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Modelling the Effects of Childcare Policy Changes

Childcare and Early Childhood Learning

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The Productivity Commission

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Modelling the effects of childcare policy changes

The Childcare and Early Childhood Learning inquiry terms of reference require the Commission to assess the contribution that access to affordable, quality childcare can make to child development and increased participation in the workforce. The Commission has been requested to consider new policy options within the current government funding parameters.

In addressing its task, the Commission has developed a model to gauge the potential impacts of policy scenarios proposed in the draft report (referred to as the Productivity Commission Microsimulation Childcare (PCMC) model). This technical supplement presents the interim version of this model and preliminary results used for the draft inquiry report. It also outlines some caveats and limitations to bear in mind when interpreting the results.

The main results show that the proposed simplification of the existing childcare arrangements could increase demand for childcare and labour supply from parents. Further, the changes are likely to benefit low- and middle-income households and increase workforce participation in these groups.

This paper is divided into 5 sections:

1. The first provides a broad overview of the Commission's approach to the modelling task and the framework adopted.
2. The second highlights the assumptions, caveats and limitations that are important when considering the results and implications of the Commission's preliminary modelling.
3. The third details the policy changes being examined.
4. The fourth explains the illustrative, initial results, as well as the intuition behind them.
5. The fifth section concludes by identifying areas of planned further development.

The paper also includes appendixes — on model data sources and preparation; a detailed model specification; detailing listing of the parameters used in the modelling; and results for all four policy options described in the draft inquiry report.

1 Commission's approach

The Commission has developed an initial, behavioural microsimulation model to estimate the effects of several policy scenarios.

Behavioural microsimulation models — models that simulate individual-level decisions and sometimes the interaction of individual decision makers — are commonly used within an economic framework to assess the impact of government policy changes, such as changes in tax and benefits, on governments' fiscal position and on labour supply.[1] They are particularly useful where there is a wide variety in decision makers and complex policy changes are likely to impact these different decision makers in different ways. Microsimulation models can incorporate information from large data sets that reflect the heterogeneity found in the population and generate disaggregated results to facilitate a detailed analysis of how a policy might affect particular groups (Creedy, Duncan, Kalb and Scutella 2004).

The simplest microsimulation models are used to calculate, for example, changes in tax bills and net incomes that arise from changing eligibility for a benefit, assuming no behavioural responses of those affected by the policy. These types of models, so-called static microsimulation models, are designed to capture 'morning after' effects. More sophisticated models contain an additional behavioural component, designed to model the effects of policy changes on the decisions of households.

Several researchers have used behavioural microsimulation models to estimate the effects on labour markets from changes in Australian childcare policy. The Commission's model draws on features of models developed by Doiron and Kalb (2005) and Gong and Breunig (2012).

[1] Note that this labour supply change is referring to the change in labour supply from households, not the induced change in the ECEC workforce that could be brought about due to changes in the childcare market.

Box 1 **The childcare policy microsimulation models used**

In developing its model, the Commission has drawn on two existing microsimulation models that have been used previously to estimate the effects of childcare policy on household behaviour in Australia.

Doiron and Kalb (2005)

The model developed by Doiron and Kalb builds on the Melbourne Institute Tax and Transfer Simulator (MITTS) model. The latter was designed to model household behavioural responses and to estimate the effects of a policy change on labour supply. To adapt that model to a childcare policy context, Doiron and Kalb added a childcare module. The childcare module consists of equations that determine demands for childcare by sole parent and coupled households for each work choice, based on household characteristics.

The Doiron and Kalb model estimates a household's labour supply on the basis of the household's income net of childcare costs. The demand for formal childcare is derived from the household's labour supply. Expenditure on formal childcare is used as an input into the household's budget constraint, which itself is an input into the decision to supply labour.

Gong and Breunig (2012)

In the Gong and Breunig model, a household's demand for formal childcare is modelled explicitly, jointly with the primary carer's decision to supply labour. A household is assumed to make the decisions simultaneously to maximise utility. The demand for childcare enters directly into the household's utility function and the model allows formal childcare to be valued for reasons other than freeing up time for mothers to work, such as child development.

The Commission's framework is largely based on the Gong and Breunig model.

Model specification

The model is comprised of three modules:

- the tax and transfer module, which calculates disposable income based on market income, tax and benefits; the module reproduces the main features of the income tax schedule as well as the benefit system
- the childcare module, which calculates income net of out-of-pocket fees; reproduces the features of the childcare rebate (CCR) and childcare benefit (CCB)[2]; this module is adapted when modelling alternative childcare policies
- the decision module, which models households' reactions to changes in the incentives before them.

The first two modules constitute the 'morning after' component of the model and account for policies as at July 2014, while the third functions as its behavioural element.

2 In the draft report version of the model, the childcare module only includes CCR and CCB, and does not include other payments (such as JETCCFA). These will be included for the final report.

Tax and transfer module

The basic tax and transfer module calculates net income given the rules of the Australian tax and transfer system, based on gross income and household characteristics. The income tax schedule, all aspects of income support for working age families (including, for example, Newstart allowance, the Parenting Payment and the Disability Support Pension) and Family Tax Benefit A and B[3] are accounted for in this module. This module serves as an input into the household decision module.

Childcare module

The module includes the rules that govern the existing CCB and the CCR, including the current income and activity tests for CCB and the annual per child cap on CCR. It also enables alternative income and activity tests for the proposed new single child-based payment, the Early Care and Learning Subsidy (ECLS). Income net of out-of-pocket costs to families is calculated based on family labour income and transfers, net of income taxes, for given household characteristics.[4] This module also serves as an input into the household decision module.

Decision module

The model represents household decisions about work and childcare in response to a change in out-of-pocket fees for sole parent and coupled households where the youngest child is aged between 0 and 12 years. The main results consist of a projected choice, for each household of:

- the number of hours of work supplied by the primary care giver (including whether to enter or leave the workforce)
- the number of hours of formal childcare demanded.

The decisions are modelled simultaneously, consistent with the methodology developed in Gong and Breunig (2012). The manner in which these decisions are made, and the constraints facing households, are described in appendix B.

The results at the household level are aggregated to obtain estimates of shifts in labour supply and demand for formal childcare at an aggregate level, or for particular demographic groups. Combined with a demand for labour and a supply for childcare services, the results can be used to estimate fiscal costs.

The decision module is specified to generate a decision that maximises each household's utility. A household's utility is assumed to be quadratic and driven by the following

3 Using pre-2014 Budget parameter values.

4 The model abstracts from changes in income from sources other than hours worked (e.g. capital income is assumed not to change as a result of childcare policies).

variables, which are explicitly included in the utility function. The exact terms in the household utility functions are detailed in appendix B.

Income net of taxes, transfers and out-of-pocket childcare fees

Households derive utility from income, as it can be spent on goods and services. The model uses the labour income of the *household* net of taxes and transfers and out-of-pocket childcare fees as the input into the utility function. For tractability, the model only estimates the impact of a change in the net income of the *primary carer*; the hours worked and wage rate of the *primary earner* are assumed to be exogenous. (Although the primary earner could reduce their hours worked as their partner increases them, preliminary simulations not detailed in this document (where the hours of the primary earner were allowed to vary) indicated that this effect is small.)

Hours of labour supplied

Households derive utility from reducing the hours worked by the primary carer, because that time can be used in other ways, including for leisure, caring for children, or other home production. Households are assumed to derive utility from working zero hours. The model includes a fixed cost associated with work[5], such as travel and other costs (aside from childcare costs) associated with working.

Leisure and home production are not explicitly represented in the household utility function. However, households derive utility from income but disutility from hours spent at work, and utility from time spent caring for children directly. Given that each member of the household is subject to a 24 hours a day time constraint, leisure and home production are valued implicitly.

Childcare from the primary care giver

Households derive utility from caring for children at home. The amount of childcare provided by the primary carer appears directly in the household's utility function.

Formal childcare

The amount of formal childcare demanded by a household appears directly in the utility function (representing, for example, the household's valuation of educational or social development of childcare). This means that use of formal childcare can provide households with benefits beyond those from enabling the primary carer to work. For this reason, formal childcare and the income that it enables households to earn appear separately in the utility function.

5 This is represented by the intercept utility parameter associated with zero work.

Behaviour of households with multiple children

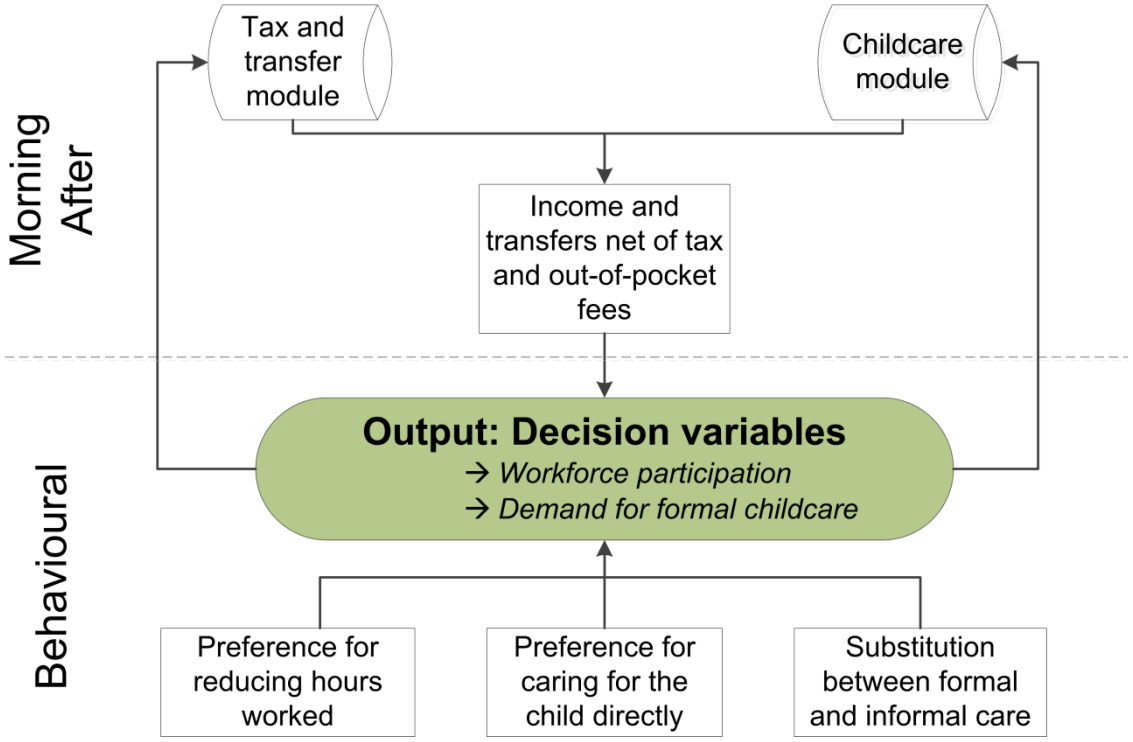
Households with multiple children are assumed to base labour supply and childcare hours demand decisions on the caring needs of the youngest child. That is, childcare for school age children mirrors the decision for the youngest child. For example, for a family with one pre-school and one school-age child, if the younger child requires 40 hours per week of non-parental childcare, the older child would also require 40 hours of non-parental supervision/care (consisting of a combination of school and outside of school hours care).

Substitution between formal and informal childcare

Informal childcare is specified as the residual care required, net of the household's demand for formal childcare and of the time spent with the primary carer. Informal care can come from a range of sources not explicitly represented in the model, including the primary earner, other family members, neighbours and friends. The costs associated with informal care are not observed, but must be accounted for. If no utility parameters governed the relative value placed on the different forms of care, households would source all non-maternal care from informal care (since it is assumed to be free). Constraints on maternal time and required total childcare, combined with utility parameters for maternal and formal childcare, ensure the model reproduces the observed data. Observed data show that as people work more, their demand for formal care increases.

Figure 1 provides a stylised representation of the model at the household level. It breaks down the model into the 'morning after' components (the impacts on household budgets from changes in taxes, transfers and childcare payments if the household did not change its behaviour) and the 'behavioural' components (the impacts on the household decisions resulting from the changes in policy).

Figure 1 **Stylised Productivity Commission Microsimulation Childcare Model**



The framework adopted by the Commission

Rather than specify labour supply and childcare demand as a continuous range, where primary carers could adjust those decisions in infinitely small increments, care and work choices in the Commission's model are divided into blocks reflecting observed values (for example, an individual is assumed to choose to work 8 or 16 hours, not 10.71 hours). Under this approach, primary carers can make a choice from a limited set of combinations of labour and childcare hours.

This approach has practical, computational advantages, does not compromise materially the accuracy of results, and offers a tractable way to model policies and outcomes that involve 'discontinuities' or non-linear relationships that would be challenging to specify and estimate in a model with continuous variables (Creedy and Kalb 2006). In the case of childcare policy and workforce participation, the tax and transfer system (as well as the CCB and CCR rules), are characterised by complex sliding scales and eligibility thresholds (see appendixes C and G in the inquiry draft report).

