Costs of children and equivalence scales: A review of methodological issues and Australian estimates

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1. Introduction

Economists have long attempted to define and estimate the costs of children. There have also been attempts to estimate how the costs of children vary by family income and the age of the child. These estimates have been used for a range of purposes, including the measurement of poverty, the design of income support systems and the design of child support schemes.

While it may seem simple to define the costs of children, the reality is that several different approaches have been used and there is no agreement as to the most appropriate definition. Even where there is agreement as to the concept that is being used, there is no consensus as to the appropriate method for estimating the cost. The problem from a policy perspective is that the different approaches and estimation methods can result in very different estimates of the cost of a child.

Empirically, the fundamental problem that must be solved in order to measure expenditures made on behalf of children is that a method is needed to divide a family's expenditure on shared goods into two components: the portion that should be attributed to the family's children and the portion that should be attributed to the family's adults. A further difficulty is that existing data sets for Australia (and many other countries) do not identify the consumption of individual members of the household and so a similar method is also needed to divide a family's expenditure on privately consumed goods (such as food).

The existence of goods and services that are jointly consumed leads to economies of scale in consumption. For example, the addition of a child to a family involves extra food consumption but due to sharing of housing services, little extra spending on housing may be required to maintain the previous standard of living of the household.[2] Economies of scale in consumption may also be generated from purchasing produce in bulk, which

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2. Joint consumption occurs where two or more individuals in a household can share a good or service without reducing the satisfaction derived by any other person.

might be cheaper. An important feature of estimates of the costs of children is the extent to which they exhibit economies of scale.

A clear definition of the costs of children is provided by Bradbury (2004: 1):

> 'a measure of the actual resources committed to child-raising. Ignoring public goods and household public goods, we can think of this as the expenditure of time and money on children. Taking household public goods into account, the cost to the parents can be defined as the additional income needed by a household in order to maintain parental living standards when they have an additional child.'

This paper provides an overview of the different ways in which the costs of children have been conceptualised and defined in the literature and discusses the methodological issues involved in estimating the costs of children. The scope of this paper is limited to considering the direct financial costs of children to their parents.[3] The main conclusion, which many other authors have also reached, is that there is no 'true cost' of a child and that, in the end it is a matter for judgment, but that this judgment needs to be informed by the existing empirical estimates (e.g. Citro and Michael 1995; Nelson 1993; Stanton 1973; Whiteford 1985).

The costs of children can also be expressed as equivalence scales. For example, an 'equivalence scale' may show how much income a household with two adults and one child needs, in relation to a childless couple, to enjoy the same level of 'welfare' as the childless couple.

The *National Academy of Sciences Panel on Poverty and Family Assistance* in the United States of America (USA) undertook a major study on how to measure poverty (Citro and Michael 1995). David Betson, a member of the panel undertaking this study concludes that:

> 'their estimation require assumptions that can never be independently verified. … equivalence scales are inherently arbitrary and as such are in reality subjective judgements masquerading as science' (Betson 2004: 1).

The main report of the National Academy of Sciences panel expresses a similar view, albeit in more considered language, 'Although the empirical evidence helps determine the limits of what makes sense, there is no objective procedure for measuring the different needs for different family types' (Citro and Michael 1995).

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3.   The additional money which is needed to raise children is only one of the costs of children. Children require time inputs (usually substantial) from their parents and the value of these inputs are large. For a discussion of this issue see Apps and Rees (2001). In addition, governments make substantial contributions in the form of public education and health care.

