* **87**(276): 109–124.

Cleveland, G., Gunderson, M. and Hyatt, D. (1996). Childcare costs and the employment decision of women: Canadian evidence, *Canadian Journal of Economics* **29**(1): 132–148.

Connelly, R. (1992). The effect of child care costs on married women's labor force participation, *The Review of Economics and Statistics* **74**(1): 83–90.

Connelly, R. and Kimmel, J. (2003). Marital status and full/prat-time work status in childcare choices, *Applied Economics* **35**(7): 761–77.

Currie, J. (2009). Healthy, wealthy, and wise: Socioeconomic status, poor health in childhood, and human capital development, *Journal of Economic Literature* **47**(1): 87–122.

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

Duncan, A., Paul, G. and Taylor, J. (2001). Mothers employment and the use of childcare in the United Kingdom. Institute for Fiscal Studies (IFS) Working Paper 01/23.

Gong, X. and Breunig, R. (2011). Estimating net child care price elasticities of partnered women with pre-school children using a discrete structural labour supply child care model. Centre for Economics Policy Research (CEPR) Discussion Paper Series. Australian National University. Available from `http://cbe.anu.edu.au/research/papers/ceprdp.asp`.

Gong, X. and Breunig, R. (2012). Child Care Assistance: Are Subsidies or Tax Credits Better? IZA discussion paper number 6606. Available from `http://ftp.iza.org/dp6606.pdf`.

Gong, X., Breunig, R. and King, A. (2010a). How responsive is female labour supply to child care costs?–New Australian estimates. Treasury Working Papers, 2010–03, Australian Treasury, Canberra.

Gong, X., Breunig, R. and King, A. (2010b). New estimates of the relationship between female labour supply and the cost, availability, and quality of child care. *Economic Roundup* Issue 1, 2010. Canberra, Australia: Australian Government Printing Service (AGPS). Available at `http://www.treasury.gov.au/documents/1783/PDF/04_New_Estimates_of_Child_Care.pdf`.

Gong, X., Breunig, R. and King, A. (2011). Partnered womens labour supply and child care costs in Australia: measurement error and the child care price. University of Canberra NATSEM Online Working Paper - WP13. Available at `http://www.canberra.edu.au/centres/natsem`.

Heckman, J. J. and Masterov, D. V. (2007). The productivity argument for investing in young children, *Review of Agricultural Economics* **29**(3): 446–493.

Irwin, L. G., Siddiqi, A. and Hertzman, C. (2007). Early childhood development: A powerful equalizer. Final report. World Health Organization. Final Report for the World Health Organization's Commission on the Social Determinants of Health. Available at `http://www.who.int/social_determinants/resources/ecd_kn_report_07_2007.pdf`.

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. (2009). Children, labour supply, and childcare: challenges for empirical analysis, *Australian Economic Review* **42**(3): 276–299.

Kalb, G. R. (2010). Modelling labour supply responses in australia and new zealand, *in* I. Claus, N. Gemmell, M. Harding and D. White (eds), *Tax Reform in Open Economies: International and Country Perspectives*, Cheltenham, UK: Edward Elgar, chapter 8, pp. 166–193.

Killingsworth, M. R. (1983). *Labor Supply*, Cambridge University Press, New York, NY.

Kornstad, T. and Thoresen, T. O. (2006). Effects of family policy reforms in norway: Results from a joint labour supply and childcare choice microsimulation analysis, *Fiscal Studies* **27**(3): 339–371.

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

McCain, M. N., Mustard, J. F. and Shanker, S. (2007). *EARLY YEARS STUDY 2: Putting Science into Action*, Toronto, Ontario: Council for Early Child Development.

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.

Powell, L. M. (2002). Joint labor supply and childcare choice decisions of married mothers, *Journal of Human Resources* **37**(1): 106–128.

Productivity Commission (2011). Productivity Commission draft research report. early childhood development workforce. june 2011. Available at http://www.pc.gov.au/__data/assets/pdf_file/0008/110501/early-childhood-draft-report.pdf.

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.

Ribar, D. (1992). Child care and labor supply of married women: Reduced form evidence, *Journal of Human Resources* **13**(3).

Ribar, D. (1995). A structural model of child care and labor supply of married women, *Journal of Labor Economics* **13**(3).

The Commonwealth of Australia (2007). Council of Australian Governments' Meeting. Melbourne. December 2007. Communique. Canberra, Australia. Available at http://www.coag.gov.au/coag_meeting_outcomes/2007-12-20/index.cfm. Last accessed 27 October 2011.

The Commonwealth of Australia (2009a). Council of Australian Governments' Meeting. Brisbane. December 2009. Communique. Canberra, Australia. Available at http://www.coag.gov.au/coag_meeting_outcomes/2009-12-07/index.cfm. Last accessed 27 October 2011.

The Commonwealth of Australia (2009b). Investing in the early years–a national early childhood development strategy. Canberra, Australia. Available at http://www.coag.gov.au/coag_meeting_outcomes/2009-07-02/docs/national_ECD_strategy.pdf. Last accessed 27 October 2011.

The Commonwealth of Australia (2009c). National partnership agreement on the national quality agenda for early childhood education and care. Council of Australian Governments COAG. Canberra, Australia. Available at http://www.coag.gov.au/coag_meeting_outcomes/2009-12-07/docs/nap_national_quality_agenda_early_childhood_education_care_signature.pdf. Last accessed 27 October 2011.

The Commonwealth of Australia (2009d). National quality agenda for early childhood education and care. factshhet. Canberra, Australia. Available at http://www.deewr.gov.au/EarlyChildhood/Policy_Agenda/Documents/Factsheets/A09-007%20National%20Quality%20Agenda%20Factsheet_proof02.pdf. Last accessed 27 October 2011.

The Commonwealth of Australia (2009e). Regulation impact statement for early childhood education and care quality reforms. COAG Consulation RIS., *Technical report*. Canberra, Australia. Available at http://www.coag.gov.au/coag_meeting_outcomes/2009-07-02/docs/RIS_for_early_childhood_development.pdf. Last accessed 1 December 2010.

The Commonwealth of Australia (2011). Australian Children's Education & Care Quality Authority ACECQA. national quality framework information sheet. frequently asked questions. Canberra, Australia. Available at http://www.acecqa.gov.au/storage/ACECQA%20FAQs.pdf. Last accessed 27 October 2011.

The Daily Telegraph (2011). Chilcare Costs Soar: $110 rise to meet new rules. October 10, 2011.

Tweed Daily News (2011). Chilcare Fees to Rise. October 12, 2011.

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

Wooden, M. and Watson, N. (2007). The HILDA survey and its contribution to economic and social research (so far), *The Economic Record* **83**(261): 208–231.