Furthermore, the characteristics of the labour and childcare markets mean that there is typically a limited number of part-time work and formal childcare combinations that the primary carer would be able to secure.

Labour supply and childcare demand options available to primary carers

Households are assumed to choose a level of primary carers' weekly supply of labour within the range of 0–56 hours, in 8-hour increments. That is, they can choose from eight options, including 0 hours. They can also choose one of six 10-hour increment options of formal childcare demanded in the range of 0–50 hours, including 0 hours.[6] Thus, households can elect from 48 combinations of hours of labour supplied and formal childcare demanded. Variations on the increments of formal childcare demanded will also be considered in order to better reflect common use patterns for more flexible home based care options.

Households can choose between long day care, family day care, out of school hours care, nannies and pre-school (where they do not already use pre-school for a 4 year old child). Under the base case of current childcare assistance arrangements, the choice of childcare type is determined by a household's initial choice as described in the database; for new users, 98 per cent of households are randomly assigned to a care type based on observed shares of the data (by income group), and 2 per cent are assumed to use nannies (nanny use would increase with the new arrangements in the model, since subsidies are introduced for nannies where previously they did not exist; however, the extent to which households entering the childcare market would start choosing to use nannies is unclear. The 2 per cent figure was chosen in the absence of any information about household response; it is larger than the proportion of nanny use observed in the Survey of Income and Housing).

The full technical specification of the model is detailed in appendix B.

Data set and estimation

In addition to the administrative rules governing the CCB, CCR and the broader tax and transfer system, the model integrates two data sets to establish the baseline, and obtain weights for subsequent aggregation of results:

- data from the ABS Survey of Income and Housing 2011-12 (SIH)
- administrative data about childcare fees by type of care used and location for 2011-12 which has been supplied by the Department of Education.

The SIH includes data for around 3500 households representative of sole and couple parent households in Australia. The data for each observation were combined with administrative childcare fee data for 1.29 million children, based on location. The procedures used to produce the model database are summarised in appendix A.

6 Outside of school hours care is divided into 4-hour increments (up to a total of 20 hours per week), which is used in conjunction with 6 hours of school per day.

Box 2 **Data sources**

The microsimulation model uses two data sources:

- The 2011 12 Survey of Income and Housing (ABS 2013) contains key demographic and economic characteristics of residents in private dwellings across Australia. The model database focuses on a subsample of the survey describing lone and coupled parents. All variables except childcare price are derived from this subsample.
- An administrative childcare database (Department of Education 2013, unpublished), which provides a comprehensive description of childcare use, price, location of service and subsidies (CCR and CCB). The administrative database was used to provide the mean and standard deviation of childcare prices by geographic location and type of care.

Several observations were excluded from the model database. Specifically, observations that reported zero employee income and positive labour supply, or positive employee income and zero labour supply, were removed. Similarly, observations that reported parents with no children were also removed.

The final model database contains 2955 households (comprising 684 lone parent and 2271 coupled parent families). The database contains variables describing income, labour supply, number of children, age of parents, occupation, industry of employment, location, educational attainment, transfer payments received, hours of childcare used and childcare prices faced for each household.

There is a plan to further develop the model database by obtaining a better concordance between the individuals in the survey data and the observed hours of childcare use, the distribution of subsidies and of childcare prices in the administrative data.

In the draft report version of the model, the utility and wage parameters have not been estimated using the above data sets. Instead, the parameters used in the model are based on those from the Doiron and Kalb (2005) model, adjusted to reflect differences in the utility function for the current model and calibrates the specification of the utility function with the data using 'unobserved utility parameters', consistent with the approach documented in Creedy and Kalb (2005). Reflecting uncertainty in model parameters, the Commission has undertaken sensitivity analysis to put ranges around model results.

2 Assumptions, caveats and limitations

There are important caveats that need to be remembered when evaluating the results from the model. The first two make the results particularly preliminary and exploratory:

1. Parameters: for the draft report version of the model, utility parameters are sourced from past studies, mainly Doiron and Kalb (2005), which estimate parameters from 1996-97 data. The 2011-12 data may reveal different preferences than those reflected in the parameters derived from earlier data.[7]

[7] This will be addressed in a future version of the model by estimating the utility function based on the more recent data.

2. Data: responses in the SIH might not be internally consistent, or questions could be misunderstood or answered incorrectly by participants. The SIH is yet to be systematically reconciled with other sources. For example, some households have inconsistent responses in the survey, such as zero hours worked with non-zero labour income (see appendix A). Further data work is required to ensure the survey is representative of the population.
3. Unemployment benefits: The model as currently implemented assumes that people who do not work and meet the eligibility requirements claim NewStart benefits. In the data, there are a number of seemingly eligible people who do not claim unemployment benefits.
4. Childcare demand: the childcare hour result is best interpreted as a *shift in the demand* for childcare. The model assumes that each individual can obtain as many hours of childcare as they want at the price they currently pay. There is no representation of childcare supply: there is no increasing cost of childcare, nor any capacity constraints and quality is assumed fixed. To the extent that childcare availability is constrained at current prices, the labour supply response could be smaller than projected. If childcare prices were to increase, the returns to labour net of taxes and out of pocket costs would decrease and the labour supply response and childcare demand response would reduce accordingly.
5. Labour supply: the labour hour results represent a *shift in the supply* of labour. The model assumes each individual can work as many hours as they want at the current wage. There is no representation of the demand for labour. Any employment result will be smaller than or equal to the projected labour supply shifts. To the extent that labour supply increases, the real wage might fall, which could cause a reduction in the quantity of labour supplied by other individuals in the economy.
6. Tax impacts: There is no representation of the potential reductions in labour supply if taxes have to be increased to fund any increases in fiscal cost. To the extent that additional funding is required through additional taxes, labour supply responses among those modelled could be lower than in the model results, and could be negative from individuals not included in the model (those without children).
7. Broader economic impacts: the projected shifts in labour supply and childcare demand can be interpreted as upper bounds on the estimated effects on employment and childcare use. Any GDP extrapolation based on these shifts is therefore best interpreted as an upper bound on the possible effects on GDP.[8]

[8] Further, GDP is not a measure of social welfare. Important components of social welfare that are relevant to this policy are excluded from GDP. In particular, while formal childcare contributes to GDP as part of economic activity, informal and parental care (valued by households) are not accounted for, and nor is the value of home production or that of leisure, or the possible longer term benefits of improved child development associated with participation in some types of formal childcare. Some of the longer term benefits might appear as positive GDP effects in the long run, which is not reflected in the microsimulation model.

The Commission will try to improve the model for the final report by:

- improving the model database to include a better mapping of households to the actual childcare prices they are likely to face
- including a more detailed uprating procedure to improve the quality of the database and fiscal estimates
- re-estimating the equation used to impute a wage for those not currently working
- re-estimating the parameters of the utility function based on the SIH data
- improving the model calibration process, consistent with the approach detailed in Bourguignon, Fournier and Gurgand (1998)

3 Policy simulations

For each policy scenario, the model produces results that include:

- net change in the supply of labour
- net change in demand for formal childcare
- fiscal costs making simplifying assumptions about labour demand and childcare supply.
- a range of aggregations for the impacts on various cohorts for labour supply, childcare demand, out-of-pocket expenses, effective subsidy rates.[9]

Given the uncertainty surrounding the data and parameter values, results are presented in terms of ranges. The sensitivity tests varied the utility parameters on income, formal childcare and labour supply by up to 50 per cent.

The Commission has used the microsimulation model to examine four variants of early childhood subsidies (outlined in appendix D). These policies relate to the Early Childhood and Learning Subsidy (ECLS) proposed in the draft report. Other proposals have not been explicitly modelled. Each of these ECLS variants include:

1. A tightening of the activity test for childcare assistance eligibility. At present, there is no activity test for households claiming 24 hours or less of childcare a week, and the CCR simply requires that each parent be working/training/studying/seeking work/volunteering to be eligible. There is an activity test (15 hours a week) that households must meet to receive a subsidy for childcare hours in excess of 24 hours per week. The scenarios institute a 24-hour fortnightly activity test on each parent in the household to be eligible for formal childcare assistance (not including pre-school).[10]

[9] Conditional on assuming no changes in wages and no changes in childcare fees, and that childcare services and employment are available at any quantity at current prices.

[10] In the draft report, the activity test is applied for all families other than when grandparents are the primary carers of children, when parents receive a Disability Support Pension, Carer Payment, or when children

2. A simplified assistance scheme replacing CCB and CCR with a single payment (means tested against household income), calculated as a percentage of a deemed cost of childcare.

The deemed costs are set per hour of childcare and are less than the actual childcare fees paid by approximately 50 per cent of the households in the population. Deemed costs vary by type of care (long day care, family day care including nannies and outside of school hours care). A household cannot receive a subsidy in excess of childcare fees.

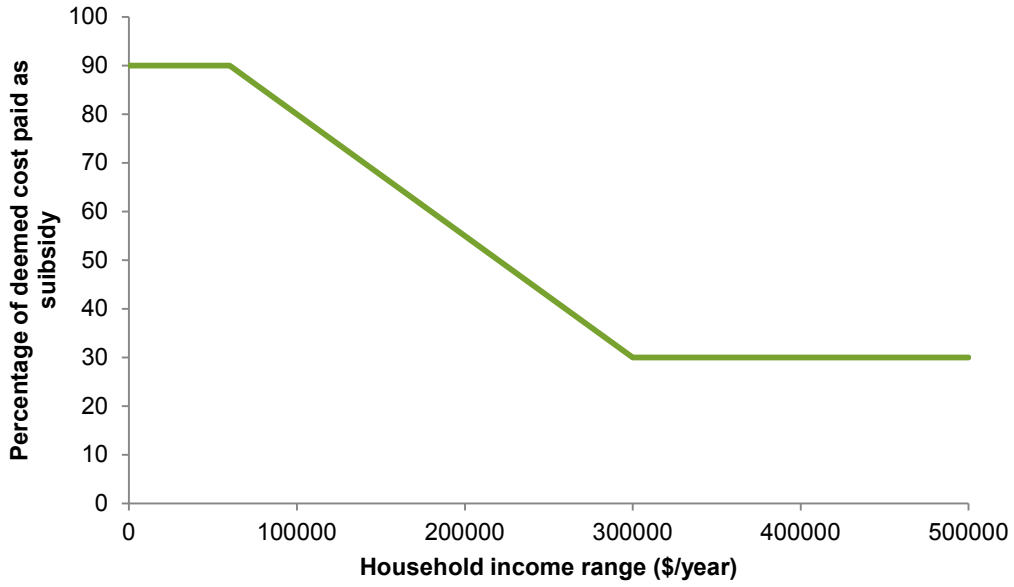
The policy scenarios proposed in the draft inquiry report vary the parameter values associated with the policy change (for example, the income thresholds at which the assistance rate begins to decline, and the rates at various income thresholds). The following will focus on the preferred scenario for expository purposes.[11] In addition to the activity test mentioned above, this scenario (figure 2) includes:

3. assistance at 90 per cent of deemed costs for households with income less than $60 000
4. assistance at 30 per cent of deemed costs for households with income at or above $300 000
5. Subsidy rates for households with an income between $60 000 and $300 000, are calculated using a linear taper rate. For example, a household with an income of $100 000 would receive 80 per cent of their deemed costs.

are assessed to be at risk. These exemptions to the activity test have not been included in the draft report modelling.

[11] The other scenarios examined by the Commission are discussed in chapter 13 of the inquiry report and in appendix D of the supplement. This paper focusses on the preferred scenario to highlight the drivers and mechanisms underpinning the results from the draft report version of the microsimulation model. The drivers and mechanisms are largely the same across policies (although the relative magnitudes differ). Results are presented for all scenarios in appendix D of the supplement.

Figure 2 **Schedule of subsidy rates under ECLS[a]**



[a] ECLS replaces existing CCB and CCR arrangements with a single means tested subsidy rate applied to a deemed cost base.

4 Model results, mechanisms and drivers

Table 1 presents results ranges for the first scenario, as well as an example result within the range. The results are exploratory at the draft report stage of the model development because of the uncertainty about the values of the parameters used in the utility function (which determine individual responsiveness within the model) (see appendix B). The 'example' results are based on a mid-range set of utility parameters taken from past studies (in particular Doiron and Kalb (2005) and Gong and Breunig (2012)). As mentioned above, the ranges were constructed by varying these parameters by up to 50 per cent. For the final report, sensitivity ranges and distributions for parameters will be constructed using information derived from the joint estimation of all utility function parameters.

Unless stated otherwise, model results for labour supply are couched in terms of shifts in *aggregate* national labour supply.