There have been a number of Australian estimates of the costs of children using a wide range of methods. This paper discusses the majority of Australian studies published in the last twenty-years. The estimates exhibit considerable variability and given, as will be discussed in this paper, no single method is entirely satisfactory, one approach to produce estimates of the costs of children which can be used for policy purposes is to take the average of a range of studies. This approach to estimating the cost of children was used by Whiteford (1985) and is the approach used in this paper. The average of the majority of post-1985 Australian studies is calculated and thus this paper updates the work of Whiteford (1985). This exercise provides one method of combining the different estimates of the costs of children into a single 'consensus' estimate.[4]

The remainder of this paper is structured as follows. In Section 2 the approaches which have been taken to defining and estimating the costs of children are discussed. In Section 3 the Australian estimates of the costs of children are summarised. In Section 4 the evidence on the extent to which the costs of children vary with family income and the age of children is discussed. The results of selected international studies are discussed. How the costs of children research can be related to expenditures on children is discussed in Section 5 and the final section concludes.

2. Defining the costs of children

This section provides an overview of the different concepts which have been used to define the costs of children. The methods which have been used to estimate these different concepts are summarised and their strengths and weaknesses discussed.

A useful way of summarising the literature on the cost of children is in terms of the question which it is attempting to answer. Browning (1992: 1440) identifies four distinct questions which the literature on the costs of children has sought to address. Of the questions which the literature has sought to answer, the following three are relevant to the design of child support schemes[5]:

(i)   The needs question: How much income does a family with children need compared to a childless family, in order to attain a specific standard of living? For example, to be above a poverty line, or to attain a modest but adequate standard of living.

(ii)   The expenditure question: How much do parents spend on their children?

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4.   This type of analysis is sometimes described as a meta-analysis and has been widely used in a range of disciplines, particularly psychology, sociology and medical science (Durlak 1995).

5.   Browning (1992: 1440) identifies a fourth question which the costs of children literature has addressed: 'How do children affect the expenditure patterns of a household?' This question is concerned with the effects of children on the allocation of a given budget and is not directly relevant to the design of child support schemes.

(iii)   The iso-welfare (or equivalent living standards) question: How much income does a family with children require to be as well off as a family with no children?

The question which is most appropriate for the design of a child support scheme depends upon the rationale behind the scheme. If the conceptual basis is that parents should contribute what they would have pre-separation to the costs of their children, then the expenditure question is most directly relevant. Alternatively, if the conceptual basis of the child support scheme is that the children have their minimum 'needs' met then the needs question is most relevant.

The literature has identified two different types of equivalence scales: conditional and unconditional (Pollak and Wales 1979). Conditional equivalence scales measure the cost of children but not their benefits and so ignore the direct effects of household composition on household welfare. They compare preferences over consumption bundles holding household demographic composition fixed. Unconditional equivalence scales take full account of choice of household composition by defining preferences over both demographic composition and consumption bundles.

Pollak and Wales (1979) in a critique of the equivalence scale (and implicitly cost of children) literature argue that conditional equivalence scales may be useful for analysing patterns of consumer demand, but cannot be used for welfare comparisons, for which they argue unconditional equivalence scales are needed. Other researchers have argued that conditional equivalence scales are valid for many policy applications such as the level of assistance provided by governments to families with children (e.g. Deaton and Muellbauer 1986; Nelson 1993). Conditional equivalence scales are also relevant for the design of child support schemes in which both parents are required to contribute to the costs of children since the standard of living rather than subjective happiness is the more relevant concept.

2.1 Needs question

The needs question dominated most of the pre-1940 debate concerning the costs of children (Browning 2002; Nelson 1993; Whiteford 1985). Discussion of needs leads to prescriptive judgements on how much children cost. In this approach a bundle of goods deemed necessary for the maintenance of a child is defined and then costed. This is taken to be the cost of that child. This approach is commonly known as the 'budgetary approach' or the 'budget standards approach'.[6] The origins of the budget standards method can be traced back to the work of Rowntree (1901) who attempted to identify the minimum costs of maintaining a family at a subsistence standard of living in York,

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6.   This method is also known as the 'basket of goods method', 'expert budget' or 'standard' budget method.