Table 1 **Illustrative labour supply, childcare demand and fiscal results**

	Lower bound results from all sensitivity simulations[a]	*Results for central parameter values*[d]	*Upper bound results from all sensitivity simulations*
Millions of hours per week			
Demand and supply shifts			
Labour supply base	53.1	53.1	53.1
Labour supply policy	54.0	55.0	56.8
Labour supply change	0.9	1.9	3.8
	18.7	18.7	18.7
Childcare demand base			
Childcare demand policy	20.3	22.4	27.3
Childcare demand change	1.7	3.8	8.6
Billions of dollars per year (2013-14)			
Net change in government fiscal position[b]	-2.7	-0.8	0.8
Change in childcare subsidy expense	0.2	1.3	3.3
Change in transfer expense	-0.7	-0.3	-0.1
Change in income tax receipts	0.0	0.2	0.6
Change in full-time equivalent labour supply (persons '000s)[c]	22	48	95

a A range of simulations were completed with different parameter values, and the 'lower bounds' can be thought of as 'lowest responses' and the high as 'highest responses'. **b** Since the lowest (highest) result for one variable was not necessarily taken from the same simulation as the lowest (highest) value for another variable, the elements within the lower/upper bound columns will not sum to the 'Net change in government fiscal position'. **c** Results are produced in terms of the change in the number of hours of work; these are converted to FTEs for ease of interpretation. **d** Parameter values used for this model run are detailed in appendix C.

Source: PCMC model estimates.

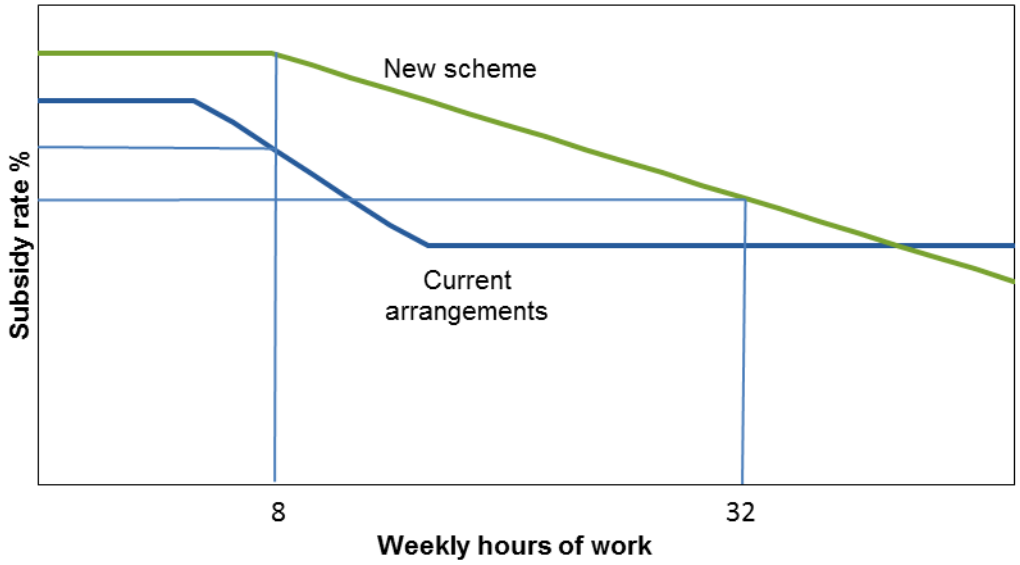
Table 1 shows that the results are sensitive to parameter values. The sensitivity analysis involved conducting a set of runs with a range of utility parameter combinations. The high (low) values represent the maximum (minimum) values obtained from this set of runs; high (low) values reported for different variable are not necessarily from the same simulation. Results from the 'central parameter' simulation pertain to a single simulation.

In general, increasing subsidy payments increases demand for childcare, and the supply of labour hours. Relatively wealthy households (higher income) who receive reduced subsidies tend not to change their behaviour much. Low- and middle- income households who receive higher subsidy rates respond by increasing their demand for childcare and their supply of labour. There is a net fiscal cost associated with the policy, as income tax and transfer payment changes from increased labour supply do not offset the additional childcare subsidy expense.

It is also worth noting that for some individuals, it can appear that despite an apparent reduction in their rate of childcare subsidy their childcare demand and labour supply can increase. This is because people shift between income groups, as illustrated using an example family (figure 3). A person may initially choose to work 8 hours and be eligible for a subsidy rate of 70 per cent (when CCB and CCR entitlements are combined). Alternatively, they could work for 32 hours a week. Under the current CCB and CCR arrangements, due to the means testing of the CCB subsidy rate, they would only receive the 50 per cent CCR subsidy if they worked 32 hours a week (assuming they have not reached the CCR cap). When the new scheme is introduced, the ECLS subsidy rate at 32 hours could be 60 per cent for this person.

As the proposed arrangements offer many families higher subsidies than are currently available, they may be encouraged to work more, despite an apparent reduction in their subsidy rate (from 70 to 60 per cent). This highlights that it is not only the point value of the subsidy at a particular income that matters to a household, it is also the range of possible subsidies available to the household for all the income ranges that they could achieve.

Figure 3 **Example family: work choices effect subsidies**



Drivers and mechanisms

The following mechanisms are at work, conditioning the results.

1. The ECLS policies are likely to increase the overall supply of labour by primary carers. People can — in some instances — increase their labour supply despite a decrease in their subsidy rate. This is primarily because:
   (a) Some people increase their hours of work to meet the new, more stringent activity test requirements.
   (b) If a subsidy rate increases in a higher income bracket, a person might be induced to work more. This can occur when the subsidy under ECLS is larger in the higher income bracket than it is under the current CCB/CCR arrangements. This might still be a lower rate of subsidy than is received at the lower, initial income level (with the original, lower labour supply).
2. The magnitude of the result for formal childcare demand — in aggregate across all individuals in the model — is less clear: it could be larger or smaller than the change in labour supply. The change in childcare demand can be larger than the labour supply change for three reasons:
   (a) Compositional change in labour supply: some of the policy changes induce a decline in labour supply from people who use a small amount of childcare relative to the hours of labour that they supply, and an increase in labour supply from people who use a large amount of childcare relative to their labour supply. Put differently, there is a larger increase in childcare demand from people who value childcare relatively highly. This can result in a net increase in childcare demand that is proportionately larger than the labour supply change. This is illustrated in box 3.
   (b) Substitution away from informal and maternal care: a decrease in the relative cost of formal childcare causes a substitution away from informal and maternal care.
   (c) SIH data highlights that some households have levels of childcare demand that exceed what would be required to facilitate work. The model does not specify which attributes of formal childcare such households find desirable (for example, educational or social experience for children), but the functional form allows some households to derive different levels of utility from formal care. The calibration process, which ensures that the families modelled work and care choices are consistent with the behaviour identified in the SIH, ensures families with high care use relative to work requirements obtain higher utility from using formal care.
3. Results for transfer expenses, childcare subsidy expenses, and income tax receipts are conditional on assuming no changes in wages and no changes in childcare fees. The net change in government fiscal position is highly uncertain. Several factors pull net revenue in different directions:

(a) More direct factors: The change in the level and rates of childcare assistance has a direct impact on fiscal cost through the cost of childcare subsidies to government. Some people receive more assistance and some receive less (relative to the base). The net impact depends on the compositional change in the labour supply relative to the changes in assistance payment. To the extent that demand for childcare increases in more heavily assisted (lower income groups) or high childcare demand cohorts (higher income groups with high labour participation), the fiscal cost directly attributable to the childcare subsidy expense will increase.

(b) More indirect factors: As stated above, the policy is likely to increase labour supply. As labour supply increases, the total cost of transfer payments will be reduced (for example means-tested family tax benefits are reduced as earnings increase). Further, as people work more, income tax collections increase.

Box 3 Illustrations of compositional change and aggregate results

The microsimulation model aggregates heterogeneous household level responses to produce aggregate results. In a number of cases, this aggregation can produce results that appear counter intuitive. In particular, this occurs where there are either (a) changes in the patterns of childcare use among workers; or (b) differential responses within a group.

(a) Changes in patterns of childcare use among workers

Assume person A is initially supplying 8 labour hours and demanding 4 childcare hours, while person B is initially out of the labour force. Further assume that a policy change causes person A to drop out of the labour force (and cease demanding childcare), while person B starts working. Person B starts supplying 24 labour hours and demanding 24 childcare hours.

The aggregate change (across person A and B) is an additional 16 hours (24 – 8) of labour supply with an additional 20 hours (24 – 4) of childcare demand. In this instance, it appears that a large amount of additional childcare is required to induce a relatively small amount of additional labour supply.

(b) Differential responses within a group

If individuals within a group experience different changes, the aggregate results can exhibit counter intuitive combinations of signs. Person C might get a large reduction in their childcare subsidy ($1000), but might only reduce their labour supply by a small amount (8 hours). Person D might get only a small increase in their subsidy ($200), but might increase their labour supply by a larger amount (16 hours).

The aggregate change (across person C and D) is an aggregate $800 subsidy cut ($1000 – $200) and an aggregate 8 hour labour supply increase. While this aggregate result may appear counter intuitive, it is based on each family in a group responding in a manner that would be expected.

Understanding the following interactions in the model can help explain the results:

1. **The activity test has a positive impact on labour supply**. The database contains a number of people (about 2.5 per cent of households) who initially work fewer hours than required under the proposed activity test, use some childcare, and are not exempted from the work test for reasons such as pursuing education. These households face an incentive to increase their work hours to meet the activity test (or lose their childcare subsidy). This incentive exists even for scenarios where the subsidy rate (once the activity test is met) is reduced. The labour supply response to increased out-of-pocket fees is positive for these households — this effect is driven by the activity test, not price responsiveness. The work test causes an increased concentration of subsidies accruing to those using childcare for work purposes, and encourages those working a few hours to increase their work hours.
2. **Relatively high income groups receive less assistance and their disposable income net of out-of-pocket fees is reduced**. This is because the CCR subsidy (50 per cent of childcare costs, up to $7500) is replaced by the lower subsidy of 30 per cent of deemed cost. Many work less as a result, although some substitute towards/using more informal care or increasing out of pocket expenditure on formal childcare and maintaining hours worked. The utility of this group is reduced. High income households are relatively unresponsive to reduced assistance (compared to other income groups), opting to fund their relatively fixed use of childcare through increased out-of-pocket spending.
3. **Half of families have childcare fees that exceed the deemed cost**. For these families, the effective subsidy rate is lower than it appears from the rate schedule (because the deemed cost is below the childcare fee they face). Relative to the base, this increases the possibility that the effective subsidy rate is lower than in the base. Such households typically reduce their childcare demand and labour supply. Note that the microsimulation framework in no way represents any supply-side changes that could be induced by reduced subsidies (for example, reductions in service quality), so any changes in out-of-pocket childcare fees brought about by switching to a deemed cost approach are assumed to be borne entirely by households.
4. **The primary beneficiaries of the policy change are low- and middle-income households.** While the simplified system tends to cut benefits to the upper-income groups (and some people affected by the new activity test), payments to the low- and middle-income groups tend to increase relative to current arrangements. While these households experience a decrease in other transfers as they increase their labour supply, the new childcare subsidies more than compensate for this loss for approximately 12 per cent of households, resulting in a net increase in government payments to that group. Some middle- and high- income households who would hit the $7500 CCR cap if they worked beyond 2-3 days per week could also be beneficiaries of the policy change as the net return from working beyond 2-3 days may be higher under the new subsidy arrangements. The new arrangements do not have a $7500 cap.

5. **For most scenarios, there is a substitution away from non-market childcare (parental and informal) in favour of formal childcare.** Not all increases in childcare demand are driven by increased labour supply. This means that there is not a one-to-one correspondence between increases in childcare hours and increases in labour supply hours.

Decomposition of model results

This section illustrates the intuition behind the micro-level responses seen in the model. This is followed by a decomposition of model results from the preferred scenario. The section concludes with the utility payoff matrices for an example individual in the base and in the preferred scenario 1 to illustrate the mechanisms at work.

Intuition underlying the micro-level behaviour

The drivers of results can be explained by grouping households based on their behaviour in the current base case (table 2).

Table 2 **Share of household groups in the database**
Based on pre policy change behaviour

	Zero childcare demand	*Positive childcare demand*
Initial labour supply below new work test	Group A (40%)	Group B (5%)
Initial labour supply above new work test	Group C (35%)	Group D (20%)

Group A

For many in this category, the incentive to work is weaker under the policy change than it is under the current arrangements, due to the activity test. The main reason is that group A is comprised mainly of low income parents, many of whom are eligible for large subsidies (in excess of the 80 per cent under the current arrangements) and do not work or demand formal childcare. The more stringent activity test increases the hurdle to receive childcare assistance and decreases the likelihood of deciding to work. Considering that increases in the rate of assistance are relatively small for this group (having initial subsidies in excess of 80 per cent of full childcare fees), the additional incentive is unlikely to be sufficient to overcome the activity test. To some extent, revisions of the modelling to include the draft report proposed exemptions to the activity test (such as for parents receiving Disability Support Pension or Carer Payment) may lessen the apparent hurdle imposed by the new activity test.

When others in this group do increase their labour supply, it is typically by relatively large amounts (to reach the new activity test), and tends to be accompanied by a proportionately large increase in demand for formal childcare (larger than the average childcare demand per hour of labour supply across all individuals in the initial database).

Group B

Individuals in group B tend to respond in one of two ways: they either increase their labour supply hours to the new activity test level; or remain at low/zero labour supply and cut their childcare demand. Those in the first category are significant contributors to the total increase in labour supply.

Since nearly everyone in group B has access to childcare subsidies in the initial data, the activity test makes those who do not change their behaviour unambiguously worse off (because they will be working and using the same amount of childcare, but will be paying more for that care if they are not eligible for ECLS).

However, those who receive a higher rate of assistance than before and change their behaviour (i.e. allowing other factors besides the activity test to vary) can increase their utility. In particular, if subsidy rates have become more favourable for someone who previously did not work enough hours to satisfy the new activity test, the improved subsidy rates might have induced them to their higher level of activity (i.e. the new activity test is not what is changing their behaviour). Individual characteristics (such as education, age and current wage) are most important for this group, and this influences the nature of the tradeoff between childcare and work for the household. The tradeoff between maintaining the pre-policy level of childcare and working (governed by utility parameters) plays a key role in determining their decision.

This is the group most likely to improve the net fiscal position. Either:

- they increase labour supply while maintaining a relatively stable level of childcare demand. In this case transfers decrease, income tax receipts increase and subsidy costs remain relatively stable, or
- they maintain a low level of labour supply and reduce their demand for childcare services (since they are no longer eligible for the subsidy). In this case, transfers and income tax collections remain relatively unchanged and the subsidy cost is reduced.

The activity test is a significant contributor to the improvement in the fiscal balance (this is illustrated quantitatively below). In scenarios where the fiscal position improves, it is because the fiscal savings from the activity test combined with savings from reduced payments to high income earners more than offset any increases in childcare subsidies to other groups.

Groups C and D

Groups C and D are the most responsive to changes in the rate of assistance and are largely unaffected by the activity test. For those households who experience cuts in their rate of assistance, they typically:

1. do not change their choices but experience lower utility (due to lower income net of taxes and out-of-pocket fees), or
2. substitute towards (and use more) informal care, or
3. reduce their hours of labour supply to be at or slightly above the activity test.

Households that experience an increase in the rate of assistance tend to be highly responsive in terms of increasing their labour supply. In general, these households already supply labour under the current arrangements. Decreasing out-of-pocket fees increases net returns to labour, which (other things equal) will increase the supply of labour.

Many in group D are already at the CCR cap under the current arrangements. For some of these people, the new arrangements increase the rate of assistance they receive, which increases childcare subsidy expenses.

Illustrative decomposition of model results

This section uses the groups and intuition in the previous section to explain the illustrative example for the preferred scenario described in the childcare inquiry draft report and detailed in section 3 above. Given the parameter and data limitations discussed above and the stage of the model development, these results should be considered preliminary.

In order to illustrate the impact of the activity test separately from the changes in the subsidy rates (as discussed above), it is useful to first decompose the aggregate model results. This is illustrated in table 3, where results are disaggregated based on the four groups of households discussed above.

Table 3 **Contribution to illustrative results by each group**

	Group A	*Group B*	*Group C*	*Group D*	*Total*
Initial childcare demand	Zero	Non-zero	Zero	Non-zero	
Initial labour supply relative to new activity test	Below	Below	Above	Above	
Mean annual income net of taxes and out of pocket fees ($)	61 366	59 468	99 083	104 833	
Mean weekly hours worked (hours)	0.5	0.9	30.9	33.2	
Labour supply (millions of hours/week)	0.6	0.1	31.9	20.5	
Childcare demand (millions of hours/week)	0.0	2.6	0.0	16.0	
Millions of hours per week					
Demand and supply shifts (hours)					
Labour supply	1.3	0.3	0.3	0.1	1.9
Childcare demand	2.0	-0.0	1.5	0.3	3.8
Billions of dollars per year (2013-14)					
Contributions to fiscal position[a]					
Childcare subsidy expense	0.5	-0.1	0.4	0.6	1.3
Transfer expenses	-0.2	-0.1	0.0	0.0	-0.3
Income tax receipts	0.1	0.0	0.1	0.1	0.2
Change in fiscal position[b]	-0.3	0.2	-0.3	-0.5	-0.8
Change in full-time equivalent labour supply (persons '000s)	32	8	6	2	48

a Conditional on assumption of no change in wages or in childcare fees. **b** May not add up due to rounding.

Source: PCMC model estimates.

Table 3 shows that the majority of the labour supply increase comes from people who initially supply low levels of work and do not demand childcare (group A), and that the majority of the fiscal savings comes from people who are affected by the new activity test (group B, with a net fiscal position improvement of $0.2 billion per year).

People with no initial demand for childcare are the major beneficiaries of the subsidy rate increases and changes to the activity test (groups A and C). This is reflected in their large increase in childcare demand (2.0 and 1.5 million hours per week respectively). While there are reductions in other transfer payments ($0.2 billion per year for group A) and increased income taxes collected ($0.1 billion per year each), transfers to both groups increase (by $0.2 billion per year each).

Group B is also a non-trivial source of childcare demand under current arrangements. As discussed above, the new activity test makes people in this group either (i) start working/work more to exceed the activity test or (ii) reduce their childcare demand. Both

choices improve the government's fiscal position, by respectively (i) reducing transfer payments ($0.1 billion per year) and increasing income tax revenue slightly or (ii) decreasing childcare subsidy payments ($0.1 billion per year).

Group D contribute to increasing fiscal costs ($0.8 billion per year). This is largely driven by the more favourable subsidy rates given to low- and middle-income working families under the Commission's preferred scenario.

Impacts by income groups

The impact of the policy can be disaggregated based on the income ranges of households pre-policy (table 4).

Table 4 **Illustrative impacts on labour supply, childcare demand, and childcare subsidy cost by household income**

Household income range	*Share of households (%)*	*Change in full time equivalent workers ('000s)*	*Change in labour supply (millions of hours per week)*	*Change in childcare demand (millions of hours per week)*	*Change in total childcare subsidy[a] ($m per week)*
Under 40 000	16.5	2.5	0.1	0.0	-2.8[b]
40 000 to 60 000	19.0	9.6	0.4	0.5	5.7
60 000 to 80 000	17.6	17.2	0.7	1.2	5.6
80 000 to 100 000	18.2	14.0	0.6	1.2	6.4
100 000 to 130 000	15.2	3.6	0.1	0.9	11.0
130 000 to 160 000	6.5	1.3	0.1	0.2	2.2
160 000 to 200 000	4.3	-0.5	0.0	0.0	-0.6
200 000 to 300 000	2.1	0.3	0.0	-0.1	-1.3
Above 300 000	0.7	0.2	0.0	0.0	-0.4

[a] Conditional on assuming no changes in wages and no changes in childcare fees. [b] Note that it is possible for there to be large changes in subsidies but small changes in the quantity demanded due to compositional shifts within the group (see box 3).

Source: PCMC model estimates.

Table 4 illustrates impacts in three broad categories:

1. Households with incomes above $160 000 do not, in aggregate, materially change their labour supply in response to the policy change. However, they contribute fiscal savings from reduced childcare subsidies ($2.3 million per week).[12]

[12] The labour supply increase in the top two income brackets are driven by two factors: 1) a small number of observations in that cohort; 2) compositional change, as some within the group receive more favourable subsidies and increase labour supply (typically households hitting the $7500 CCR limit under current arrangements who receive a subsidy rate of at least 30 per cent of deemed cost under the new

2. The lowest income households (under $40 000) increase their labour supply slightly (0.1 million hours per week) and cause a government childcare expenditure saving of ($2.8 million per week). This effect is driven largely by the new activity test, which causes some people to cut their demand for formal childcare. [13]
3. Other households produce an aggregate increase in labour supply (summing to 1.9 million hours per week) and a large increase in formal childcare demand (summing to 3.9 million hours per week). This group is the major source of increased fiscal expenditure (having an additional childcare subsidy cost of $30.9 million per week).

An illustration of the decision making process in the model based on an example household

While it is not possible to investigate the responses by all families, it is instructive to analyse how incentives change for an example observation. Table 5 shows some characteristics for a single-parent household from group D, both pre- and post-policy change. This family is assumed to face relatively low fees (below the deemed cost), and in this instance would receive an effective subsidy of 100 per cent under the new arrangements. Note that this family is just an example, and not representative of all responses in the model. The purpose of microsimulation is to represent population heterogeneity, as such, no one agent is representative of the behaviour of any other agent in the data.

Table 5 **Illustrative results for an example household**

	Hours of labour supply per week	*Childcare hours demanded per week*	*Subsidy rate as a proportion of unit childcare cost*	*Gross labour income per week*	*Income net of tax and transfers per week*
Pre-policy	32	20	88.0%	$692	$826
Post-policy	32	40	100.0%[a]	$1 039	$1 026

a. This family is paying a total cost (pre-subsidy) that is below the deemed cost. When fees are below deemed cost, the subsidy is the minimum of the actual fees paid or the families eligible proportion of the deemed cost. This is why their rate (100%) is larger than the upper bound on rates (90%) shown in figure 1.

Source: PCMC model estimates.

arrangements), while others within the group receive lower rates of assistance, but do not reduce work (instead funding formal childcare out-of-pocket).

13 However, this group is likely to contain a disproportionate share of families that would be exempt from the proposed activity test (such as children deemed to be at risk, those where grandparents are the primary carers for the children, parents in receipt of a Disability Support Pension or Carer Payment). The SIH did not contain sufficient information to identify those families and model these exemptions from the activity test. As such, there is likely to be an overstatement of the modelled reduction in childcare use for this income group and an understatement of the effect on subsidy expense.

Increasing the subsidy decreases out of pocket fees. For a given level of labour supply, the household's utility level has increased (due to the larger amount of income net of taxes and out of pocket fees). Reduced out-of-pocket fees also reduce the costs of working and increases labour supply, along with the demand for childcare services.

The utility the household derives from all possible work/childcare decisions pre- and post-policy change are shown in tables 6 and 7. The shaded cells indicate the utility-maximising choice. Note that units of utility are ordinal — they determine the ranking of choices for the individual, but not the relativities. For example, a utility of 12 is not necessarily twice as desirable as a utility of 6.

Table 6 **Illustrative pre policy utility payoff table**

	Hours of formal childcare					
Hours of labour supply	*0*	*10*	*20*	*30*	*40*	*50*
0	9.47	7.95	7.71	6.99	6.70	3.73
8	6.51	6.14	6.44	4.54	5.41	4.04
16	5.91	6.39	9.13	6.09	6.48	5.09
24	7.01	6.93	9.04	8.34	10.89	7.02
32	6.78	8.23	**12.40**	7.91	6.51	6.94
40	6.66	7.78	7.53	8.37	9.38	7.21
48	6.15	7.79	7.17	6.63	12.10	8.68
56	5.20	7.12	6.04	8.70	6.61	9.70

Source: PCMC model estimates.

Table 7 **Illustrative post-policy utility payoff table**

	Hours of formal childcare					
Hours of labour supply	*0*	*10*	*20*	*30*	*40*	*50*
0	9.47	7.20	6.21	5.14	4.82	1.81
8	6.51	5.28	4.71	2.13	2.46	0.52
16	5.91	6.50	9.35	6.42	6.92	5.63
24	7.01	7.03	9.24	8.64	11.30	7.53
32	6.78	8.32	12.58	8.19	6.88	7.41
40	6.66	7.90	7.77	8.71	9.85	7.79
48	6.15	7.91	7.41	7.00	**12.59**	9.30
56	5.20	7.24	6.30	9.08	7.12	10.34

a Light grey cells indicate where the utility has declined relative to the pre-policy value. The dark grey cells indicate values where utility has increased relative to the pre-policy value. The bold number is the maximum utility, showing the optimal work-childcare choice.

Source: PCMC model estimates.

The individual is made better off by the policy even assuming no behavioural change (at 32 hours of labour supply, 20 hours of childcare demand). However, a marginally higher level of utility can be obtained through a higher labour supply level of 48 hours, with 40 hours of childcare demand.

5 Further model developments

The model as it stands:

1. is an expansion of the Doiron and Kalb (2005) and Gong and Breunig (2012) frameworks. Like these models, it includes the main childcare subsidies and transfers in the current system and accurately reproduces the work and care decisions from the survey data (for the draft report, modelled decisions are consistent with reported work and care decisions in the SIH)
2. has been used to examine four policy scenarios, which feature adjustments to both the activity test and subsidy rates households face, and uses a deemed cost as the basis for calculating the subsidy.