United Kingdom. Rowntree conducted a follow up study of York in 1935-36 (Rowntree 1942).[7]

Approaches to defining a needs estimate of the cost of children fall along a continuum. These range from expert-defined budgets for one or a few categories of expenditure (such as food) with a large multiple to allow for other needed expenditure[8] to expert estimates of a comprehensive, detailed list of budget times.

There is a long history of the use of budget standards to provide estimates of the costs of children in Australia. A very early example of the use of a budget standard is by Justice Higgins in the determination of a basic wage in his 'Harvester Judgement' of 1907. This decision influenced the determination of wage rates until the basic wage was abandoned in 1967. Further work was done on the costs of children in the 1920s by the Royal Commission on the Basic Wage Chaired by A.B. Piddington. Professor Wilfred Prest at the University of Melbourne also did work on budget standards during the Second World War (see Saunders 1998).

The first detailed survey of poverty in Australia was undertaken by Professor Henderson and his team at the Institute of Applied Economic and Social Research at the University of Melbourne in 1966. This study used costs of children derived from the 1954 'Family Budget Standard', prepared for the Community Council of Great New York to adjust their poverty line for differing family structures. In the absence of an Australian equivalence scale, the subsequent Henderson Commission of Inquiry into Poverty in Australia also used the equivalence scale relativities provided by the 1954 New York Family Budget Standards (Saunders 1998). The cost equivalence scale embodied in the Henderson poverty line makes allowance for need to vary with the number of adults and children in the family, their age, gender and workforce status and the number of other people residing in the same household. While the Henderson Poverty line has been widely used to provide estimates of the costs of children it has been subject to substantial criticism (e.g. Stanton 1980).

In the early 1980s the Institute of Family Studies (now the Australian Institute of Family Studies) developed a budget standards estimate of the costs of children (Lovering 1984).[9] In 1995 the Minister for Social Security commissioned the Social Policy Research Centre (SPRC) at the University of New South Wales to develop a set of indicative budget standards for a range of households that would among other things, 'examine the costs of children in different family circumstances'. The SPRC estimates provide the basis of the most recent and comprehensive set of budget standards for Australia. The SPRC developed budget standards for a range of different households at two separate standards - a modest but adequate standard and a low cost standard (Saunders et al. 1998). The

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7.   The summary in this section of the history of Australian budget standards research draws heavily upon Saunders (1998, 1999) and Whiteford (1985).

8.   This is the approach adopted by Orshansky (1965, 1969) in the development of poverty lines in the US. Orshansky's estimates are essentially based on expenditure on food.

9.   Lovering's study was carried out in response to a request from the Family Law Court.

SPRC estimates were restricted to Sydney. Henman (2001, 2005) has updated and expanded the SPRC estimates for additional household types and for each Australian State capital city.

The SPRC in their recent work on budget standards, define a budget standard as 'what is needed, in terms of material goods and services, by a particular type of family in order to achieve a particular standard of living in a particular place at a particular time' (Saunders 1998: 2). This definition emphasises:

> The material dimensions of well-being rather than its psychological or subjective determinants;

> That a very specific list of items which a particular family needs in order to attain the standard of living has to be defined; and

> That in theory it is possible to develop a budget standard that corresponds to any standard of living.

If a budget standard is derived for households with no children and households with children it is possible to use these standards as a basis for estimating the cost of children.[10] While this may seem like a simple exercise, in reality it is complex. Saunders (1999) has identified three main approaches which differ in the way they allocate the cost of items that are consumed by the household as whole, rather than by any specific individual within it. Examples of such items are housing, transport, consumer durables and furniture.

The first approach is the 'individualised method'. This method ignores shared household costs when calculating the costs of children and only includes those expenditures which can clearly be attributed to children (eg food, clothing, health, personal care). The second approach involves calculating the costs of children as the costs which can be clearly attributed to children and adds an estimate of the portion of the cost of each shared item that can be assigned to the children. This method is termed the normative method because it requires normative judgement to be made when allocating shared costs to individuals. The third approach is the difference method. This method estimates the costs of children by taking the difference in the budget standards for households with and without children, or households with different numbers of children.