Despite the limitations of the microsimulation framework, the model provides meaningful insights into mechanisms driving behavioural change at the individual household level and in aggregate.

The results at the inquiry draft report stage are preliminary and illustrative. The main further developments intended to be included in the modelling for the inquiry final report include:

- Estimating parameters for the utility function based on the refined data.
- Modifications to the database to more closely reflect information contained in administrative data to improve estimates of economywide and fiscal impacts.

Appendix A — Data

The Commission's microsimulation model uses data from two sources:

- The basic confidential unit record file (CURF) version of the 2011-12 Survey of Income and Housing (SIH) (ABS 2013). This survey captures key demographic and economic characteristics of individuals residing in private dwellings across Australia.
- An unpublished administrative childcare dataset (Department of Education, 2013, unpublished). This dataset provides a comprehensive description of childcare use, childcare prices[14], location of services and childcare benefits received.

After considering multiple sources, the basic SIH was adopted as a starting point, since it contained all the variables necessary for a preliminary analysis. There are, however, limitations with the basic SIH and the Commission is considering the use of other sources for the final report if appropriate.

Processing the source data

The model's database includes two samples extracted from the basic SIH — a 684 household sample representing lone parents and a 2271 household sample representing coupled parents. When extracting samples, a parent was defined as an adult member of a household who — for the relevant variable — identified as a parent or guardian of a child under 12 years.[15]

Variables describing parent's characteristics were extracted from the basic SIH and assigned to the relevant household. Specifically, variables capturing income sources, employment status, number of children, age, occupation, industry of employment, location, educational attainment and hours of childcare use were extracted.

Each household was allocated a childcare price based on a random draw from a childcare price distribution estimated from the administrative data. This distribution dictates the possible childcare prices a household faces, conditional on the location of the household (capital city or other location in each state/territory), age of the child in care and the type of childcare used. There is a plan for the final report to create a better mapping between individuals in the survey data and the childcare prices they face.

The Commission has identified several limitations with using the basic SIH in the context of this modelling project. Specifically:

- some households are rejected due to inconsistent responses

[14] Childcare price was derived by dividing total fees by the number of hours charged for childcare.

[15] For a couple with dependent children, it was sufficient for *either* member of the couple to identify as a parent or guardian of a child under 12 years.

- the lack of a detailed location variable means the geographic variation of childcare price in the administrative data cannot be fully utilised
- there are inconsistencies between the basic SIH and the administrative data regarding the proportion of households failing the new activity test in the proposed childcare policies.

These concerns do not necessarily invalidate the model's database. The Commission will, however, seek to address these shortcomings for the final report.

Inconsistent responses

In the basic SIH, several households report inconsistent combinations *'total current weekly employee income'* and *'number of hours usually worked per week in main and second jobs'*. Specifically, some individuals report no labour income and positive employment, or positive labour income and no employment. If any person in the household reported inconsistent combinations, the household was removed.[16] Additionally, any household with no children was removed. In total, 521 households were removed from the model's database prior to calibration (table A.1).

Table A.1 **From SIH sample to model database**

Aggregate characteristics of observations removed from the model's database

Sample	*Sample households*	*Population units[a] ('000)*	*Labour supply ('000 hours)*	*Childcare use[b] ('000 hours)*
Initial sample	3 476	2 095	104 796	10 545
Positive income and zero hours	55	32	974	150
Positive hours and zero income	460	280	17 278	1 363
Zero children	6	5	297	0
Final sample prior to calibration	2 955	1 778	86 248	9 032

a Population units reflect the sum of population weights assigned to households in each sample. **b** Childcare use of the youngest child.

Sources: 2011-12 Survey of Income and Housing (ABS 2013); Productivity Commission estimates.

Further, approximately 10 per cent of observations are dropped as part of the endogenous model calibration process. The process of model calibration and dropped observations is further discussed in appendix B.

16 For some households, the primary earner reported working no hours but earning wage income. As these households were dropped, any work reported by the primary carer would be excluded.

Childcare prices

Childcare prices were assigned to households based on the geographic location of childcare users and services, the age of the child in care and the type of childcare provided.

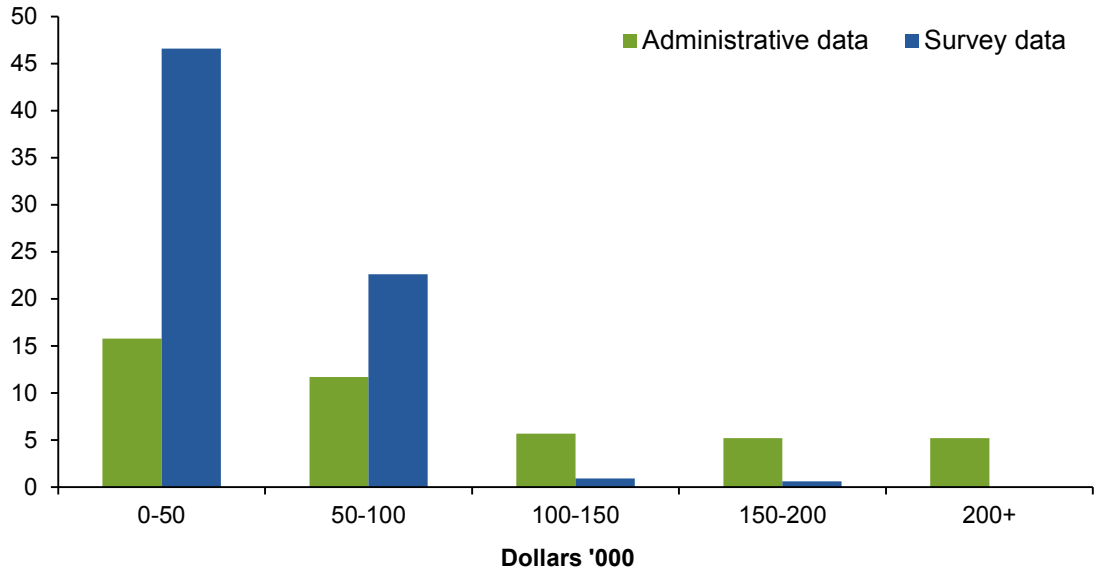
The accuracy of assigned childcare prices is limited by the degree of geographic disaggregation in the basic SIH. All households using a particular type of childcare in a state[17] face prices governed by one of only two distributions reflecting prices within and outside capital cities. As a result, the model's database does not incorporate all childcare price variation from the highly geographically disaggregated administrative data.

Activity test

The proposed childcare policies adopted in the Commission's modelling incorporate a new activity test to replace the existing activity test. The proportion of households failing the new activity test is significantly higher in the basic SIH than in the administrative dataset. While this was accounted for in the draft report by reweighting the model's database to better reflect existing users of childcare, this discrepancy may indicate the presence of a bias in the SIH. For the final report, there will be further attempts to understand the drivers of the differences between the two datasets.

Figure A.1 **Impact of the new activity test**

Per cent of current childcare expense paid to families that would fail the new activity test by annual income range



Data sources: 2011-12 Survey of Income and Housing (ABS 2013); unpublished administrative data (Department of Education 2013, unpublished); Commission estimates.

[17] The Australian Capital Territory and the Northern Territory were considered as a single region in accordance with the geographic disaggregation in the basic SIH.

Alternative data sources

The Commission is considering alternative data sources to address the limitations of the model's database. Four alternatives to the basic SIH are:

1. the expanded CURF version of the 2011-12 Survey of Income and Housing (the expanded SIH)
2. the Household, Income and Labour Dynamics in Australia (HILDA) survey
3. the childcare administrative data
4. alternative ABS sources.

Expanded CURF Survey of Income and Housing

Adopting the expanded CURF SIH would represent an improvement in variable quality and data accuracy.

The expanded SIH would provide improved location data — facilitating more accurate childcare price estimates — and may reduce the need to reject observations for inconsistency by providing improved measures of labour income and labour supply. That said, the expanded SIH is unlikely to address concerns regarding the possible bias identified in the data.

HILDA

The HILDA Survey is a longitudinal dataset describing the economic, social, labour market and family characteristics of Australian households. The survey has 12 waves, with a most recent sample size of 17 472 individuals (HILDA 2013). HILDA provides the basis for the Breunig, Gong and King 2010 and the Breunig and Gong 2011 studies.

The use of HILDA could address concerns with the model's database. For instance, improved data on the geographic location of respondents available in the 'in-confidence' survey would allow the allocation of more accurate childcare prices (as would the expanded CURF SIH).

There are, however, possible drawbacks associated with HILDA. For instance, concerns exist regarding the accuracy of childcare responses (Summerfield et al 2014). Furthermore, adopting HILDA is likely to reduce the number of observations in the model's database. The Breunig and Gong (2011) study uses a pooled sample across multiple waves of HILDA to produce observations representing 978 partnered females.

Administrative data

The unpublished administrative childcare database provides a comprehensive overview of childcare in Australia. Adopting the administrative data as the sole data source could present significant advantages — using administrative data alone would eliminate the need to assign childcare prices and would provide a comprehensive database of childcare use.

The administrative data does not, however, contain sufficient demographic variables to form the sole data source for the Commission's model. For instance, the administrative data does not report parent's hours of labour supply, age, industry employment, occupation or educational attainment. In addition, the information on incomes is not complete and there are doubts over the accuracy of income data that is present.

Other ABS sources

Various ABS datasets could be used as alternative sources or for diagnostic purposes. For instance, the 2011 Childhood Education and Care Survey reports comprehensive demographic and economic data on families of children up to the age of 12 — with detailed information only available for a maximum of two (randomly chosen) children per family (Australian Bureau of Statistics, sub. 360, p. 2). Furthermore, sources such as the 2011 Census or the 2011 Labour Force dataset could be used as a benchmark to provide insights into the possible sample bias issue (Australian Bureau of Statistics, sub. 360).

Appendix B — Model specification

The PCMC model is comprised of three modules:

- tax and transfer module
- childcare module
- decision module.

This appendix presents additional detail on the decision module.

Decision module framework

In the PCMC model, primary care givers have 168 hours in a week to spend on various activities. It is assumed that 56 of these hours are spent sleeping. Of the remaining 112 hours, primary care givers can choose to work, look after their child(ren), or enjoy leisure, home production or other activities.

Children are also assumed to have 168 hours in the week. They are assumed to sleep for 70 of those hours, and their remaining hours can be spent being minded by the primary care giver, being minded in formal childcare, being minded at school (for school-aged children) or being minded in informal care.

A number of simplifying assumptions are made regarding when these activities can occur.

If a child is at home and the primary caregiver is at home (and they are both awake), the primary care giver is assumed to care for the child.

- If the child is in formal care (or at school) and the primary care giver is at home, the primary care giver is assumed to undertake leisure/home production.
- If the primary care giver is at work, and the child is not in formal care, the child is assumed to be in informal care (this includes care by the secondary care giver in a couple).

Households are assumed to make two choices simultaneously:

- the number of hours that the primary care giver works
- the number of hours that the youngest child is in formal child care.

Households must choose from a set of discrete options for these two choices.

- Labour supply can be 0, 8, 16, 24, 32, 40, 48 or 56 hours a week
- Formal child care can be 0, 10, 20, 30, 40 or 50 hours a week.[18]

[18] Outside of school hours care can be 0,4,8,12,16 or 20 hours. This is equal to two fifths of the formal child care choices.

Households with multiple children are assumed to base labour supply and childcare decisions on the caring needs of the youngest child. That is, childcare for older children mirrors the decision for the youngest child. For example, for a family with one pre-school and one school-age child, if the younger child requires 40 hours per week of non-primary-carer childcare, the older child would also require 40 hours of care (comprising of school and outside of school hours care). The costs associated with the formal care of *all* children in a household factor in the estimate of a household's net income and its decisions (that is, households have to pay for and receive utility from care for all children, but the nature of the care decision is driven by the youngest).

Households are permitted to use one type of formal care for children aged 0 to 4 years old. The types of care available for 0 to 4 year olds are: long day care, family day care, nannies and up to 15 hours per week of preschool. Households who do not use a type of care in the base case, are assigned a childcare type for children aged 0 to 4, based on their income and childcare administrative data to inform the underlying probability distribution. All children aged 5-12 are assumed to use outside of school hours care if any formal care is required, and receive the same amount of informal care as younger children.

Households are assigned a childcare price per hour for their care types based on their location. This price is drawn from a probability distributions based on the administrative data.

The utility function

Households are assumed to choose the combination of the number of hours of work supplied by the primary care giver and the number of hours of formal childcare demanded that maximises household utility.

Primary carers can make a choice from the limited set of discrete combinations of labour and childcare hours mentioned above.

Households derive utility (u) (or disutility) from:

- household income net of taxes and transfers less out-of-pocket childcare costs (y)
- the labour supply of adult members of the household (h)[19]
- childcare provided by the primary care giver (m)
- formal child care (f) — the utility derived from formal childcare increases as the labour supply of the primary care giver increases.