Each method for estimating the costs of children has strengths and weaknesses. The main limitation of the individualised method is that it excludes shared household costs and therefore produces only a partial estimate of the cost of children. The normative method has the advantage of taking account of fixed costs, but has the drawback of being time-consuming to apply. Further, the judgements made as to how to allocate shared costs may be legitimately contested. The main attraction of the difference method is that it is simple to apply and does not include in the costs of the child costs that would have been incurred in a childless household. The main weakness of the difference approach is that some of

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10.   This discussion of the budget standards approach is based on Saunders (1999).

the cost differences between households with and without children may reflect changes in the behaviour of adult household members in response to the presence of children.

There are several limitations with the budget standards approach. The budget standards approach inevitably requires that normative judgements be made about the goods and services that need to be consumed to achieve a particular living standard. For some goods and services there are official or quasi-official guidelines which provide guidance to the developers of budget standards. For example many countries have nutritional guidelines.[11] In other areas there are no established social norms available and so budget standards are based on expert recommendations which have no official status. This can lead to criticism.

Inevitably normative standards of the goods and services that should or ought to be consumed to achieve a particular living standard must, to some extent, reflect the customs, habits and social expectations which determine behaviour[12] The difficulty is how the normative standards can be defined without undermining the ability of a budget standard to reflect normative judgments about *needs*, as opposed to the resource *constraints* that also influence actual patterns of behaviour. Since one of the main uses to which a budget standard can be put is to provide an independent benchmark for assessing the adequacy of incomes and standards of living, it is important that the standards do not mirror the effects of the constraints under which different families operate.

Whiteford has noted that 'The claim that the budgetary approach is objective arose initially from the belief that it is possible to specify 'scientifically' the necessities of life in terms of biological and physiological requirements' (Whiteford 1985: 17). The Social Welfare Policy Secretariat's (SWPS) *Report on Poverty Measurement* published in 1981 also noted budgetary standard have an element of arbitrariness. The SWPS report argues that budgets can be constructed to show almost anything.

2.2 Expenditure question

The question of how much parents spend on their children seems the most straightforward. In principle this question can be answered by asking, in a large-scale survey, 'who gets what' in the household. However, the available data sets do not contain information on intra-household expenditures, only on total household expenditure on different areas. From expenditure data it is possible to estimate how expenditure patterns vary across families with different numbers and ages of children. Consumption on each good is divided (deflated) by the number of 'equivalent adults' in the household.

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11. The National Health and Medical Research Council (NH&MRC) provide nutritional guidelines for Australia.

12. Saunders (1998: 7) makes the point compellingly when he writes 'In the area of food, for example, a diet consisting mainly of lentils and brown rice may meet the NH&MRC dietary guidelines, but be of little relevance to the actual eating habits of the vast majority of Australians.'.

An alternative approach is to use information on expenditures on goods that can be attributed to parents—the so called adult goods approach. This method is usually attributed to Rothbarth (1943), although Rothbarth used this method to address the equivalent living standards question (discussed in Section 2.3 below). To infer expenditures on children from expenditures on adult goods requires assumptions. Various assumptions have been used in the literature. A common assumption is that the ratio of expenditure on adult goods to total expenditure on adults is independent of total expenditure and that childless couples have the same preferences over their consumption preferences as do couples with children. It is apparent that these assumptions are not really plausible. Other assumptions have been used in the literature but none of them are entirely plausible.

2.3 Equivalent living standards question (iso-welfare question)

All of the methods for calculating the costs of children require the estimation of the effects of adding children to a family on the cost function of the family. Unfortunately, when using data on observed expenditure patterns, the impact of children on the cost function is not directly measured in the data. Therefore, it is necessary to make assumptions about the way in which children affect the cost function. The different methods of calculating the costs of children vary in the assumptions that they make about the impact of children on the cost function and these are described in this section.

Engel and iso-prop methods

This concept of costs is a measure of the additional income required so that the parents can obtain the same living standard as they had when there were no children in the household. The cost to parents is a function of the social norms for the rasing of children as well as the extent of support received from outside the household.[13] This question is often termed the iso-welfare question.

Several different approaches have been developed to estimate this concept of the costs of children. The Engel procedure dates back to the work of Engel (1895) and uses the share of the family budget devoted to food as an indicator of living standards. Engel argued that the share of food in the budget correctly indicates the standard of living across families of different types. Using this assumption, all that is needed to calculate the cost of a child is to calculate how much must be added to the budget to restore the family's food share to its original value.[14] The Engel method is sometimes extended beyond the share of food to the share of other necessities. This method has been called the iso-prop approach and was introduced by Watts (1967).

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13. This differs from the needs approach in which the amount of money which is needed to provide some expert determined bundle of goods and services which are required to have a particular living standard.

14. In practice the Engel method is implemented by fitting an Engel curve in which the share of expenditures on food is linked to income and family characteristics. The estimated equation is then used to calculate what increase in income is equivalent to an additional family member.

The Engel and iso-prop methods are only valid if the assumption that the proportion of the budget spent on food (or other necessities) correctly indicate family welfare. A major limitation of the Engel method is that since a child consumes mostly food and clothing, providing an income which will allow the share of the family budget spent on food to return to the pre-child level will overcompensate the family for the addition of a child (see Nicholson 1976).

Rothbarth method

An alternative measure of the standard of living of a family is expenditures on goods that are consumed only by adults (adult goods). The approach is termed the Rothbarth or adult goods approach and, as discussed in Section 2.2, a variant of this approach has been used to estimate how much parents spend on their children. The logic underlying the Rothbarth method is that children brings needs but no resources to a family, and those needs can be met only by making cuts elsewhere in the budget.[15] Expenditure on adult goods (e.g. alcohol, tobacco and adult clothing) should decline when a child is added to the family as resources are diverted from adult goods to meeting the needs of the child. The Rothbarth approach imputes the same welfare level to households that have the same level of consumption of adult goods. The Rothbarth method defines the costs of children as the reduction in income which would lead to the same reduction in expenditure on adult goods that the addition of a child to a family generates.

A number of criticisms have been made of the Rothbarth method. Perhaps the most telling is that although children do not consume adult goods, their presence may alter their parents' tastes for adult goods. Similarly, the presence of a child is likely to change the way the parents spend their leisure time and 'surplus' cash. This makes it very difficult, if not impossible, to find adult goods for which family consumption is not directly affected by the presence of children. In practice, tobacco and alcohol are often used as adult only goods and it seems rather strange to equate welfare with consumption of these goods. Both the Engel and Rothbarth methods ignore the impact of the addition of a child to a household's preference between items.

'Complete demand system' methods

Many economists are dissatisfied with the single equation Engel, Iso-prop and Rothbarth methods because they are not directly derived from utility theory.[16] Other limitations of these methods is that they do not explicitly consider prices or the fact that a change in household composition may lead to changes in the implicit prices a family pays for

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15. In Australia (and most other developed countries) many families with children receive government child related income supplements to assist with the costs of bearing and raising children so that in reality children bring additional resources to a family. To the extent to which children bring additional resources to the family the costs of the children to the parents (the 'private cost') will be reduced.

16. Although on the surface the utility based methods and proxy methods such as the Engel, iso-prop and Rothbarth methods appear to be very different, it is possible to provide a utility basis for proxy methods. However, this requires strong assumptions to be made.

various items. For example, the birth of a child will increase the price of outside entertainment for a couple if baby sitting services need to be paid for.