Like MITTS, the model uses a quadratic utility function. This function consists of squared terms, linear terms for all inputs and cross product terms for all inputs into the utility function.

[19] Note that labour supply is also driving the level of income

A fixed cost of working parameter is included in the income variable (γ). This is used to prevent the model from under-predicting non-participation and over-predicting part-time hours.

Heterogeneity of preferences was included in the module by making the linear terms (including the fixed cost term) depend on household and individual characteristics (such as the age of the youngest child, the number of children, age of parents and educational attainment of parents).

The deterministic component of the utility function for sole parent households can be represented as:[20]

(1) $$u = \alpha_y(y-\gamma)^2 + \alpha_h(h)^2 + \alpha_f(f)^2 + \alpha_{yh}(y-\gamma)h + \alpha_{ym}(y-\gamma)m + \alpha_{hf}hf$$
$$+\beta_y(y-\gamma) + \beta_h h + \beta_m m$$

where the 'α's and the 'β's are parameter values. The utility function for couple households can be represented as:

(2) $$u = \alpha_y(y-\gamma)^2 + \alpha_{h2}(h_2)^2 + \alpha_f(f)^2 + \alpha_{yh1}(y-\gamma)h_1$$
$$+\alpha_{yh2}(y-\gamma)h_2 + \alpha_{ym}(y-\gamma)m + \alpha_{h1m}h_1 m + \alpha_{h2f}h_2 f + \beta_y(y-\gamma)$$
$$+\beta_{h1}h_1 + \beta_{h2}h_2 + \beta_m m$$[21]

[20] Note that the utility function is missing several interaction terms. The reason for this is that parameters were taken and adjusted from –past studies, which did not include these terms. A utility specification containing all material interaction terms will be used for the final report.

[21] Note that the utility function for couples includes some partner variables that will have no effect on model results.

Individual household responses are complex

The model used by the Commission for the draft report contains the utility specification detailed above. While individual level responses — and consequently aggregate responses — could be derived, the relationships would be very complicated. For this reason, the simulation approach documented in this paper does not directly derive individual response functions.

Households choose their level of labour supply, the level of childcare provided by the primary carer, and formal childcare demand to maximise utility. Equation (2) could be expressed in functional form notation as:

(3) $u = U(y, h, m, f)$

Where $U(.)$ is the function converting the inputs into household utility. Note that equation (3) does not contain an informal care or leisure term, as these are implied from the other terms. Informal care is defined as a residual, such that informal childcare equals the minimum of either (a) formal care less primary-carer labour supply or (b) zero.[22]

This utility function can be re-expressed as a function of only h and f by substituting other functions into (3)[23]:

- Reflecting constraints on the total available hours of the primary carer, and the total required time of care for children, the amount of care provided by the primary carer (m) can be thought of as a function $C(.)$ of household labour supply (h) and formal childcare demand (f).
- Similarly, assuming a fixed price of childcare and a fixed wage for each household, household income net of taxes and transfers less childcare costs can be thought of as a function $T(.)$ of the tax and transfer system, household labour supply (h) and formal childcare demand (f)

These substitutions allow the household utility function to be simplified to:

(4) $u = U\big(T(h, f), h, f, C(h, f)\big) = V(h, f)$

where $V(.)$ is defined for a given wage, childcare price, total hours for the primary carer, total required care for the children, and a given tax and transfer system.

[22] Informal childcare can be treated as a residual because it is assumed that any formal childcare used by a household will be used while the primary carer is working, unless the formal childcare hours are greater than hours of labour supply. This is consistent with the approach adopted by Gong and Breunig (2012).

[23] Note that the model used by the Commission does not substitute out these terms. This substitution is made for illustrative purposes in this section only.

Assuming differentiability, taking the total differential of (4) with respect to *h* and setting it equal to zero:

$$(5)\ \frac{du}{dh} = \frac{\partial V(h,f)}{\partial h} + \frac{\partial V(h,f)}{\partial f}.\frac{df}{dh} = 0$$

Solving equation (5) for *h* will give the household supply of labour, for given parameters, policy environment and formal childcare demand. A similar relationship can be derived for formal childcare demand as a function of given parameters, policy environment and labour supply, taking the total differential of (4) with respect to *f*:

$$(6)\ \frac{du}{df} = \frac{\partial V(h,f)}{\partial f} + \frac{\partial V(h,f)}{\partial h}.\frac{dh}{df} = 0$$

These two relationships could be used to derive an individual household's childcare demand and labour supply as a function of parameters (utility coefficients, wages, childcare prices) and the policy environment (tax, transfer and childcare subsidy system).

In order to describe the household's response to a policy change, the difference would need to be taken between the functions derived from (5) and (6), and alternative functions derived with a new tax, transfer and childcare cost function (replacing *T(.)* in equation (4)).

An aggregate function would require a weighted sum of all of these individual household change functions. This relationship would be very complex (containing many terms). The complicated nature of the resulting functions (and difficulty deriving them) make simulation methods (like those used in this paper) a practical method for evaluating the impacts of policy change.

Parameter values

Ideally, the parameters of the household utility functions (the 'α's and the 'β's) would be estimated econometrically. However, the Commission has not had sufficient time to estimate the model parameters for the draft report. Rather, the Commission has used a set of values that are informed by parameters in Doiron and Kalb (2005) and Gong and Breunig (2013).

This approach has a number of drawbacks. For example, the reported parameters from previous research are based on older datasets. Furthermore, neither of these studies employ the exact same utility function that is used in the Commission's model. For this reason, the modelling included in the draft report is preliminary.

The Commission intends to estimate the utility function parameters for the modelling that is included in the final report.

Calibration

The decision making module needs to be calibrated to replicate observed data for households before the effects of policy changes can be estimated.

In practice, a parameterised utility function (even with parameters varying by demographic characteristics) will not perfectly reproduce observed data for all individuals in the dataset. In order to ensure the initial database can be reproduced using the model, a process of calibration is completed.

Calibration involves generating a set of error terms (one for each combination of labour supply and childcare demand, and drawn from a standard Gumbel distribution), adding them to the utility function, and testing whether the households replicate their observed behaviour. If they do, that set of errors is stored. If they do not, that set of errors is discarded.

This process is replicated until each household has 10 sets of errors that lead to the utility function reproducing observed behaviour. Households are dropped from the dataset if they are too difficult to calibrate (it takes more than 500 attempts to obtain a plausible set of errors).

This process is documented in Creedy and Kalb (2005).

These error terms (described as 'unobserved utility' or 'calibration' parameters) can be thought of as including individual-specific factors outside the model that cause a household to a have the particular work-care choice observed in the data.

The wage equation

There is no wage reported in the database for individuals who do not work (and thus do not earn a salary). However, to model the impact of changes in childcare prices, wages are required for all individuals.

Ideally, estimates of unobserved wages would be obtained by estimating a wage equation. Instead, for the draft report, the Commission has used a wage equation that is based on the wage equation estimated by Kalb (2004).

The Commission intends to estimate a wage equation for the final report. This wage equation will be estimated simultaneously with the utility function.

Appendix C — Model parameters

In the current version of the model, the utility and wage parameters have not been estimated using the above data sets. Instead, the parameters used in the model are based on those from the Doiron and Kalb (2005) model, adjusted to reflect differences in the utility function for the current model. Parameters will be estimated for the final report using the Commission's dataset.

Table C.1 **Utility function parameter values — single parents**

	Youngest child aged 0 4	*Youngest child at primary school*
Income squared × 100 000	-0.3000	-0.3000
Labour supply squared × 100	-0.0199	-0.0199
Formal childcare squared × 100	-0.4000	-0.4500
Labour supply × income × 10 000	-1.0000	-1.5000
Income × primary care giver childcare × 10 000 **b**	-0.5010	-0.5010
Labour supply × formal childcare × 100	1.5000	1.0000
Income × 100		
Constant	2.3000	1.5000
Youngest child aged 0-2	0.4762	—
Youngest child aged 3-4	-0.1161	—
Youngest child aged 5-9	—	0.8649
Number of dependent children	0.1135	0.1135
Age × 10	-0.2572	-0.2572
Age squared × 100	0.0127	0.0127
Highest qualification: vocational education	-0.0452	-0.0452
Highest qualification: diploma or degree	-0.0165	-0.0165
Female	0.0300	0.0300
Labour supply		
Constant	-0.2700	-0.1473
Youngest child aged 0-2	-0.0355	—
Youngest child aged 3-4	-0.0214	—
Youngest child aged 5-9	-0.0534	0.0080
Number of dependent children	-0.0020	-0.0020
Age × 10	0.0909	0.0909
Age squared × 100	-0.0111	-0.0111
Highest qualification: vocational education	0.0169	0.0169
Highest qualification: diploma or degree	0.0242	0.0242
Female	-0.0486	-0.0486
Fixed cost parameter ÷ 100		
Constant	2.3593	2.3593
Resides in capital city	0.0563	0.0563
Youngest child aged 0-4	-0.2301	—
Youngest child aged 5-9	—	-0.6367
Resides in NSW	0.2290	0.2290
Female	-0.4902	-1.3900
Primary carer childcare		
Constant	0.0200	0.1000
Age × 10	0.0500	0.0500
Age squared × 100	-0.0050	-0.0050
Female	0.0310	0.0310

Table C.2 **Utility function parameter values — couple parents**

	Youngest child 0 4	*Youngest child at primary school*
Income squared × 100 000	-0.0021	-0.0021
Labour supply (primary carer) squared × 100	-0.1912	-0.1912
Formal childcare squared × 100	-0.8000	-0.8000
Labour supply (primary earner) × income × 10 000	-0.0500	-0.0500
Labour supply (primary carer) × income × 10 000	-0.0250	-0.0250
Labour supply (primary earner) × Labour supply (primary carer) × 100	-0.0466	-0.0466
Labour supply (primary earner) × primary carer childcare × 100	0.0050	0.0050
Labour supply (primary carer) × formal childcare × 10 000	1.0000	1.0000
Income × primary carer childcare ×10 000	-0.5000	-0.5000
Income × 100		
Constant	0.5000	0.5000
Number of children	-0.0095	-0.0095
Labour Supply (primary earner)		
Constant	0.3622	0.3622
Youngest child aged 0-2	0.0001	0.0001
Youngest child aged 3-4	-0.0025	-0.0025
Youngest child aged 5-9	0.0004	0.0004
Number of children	0.0009	0.0009
Age × 10	0.0633	0.0633
Age squared × 100	-0.0086	-0.0086
Highest qualification: vocational education	0.0086	0.0086
Highest qualification: diploma	0.0065	0.0065
Highest qualification: degree	0.0114	0.0114
Highest qualification: vocational education (primary carer)	0.0024	0.0024
Highest qualification: diploma (primary carer)	0.0005	0.0005
Highest qualification: degree (primary carer)	0.0023	0.0023
Labour Supply (primary carer)		
Constant	0.0567	0.0567
Youngest child aged 0-2	-0.0693	-0.0693
Youngest child aged 3-4	-0.0498	-0.0498
Youngest child aged 5-9	-0.0212	-0.0212
Number of children	-0.0057	-0.0057
Age × 10	0.0452	0.0452
Age squared × 100	-0.0075	-0.0075
Highest qualification: vocational education	-0.0001	-0.0001
Highest qualification: diploma	-0.0032	-0.0032
Highest qualification: degree	-0.0070	-0.0070
Highest qualification: vocational education (primary earner)	0.0090	0.0090
Highest qualification: diploma (primary earner)	0.0169	0.0169
Highest qualification: degree (primary earner)	0.0287	0.0287
Fixed cost parameter (primary earner) ÷ 100	8.0933	8.0933
Fixed cost parameter (primary carer) ÷ 100	2.0702	2.0702
Primary carer childcare		
Constant	0.1000	0.1000
Age (primary carer) × 10	0.0500	0.0500
Age (primary carer) squared × 100	-0.0050	-0.0050