This has resulted in the conceptualisation of the costs of children using consumer demand theory in which the costs of children are estimated directly from the cost function of the household to which they belong. This approach was pioneered by Barten (1964) and developed by among others Gorman (1976), Muellbauer (1977), Ray (1983), Jorgenson and Slesnick (1987) and Nelson (1988). Examples of prominent studies which estimate equivalence scales using demand equations are Deaton and Muellbauer (1986) and Blundell and Lewbel (1991).

These methods assume a particular mathematical relationship between the consumption of each category of goods (also termed demand), the number and age of family members, and the level of well-being within the family. Once this mathematical relationship is specified, it is possible to determine how much expenditure would have to increase in order to hold well-being constant after the addition of a child. Procedures of this type encompass a broad class of utility maximisation models that could be used for the purpose of estimating the expenditures on children. The parameters of these demand equations are estimated using information on household expenditure. Assumptions which have been used to identify equivalence scales include assumptions about savings and the assumption that the equivalence sale is the same at all income levels.[17]

Subjective method

A final approach to estimating the costs of children is to collect information via surveys on peoples' subjective evaluations of the relationship between income, family composition and living standards.[18] This approach has been widely used overseas, particularly in Europe, but not in Australia. The main advantage of the subjective approach is that it avoids reliance on particular "experts" and is based on the prevailing opinion in a society. The method suffers from several difficulties. First, the results differ substantially for even quite subtle changes in question wording (e.g. Flik and Van Praag 1991). Second, subjective responses may reveal more about underlying differences in expectations and current circumstances rather than their relative income needs. When answering the questions people may compare their living standards to that of people in similar families and not to other family types. Bradbury (1989) argues that this may be the reason for the low estimate of the additional costs of children often obtained when using the subjective approach. Third, if the respondents know or suspect that the survey is being used to determine the level of government payments then the respondents might give different answers.

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17. This is termed the Independence of Base (IB) assumption (Lewbel 1989) or Equivalence Scale Exactness (Blackorby and Donaldson 1993).

18. For discussion of the subjective method see Bradbury (1997) and Citro and Michael (1995).

2.4. Which the most defensible method for estimating the costs of children?

Which method is the most defensible? If the question is 'How much income does a family with children need compared to a childless family?' then some form of budget standards approach is needed. Each method of estimating the costs of children has strengths and weaknesses

For the expenditure or equivalent living standards questions there is little consensus as to what is the best method to use with each method having strengths and weaknesses. The robustness of the complete demand system models is yet to be fully established. Furthermore, the assumptions involved in estimating these models of the costs of children are complex, require a large amount of data and are often far from clear. It is often difficult to determine the extent to which the assumptions being made are driving the results. For this reason, estimates using these methods often lack transparency.

On balance, the Rothbarth method is the most defensible but there is little to choose between the Rothbarth and Iso-prop methods. The Engel method (food only) is difficult to justify. The National Academy of Sciences study on the measurement of poverty and equivalence scales also concludes that the Rothbarth method is most defensible (Citro and Michael 1995) although they also conclude that none of the published methods for calculating poverty thresholds provide a fully defensible rational for calculating the kind of equivalence scale that is needed for different family types' (Citro and Michael 1995: 175).

3. Australian estimates of the costs of children

3.1 Introduction

In this section Australian estimates of the cost of children are presented and summarised. The Australian research has largely focussed either on the needs question or the equivalent living standards approach. There is a very large International literature on the costs of children which is not considered in detail in this paper, although Appendix Table A3 provides the equivalence scales of several important international studies, including the estimates of the US Department of Agriculture which provides the guidelines used by many of the US States child support schemes.

Studies of the costs of children have generally presented the costs in one of two ways. As a dollar cost (usually at a particular family or household income) or using equivalence scales. Equivalence scales show how much additional income is needed to maintain living standards as the number of children increases. For example, if the reference family is a childless couple then they have an equivalence scale of 1.00. If the equivalence scale for a couple with one-child is 1.20 then this implies that a couple with one child needs 120% of the income of the childless couple to enjoy the same standard of living. For example if a childless couples needs $100 to achieve a certain standard of living and equivalence scale for couple with one child is 1.2, then a couple with one child would

need $120 to maintain the childless couples living standards. This implies expenditure on children of $20 at an income of $120.

In this paper the costs of children are presented as a percent of income. This approach has been used because it allows comparisons between estimates of the costs of children and for the results of different studies to be readily compared and averaged. It also has the advantage of being consistent with the current Child Support Formula and the way in which the majority of child support formulae around the world are presented. It is simple exercise to convert these percentages to dollar figures for any given income level.

While it is conventional to compare estimates of the costs of children using equivalence scales caution does need to be exercised in interpreting the results. For example, conversion of budget standards estimates of the costs of children to achieve a certain standard of living to an equivalence scale requires the conversion of the dollar costs to a percent of income. The level of income which the costs of children are expressed relative to will affect the percentage costs of children.

3.2 Sensitivity of the costs of children to estimation method

Before summarising the results of the Australian studies the sensitivity of the costs of children to the estimation method used is illustrated using the studies of Lancaster and Ray (1998) and van de Ven (2003) who use single Australian data sets to estimate the costs of children using a number of different methods. Lancaster and Ray (1998) illustrates the sensitivity of estimates of the costs of children to the estimation method by applying eight different methods to the pooled 1984 and 1988-89 Household Expenditure Surveys.[19] A summary of Lancaster and Ray's estimates is shown in Table 1. The main point to be taken from these estimates is that they are highly variable For example, the equivalence scale estimate of the cost of one child varies from 1.08 when estimated using the Barten Almost Ideal Demand System (AIDS) to 1.33 when estimated using the Rothbarth method.

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19.   Lancaster and Ray (1998) estimate two variants of the Engel method, two variants of the Rothbarth method and four variants of demand system methods using the 1984 and 1988-89 Household Expenditure Surveys for Australia.

Table 1. Equivalence scale estimates of the costs of children by Lancaster and Ray (1998)

	Number of children		
	1	**2**	**3**
Engel			
Food excluding takeaway food	1.22	1.50	1.83
All food	1.21	1.45	1.75
Rothbarth			
Adult clothing	1.15	1.32	1.52
Adult education	1.33	1.76	2.33
Demand system methods			
Complete demand system - Barten AIDS	1.08	1.16	1.24
Price Scaled AI	1.21	1.42	1.63
Price Scaled LES	1.12	1.24	1.36
Price Scaled GAIDS	1.12	1.23	1.35

Notes: Estimated using the pooled 1984 and 1988-89 Household Expenditure Surveys.
Source: Lancaster and Ray (1998).

Van de Ven (2004) similarly uses several different methods of estimating the costs of children using a more recent Household Expenditure Survey and finds a similar degree of variability in the estimated costs of children (Table 2) as do Lancaster and Ray (1998). Furthermore, there is no clear pattern to the estimates. For example, van de Ven finds that the Engel method produces higher cost estimates than does the Rothbarth method. While this is consistent with the findings of international research, Lancaster and Ray (1998) demonstrate that the Rothbarth method can produce higher cost estimates than the Engel method.

Table 2. Equivalence scale estimates of the costs of children by van de Ven (2003)

Methodology	Number of children			
	1	**2**	**3**	**4**
Engel	1.24	1.50	1.78	2.06
Rothbarth	1.06	1.18	1.32	1.47
Demand system – fixed price effects	1.18	1.36	1.54	1.70
Demand system - demographic dependent price effects	1.12	1.26	1.39	1.52

Notes: The Engel estimate uses all food and non-alcoholic beverages. The Rothbarth estimate uses adult expenditure on food taken outside the home as the adult good. Estimated using the 1993-94 Household Expenditure Survey.
Source: van de Ven (2003).