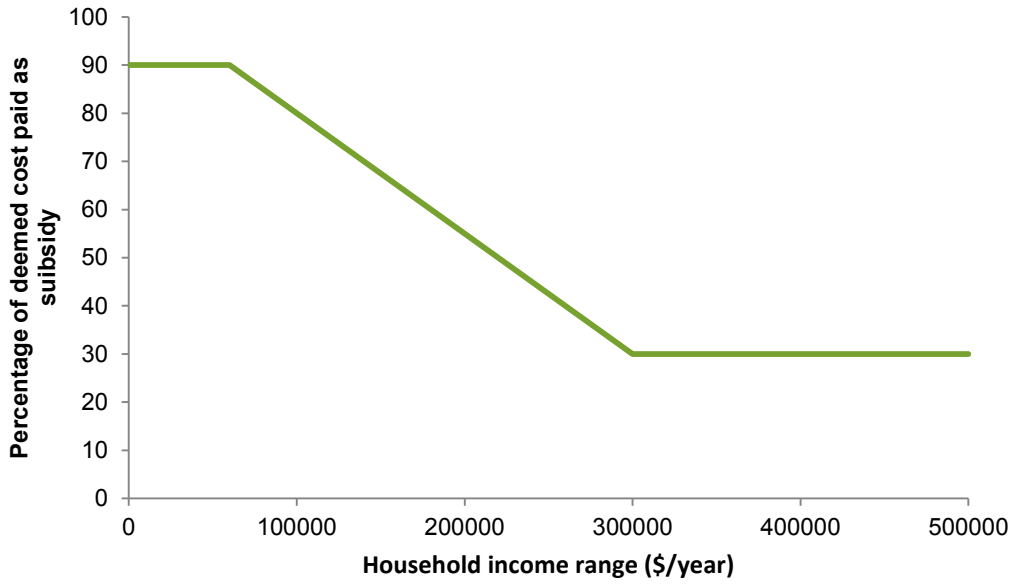
Table C.3 **Wage parameters**

	Sole parent	*Coupled Male*	*Coupled Female*
Constant	2.37	1.87	1.96
Female	-0.15	—	—
Age ×10	-0.11	0.27	0.20
Age squared x 100	0.01	-0.03	-0.02
Occupation: Professional	0.30	0.20	0.32
Occupation: Paraprofessional	0.24	0.16	0.23
Occupation: Clerical/Sales	0.10	0.06	0.11
Industry: Mining	1.23	0.62	0.26
Industry: Manufacturing	0.08	0.26	0.11
Industry: Construction	0.05	0.23	0.26
Industry: Utilities	0.48	0.34	0.25
Industry: Trade	0.08	0.12	0.06
Industry: Transport	0.22	0.29	0.18
Industry: Communication	0.26	0.30	0.18
Industry: Financial/business services	0.13	0.24	0.14
Industry: Other Services	0.10	0.18	0.08
Highest qualification: Postgraduate	0.34	0.08	0.15
Highest qualification: Undergraduate	0.20	-0.01	0.10
Highest qualification: Diploma	0.10	0.14	0.09
Highest qualification: Vocational	-0.01	0.06	0.02
State of residence: Victoria	-0.08	-0.06	-0.04
State of residence: Queensland	-0.07	-0.04	-0.06
State of residence: South Australia	-0.08	-0.09	-0.05
State of residence: Western Australia	-0.04	-0.03	-0.06
State of residence: Tasmania	0.01	-0.05	-0.05
State of residence: ACT/Northern Territory	0.09	0.07	0.07
Capital city	0.06	0.07	0.06
Mills ratio	0.21	-0.01	0.11
Age × Highest qualification: degree	—	0.06	0.02
σ	0.36	0.37	0.35
ρ	-0.05	0.00	0.05

Appendix D — Model results for all scenarios

Scenario 1

Figure D.1 **Schedule of subsidy rates under the new policy scenario[a] — scenario 1 (90-30 linear)**



[a] The 'new policy' replaces existing CCB and CCR arrangements with a single means tested subsidy rate applied to a deemed cost base, detailed above..

Table D.1 **Illustrative labour supply, childcare demand and fiscal results — scenario 1**

	Lower bound results from all sensitivity simulations[a]	*Example*	*Upper bound results from all sensitivity simulations*
Millions of hours per week			
Demand and supply shifts			
Labour supply base	53.1	53.1	53.1
Labour supply policy	54.0	55.0	56.8
Labour supply change	0.9	1.9	3.8
Childcare demand base	18.7	18.7	18.7
Childcare demand policy	20.3	22.4	27.3
Childcare demand change	1.7	3.8	8.6
Billions of dollars per year (2013-14)			
Net change in government fiscal position[b]	-2.7	-0.8	0.8
Change in childcare subsidy expense	0.2	1.3	3.3
Change in transfer expense	-0.7	-0.3	-0.1
Change in income tax receipts	0.0	0.2	0.6
Change in full-time equivalent labour supply persons ('000s) [c]	22	48	95

[a] A range of simulations were completed with different parameter values, and the 'lower bounds' can be thought of as 'lowest responses' and the high as 'highest responses'. [b] Since the lowest (highest) result for one variable was not necessarily taken from the same simulation as the lowest (highest) value for another variable, the elements within the lower/upper bound columns will not sum to the 'Net change in government fiscal position'. [c] Results are produced in terms of the change in the number of hours of work; these are converted to FTEs for ease of interpretation.

Source: PCMC model estimates.

Table D.2 **Contribution to illustrative results by each group — scenario 1**

subtitle

	Group A	*Group B*	*Group C*	*Group D*	*Total*
Initial childcare demand	Zero	Non-zero	Zero	Non-zero	
Initial labour supply relative to new activity test	Below	Below	Above	Above	
Mean annual income net of taxes and out of pocket fees ($)	61 366	59 468	99 083	104 833	
Mean weekly hours worked (hours)	0.5	0.9	33.2	30.9	
Labour supply (millions of hours/week)	0.6	0.1	31.9	20.5	
Childcare demand (millions of hours/week)	0.0	2.6	0.0	16.0	
Millions of hours per week					
Demand and supply shifts (hours)					
Labour supply	1.3	0.3	0.3	0.1	1.9
Childcare demand	2.0	-0.0	1.5	0.3	3.8
Billions of dollars per year (2013-14)					
Contributions to fiscal position[b]					
Childcare subsidy expense	0.5	-0.1	0.4	0.6	1.3
Transfer expenses	-0.2	-0.1	0.0	0.0	-0.3
Income tax receipts	0.1	0.0	0.1	0.1	0.2
Change in fiscal position[a]	-0.3	0.2	-0.3	-0.5	-0.8
Change in full-time equivalent labour supply persons (‘000s)	32	8	6	2	48

[a] May not add up due to rounding. [b] Conditional on assumption of no change in wages or in childcare fees.

Source: PCMC model estimates.

Table D.3 **Illustrative impacts on labour supply, childcare demand, and childcare subsidy cost by household income — scenario 1**

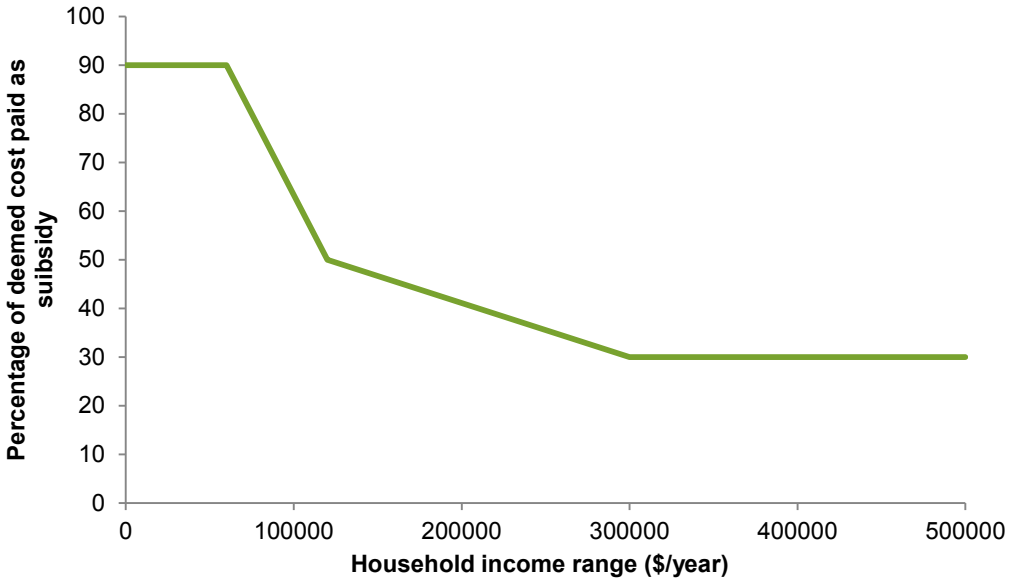
Household income range	*Share of households (%)*	*Change in full-time equivalent workers ('000s)*	*Change in labour supply (millions of hours per week)*	*Change in childcare demand (millions of hours per week)*	*Change in total childcare subsidy[a] ($m per week)*
Under 40 000	16.5	2.5	0.1	0.0	-2.8[b]
40 000 to 60 000	19.0	9.6	0.4	0.5	5.7
60 000 to 80 000	17.6	17.2	0.7	1.2	5.6
80 000 to 100 000	18.2	14.0	0.6	1.2	6.4
100 000 to 130 000	15.2	3.6	0.1	0.9	11.0
130 000 to 160 000	6.5	1.3	0.1	0.2	2.2
160 000 to 200 000	4.3	-0.5	0.0	0.0	-0.6
200 000 to 300 000	2.1	0.3	0.0	-0.1	-1.3
Above 300 000	0.7	0.2	0.0	0.0	-0.4

a Conditional on assuming no changes in wages and no changes in childcare fees. **b** Note that it is possible for there to be large changes in subsidies but small changes in the quantity demanded due to compositional shifts within the group (see box 3).

Source: PCMC model estimates.

Scenario 2

Figure D.2 **Schedule of subsidy rates under the new policy scenario[a] — scenario 2 (90-30 stepped)**



a The 'new policy' replaces existing CCB and CCR arrangements with a single means tested subsidy rate applied to a deemed cost base, detailed above.

Table D.4 **Illustrative labour supply, childcare demand and fiscal results — scenario 2**

	Lower bound results from all sensitivity simulations[a]	*Example*	*Upper bound results from all sensitivity simulations*
Millions of hours per week			
Demand and supply shifts			
Labour supply base	53.1	53.1	53.1
Labour supply policy	53.2	53.9	54.5
Labour supply change	0.1	0.8	1.4
Childcare demand base	18.7	18.7	18.7
Childcare demand policy	18.7	19.8	21.1
Childcare demand change	0.1	1.1	2.4
Billions of dollars per year (2013-14)			
Net change in government fiscal position[b]	-0.8	0.4	1.5
Change in childcare subsidy expense	-0.9	-0.1	0.8
Change in transfer expense	-0.4	-0.2	0.0
Change in income tax receipts	-0.1	0.1	0.2
Change in full-time equivalent labour supply persons ('000s) [c]	4	20	36

[a] A range of simulations were completed with different parameter values, and the 'lower bounds' can be thought of as 'lowest responses' and the high as 'highest responses'. [b] Since the lowest (highest) result for one variable was not necessarily taken from the same simulation as the lowest (highest) value for another variable, the elements within the lower/upper bound columns will not sum to the 'Net change in government fiscal position'. [c] Results are produced in terms of the change in the number of hours of work; these are converted to FTEs for ease of interpretation.

Source: PCMC model estimates.

Table D.5 Contribution to illustrative results by each group — scenario 2

	Group A	*Group B*	*Group C*	*Group D*	*Total*
Initial childcare demand	Zero	Non-zero	Zero	Non-zero	
Initial labour supply relative to new activity test	Below	Below	Above	Above	
Mean annual income net of taxes and out of pocket fees ($)	61 366	59 468	99 083	104 833	
Mean weekly hours worked (hours)	0.5	0.9	33.2	30.9	
Labour supply (millions of hours/week)	0.6	0.1	31.9	20.5	
Childcare demand (millions of hours/week)	0.0	2.6	0.0	16.0	
Millions of hours per week					
Demand and supply shifts (hours)					
Labour supply	0.6	0.2	0.0	-0.1	0.8
Childcare demand	1.0	-0.2	0.5	-0.2	1.1
Billions of dollars per year (2013-14)					
Contributions to fiscal position[b]					
Childcare subsidy expense	0.2	-0.2	0.1	-0.1	-0.1
Transfer expenses	-0.2	-0.1	0.0	0.0	-0.2
Income tax receipts	0.0	0.0	0.0	0.0	0.1
Change in fiscal position[a]	-0.2	0.5	-0.2	0.2	0.4
Change in full-time equivalent labour supply persons ('000s)	16	6	0	-2	20

[a] May not add up due to rounding. [b] Conditional on assumption of no change in wages or in childcare fees.

Source: PCMC model estimates.

Table D.6 **Illustrative impacts on labour supply, childcare demand, and childcare subsidy cost by household income — scenario 2**

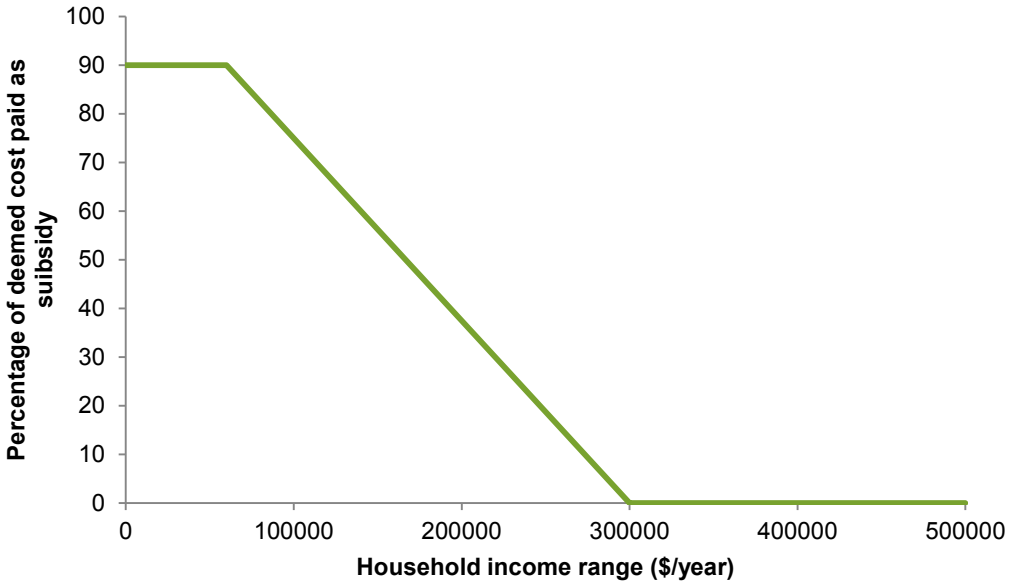
Household income range	*Share of households (%)*	*Change in full-time equivalent workers ('000s)*	*Change in labour supply (millions of hours per week)*	*Change in childcare demand (millions of hours per week)*	*Change in total childcare subsidy[a] ($m per week)*
Under 40 000	16.5	2.5	0.1	0.0	-2.8
40 000 to 60 000	19.0	7.5	0.3	0.4	4.2
60 000 to 80 000	17.6	7.2	0.3	0.6	2.0
80 000 to 100 000	18.2	1.0	0.0	0.1	0.0
100 000 to 130 000	15.2	0.6	0.0	0.2	-0.4
130 000 to 160 000	6.5	0.9	0.0	0.0	-1.6
160 000 to 200 000	4.3	-0.5	0.0	-0.1	-1.5
200 000 to 300 000	2.1	0.3	0.0	-0.1	-1.3
Above 300 000	0.7	0.2	0.0	0.0	-0.4

a Conditional on assuming no changes in wages and no changes in childcare fees. **b** Note that it is possible for there to be large changes in subsidies but small changes in the quantity demanded due to compositional shifts within the group (see box 3).

Source: PCMC model estimates.

Scenario 3

Figure D.3 **Schedule of subsidy rates under the new policy scenario[a] — scenario 3 (90-0 linear)**



a The 'new policy' replaces existing CCB and CCR arrangements with a single means tested subsidy rate applied to a deemed cost base, detailed above.

Table D.7 **Illustrative labour supply, childcare demand and fiscal results — scenario 3**

	Lower bound results from all sensitivity simulations[a]	*Example*	*Upper bound results from all sensitivity simulations*
Millions of hours per week			
Demand and supply shifts			
Labour supply base	53.1	53.1	53.1
Labour supply policy	53.4	54.3	55.5
Labour supply change	0.3	1.2	2.4
Childcare demand base	18.7	18.7	18.7
Childcare demand policy	19.4	20.6	23.6
Childcare demand change	0.7	1.9	5.0
Billions of dollars per year (2013-14)			
Net change in government fiscal position[b]	-1.4	0.1	1.5
Change in childcare subsidy expense	-0.8	0.2	1.6
Change in transfer expense	-0.6	-0.3	-0.1
Change in income tax receipts	-0.1	0.1	0.3
Change in full-time equivalent labour supply persons ('000s) [c]	9	30	60

[a] A range of simulations were completed with different parameter values, and the 'lower bounds' can be thought of as 'lowest responses' and the high as 'highest responses'. [b] Since the lowest (highest) result for one variable was not necessarily taken from the same simulation as the lowest (highest) value for another variable, the elements within the lower/upper bound columns will not sum to the 'Net change in government fiscal position'. [c] Results are produced in terms of the change in the number of hours of work; these are converted to FTEs for ease of interpretation.

Source: PCMC model estimates.

Table D.8 Contribution to illustrative results by each group — scenario 3

	Group A	*Group B*	*Group C*	*Group D*	*Total*
Initial childcare demand	Zero	Non-zero	Zero	Non-zero	
Initial labour supply relative to new activity test	Below	Below	Above	Above	
Mean annual income net of taxes and out of pocket fees ($)	61 366	59 468	99 083	104 833	
Mean weekly hours worked (hours)	0.5	0.9	33.2	30.9	
Labour supply (millions of hours/week)	0.6	0.1	31.9	20.5	
Childcare demand (millions of hours/week)	0.0	2.6	0.0	16.0	
Millions of hours per week					
Demand and supply shifts (hours)					
Labour supply	0.9	0.3	0.1	0.0	1.2
Childcare demand	1.4	-0.1	0.9	-0.2	1.9
Billions of dollars per year (2013-14)					
Contributions to fiscal position[b]					
Childcare subsidy expense	0.3	-0.1	0.2	0.0	0.2
Transfer expenses	-0.2	-0.1	0.0	0.0	-0.3
Income tax receipts	0.0	0.0	0.0	0.0	0.1
Change in fiscal position[a]	-0.6	1.2	-0.9	0.4	0.1
Change in full-time equivalent labour supply persons ('000s)	22	7	2	-1	30

[a] May not add up due to rounding. [b] Conditional on assumption of no change in wages or in childcare fees.

Source: PCMC model estimates.

Table D.9 **Illustrative impacts on labour supply, childcare demand, and childcare subsidy cost by household income — scenario 3**

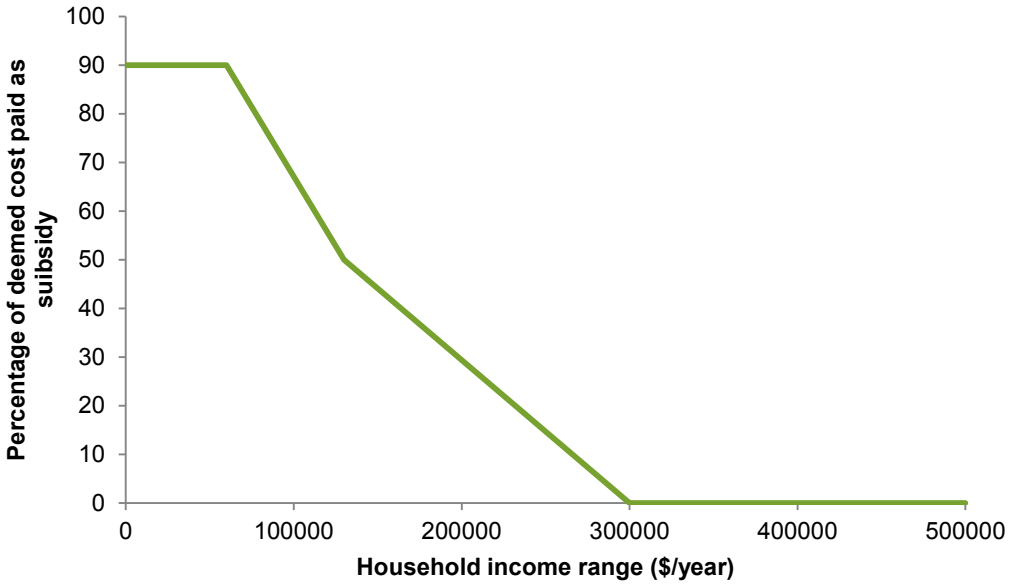
Household income range	*Share of households (%)*	*Change in full-time equivalent workers ('000s)*	*Change in labour supply (millions of hours per week)*	*Change in childcare demand (millions of hours per week)*	*Change in total childcare subsidy[a] ($m per week)*
Under 40 000	16.5	2.5	0.1	0.0	-2.8
40 000 to 60 000	19.0	8.4	0.3	0.4	4.9
60 000 to 80 000	17.6	12.5	0.5	0.9	3.9
80 000 to 100 000	18.2	6.8	0.3	0.6	3.2
100 000 to 130 000	15.2	-0.3	0.0	0.4	3.8
130 000 to 160 000	6.5	0.3	0.0	0.0	-2.0
160 000 to 200 000	4.3	-0.5	0.0	-0.1	-2.9
200 000 to 300 000	2.1	0.2	0.0	-0.2	-2.9
Above 300 000	0.7	0.2	0.0	0.0	-0.8

a Conditional on assuming no changes in wages and no changes in childcare fees. **b** Note that it is possible for there to be large changes in subsidies but small changes in the quantity demanded due to compositional shifts within the group (see box 3).

Source: PCMC model estimates.

Scenario 4

Figure D.4 **Schedule of subsidy rates under the new policy scenario[a] — scenario 4 (90-0 stepped)**



a The 'new policy' replaces existing CCB and CCR arrangements with a single means tested subsidy rate applied to a deemed cost base, detailed above.

Table D.10 **Illustrative labour supply, childcare demand and fiscal results — scenario 4**

	Lower bound results from all sensitivity simulations[a]	*Example*	*Upper bound results from all sensitivity simulations*
Millions of hours per week			
Demand and supply shifts			
Labour supply base	53.1	53.1	53.1
Labour supply policy	53.0	53.8	54.4
Labour supply change	-0.1	0.7	1.3
Childcare demand base	18.7	18.7	18.7
Childcare demand policy	18.2	19.3	20.7
Childcare demand change	-0.4	0.6	2.0
Billions of dollars per year (2013-14)			
Net change in government fiscal position[b]	-0.5	0.7	2.0
Change in childcare subsidy expense	-1.4	-0.5	0.5
Change in transfer expense	-0.4	-0.2	0.0
Change in income tax receipts	-0.2	0.0	0.2
Change in full-time equivalent labour supply persons ('000s) [c]	-1	17	33

[a] A range of simulations were completed with different parameter values, and the 'lower bounds' can be thought of as 'lowest responses' and the high as 'highest responses'. [b] Since the lowest (highest) result for one variable was not necessarily taken from the same simulation as the lowest (highest) value for another variable, the elements within the lower/upper bound columns will not sum to the 'Net change in government fiscal position'. [c] Results are produced in terms of the change in the number of hours of work; these are converted to FTEs for ease of interpretation.

Source: PCMC model estimates.

Table D.11 **Contribution to illustrative results by each group — scenario 4**

	Group A	*Group B*	*Group C*	*Group D*	*Total*
Initial childcare demand	Zero	Non-zero	Zero	Non-zero	
Initial labour supply relative to new activity test	Below	Below	Above	Above	
Mean annual income net of taxes and out of pocket fees ($)	61 366	59 468	99 083	104 833	
Mean weekly hours worked (hours)	0.5	0.9	33.2	30.9	
Labour supply (millions of hours/week)	0.6	0.1	31.9	20.5	
Childcare demand (millions of hours/week)	0.0	2.6	0.0	16.0	
Millions of hours per week					
Demand and supply shifts (hours)					
Labour supply	0.6	0.2	0.0	-0.2	0.7
Childcare demand	1.0	-0.2	0.4	-0.6	0.6
Billions of dollars per year (2013-14)					
Contributions to fiscal position[b]					
Childcare subsidy expense	0.3	-0.3	0.1	-0.7	-0.5
Transfer expenses	-0.2	-0.1	0.0	0.0	-0.2
Income tax receipts	0.1	0.1	0.0	-0.1	0.0
Change in fiscal position[a]	-0.1	0.4	-0.1	0.6	0.7
Change in full-time equivalent labour supply persons ('000s)	15	6	0	-4	17

[a] May not add up due to rounding. [b] Conditional on assumption of no change in wages or in childcare fees.

Source: PCMC model estimates.

Table D.12 **Illustrative impacts on labour supply, childcare demand, and childcare subsidy cost by household income — scenario 4**

Household income range	*Share of households (%)*	*Change in full-time equivalent workers ('000s)*	*Change in labour supply (millions of hours per week)*	*Change in childcare demand (millions of hours per week)*	*Change in total childcare subsidy[a] ($m per week)*
Under 40 000	16.5	2.5	0.1	0.0	-2.8
40 000 to 60 000	19.0	7.5	0.3	0.4	4.2
60 000 to 80 000	17.6	7.2	0.3	0.6	2.0
80 000 to 100 000	18.2	0.9	0.0	0.1	-0.1
100 000 to 130 000	15.2	-0.1	0.0	0.1	-2.0
130 000 to 160 000	6.5	-0.5	0.0	-0.1	-3.9
160 000 to 200 000	4.3	-0.8	0.0	-0.2	-3.5
200 000 to 300 000	2.1	0.2	0.0	-0.2	-2.9
Above 300 000	0.7	0.2	0.0	0.0	-0.8

a Conditional on assuming no changes in wages and no changes in childcare fees. **b** Note that it is possible for there to be large changes in subsidies but small changes in the quantity demanded due to compositional shifts within the group (see box 3).

Source: PCMC model estimates.

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