3.3 The average of Australian estimates of the costs of children

In a detailed survey of the literature on equivalence scales twenty years ago Whiteford (1985: 130) concluded that 'While there are therefore many good reasons for rejecting nearly all available equivalence scales, the problem remains that equivalence scales are unavoidable in many important areas of social research and social policy, and some sort of choice must therefore be made. … Rather than choosing one discredited approach, I would opt for the average of all the discredited approaches!'

That there is no objective procedure for measuring the costs of children and that taking the average of all approaches is a valid approach to estimating the costs of children for policy purposes still holds despite the large number of studies which have been taken in the two-decades since Whiteford's original study. In this section the results of the majority of Australian studies since 1985 (when Whiteford conducted his review) are averaged. Thus this section presents the results of a similar exercise for post-1985 Australian studies. This type of analysis is sometimes described as meta-analysis and in this paper is used as a benchmark for individual studies as well as providing one means of obtaining consensus estimates of the costs of children in Australia.

Table 3 presents the average of all post-1985 Australian equivalence scale estimates[20] and the average of the pre-1985 studies (from Whiteford 1985). Also presented in Table 3 is the average of post-1985 studies which use the Iso-prop and Rothbarth methods. The Taskforce also commissioned two new studies of the costs of children by Henman (2005) and Percival and Harding (2005) which use the latest available data. The results of the Henman and Percival and Harding studies are also presented in Table 3 to facilitate comparison with the findings of other Australian studies.

A number of points can be made about the average costs of children presented in Table 3. First, estimates from the post-1985 Australian studies are higher than the pre-1985 Australian studies. This is true for couple families with one, two and three children. Second, the average of studies which used the Iso-prop and Rothbarth methods is higher than the average of all post-1985 studies. Third, for the post-1985 studies there are no economies of scale evident between the first and second child and for the third-child there are diseconomies of scale. There are strong economies of scale for the fourth child. This

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20.   The average for the post-1985 studies include the equivalence scales presented in Appendix Table A1. For the budget standards estimates for Australia made post-1985 the results of Henman (2005) are included and Saunders et. al. (1998) are not included because the Henman (2005) estimates are an updating and extension of the estimates by the Budget Standards Unit at the SPRC. The underlying budget standards in the Henman (2005) and Saunders et. al. (1998) studies are essentially the same. Appendix Table A2 shows equivalence scale estimates for Australia made using the budget standards method. Appendix Table A3 shows various international equivalence scales.

is consistent with the pre-1985 average which shows very slight economies of scale for the second child and diseconomies of scale for the third child.[21]

While, on average, there are no economies of scale shown it is probable that the marginal expenditure on children does decrease as the number of children increase because of the budget constraint. That is, families do not have enough income to keep increasing total expenditures on children as the number of children increases. Most of the Australian studies are apparently addressing the equivalent living standards (iso-welfare) question and are therefore asking how much income is needed to maintain living standards rather than what families actually spend.

Table 3. Equivalence scale estimates of the costs of children in Australia

	Number of children			
	1	**2**	**3**	**4**
	Equivalence scale value			
Pre-1985 Australian studies[a]	1.16	1.30	1.48	-
Post-1985 Australian studies[b]	1.19	1.38	1.59	1.66
Post-1985 Iso-prop and Rothbarth method studies	1.22	1.45	1.72	
Henman (2005)[c]	1.23	1.46	1.61	1.79
Percival and Harding (2005)[d]	1.15	1.26	1.35	1.42

Notes: (a) The pre-1985 Australia average is that calculated and reported in Whiteford (1985). The geometric mean is reported. Whiteford does not present the average of equivalence scales for four children.

(b) The detailed equivalence scales used to construct the average of the post-1985 estimates of the costs of children are shown are shown in Appendix Table A1. Not all studies provide an estimate of the costs of children for 4 children and therefore the average for 4 children does not include all of the studies. There is relatively little difference between the mean and the geometric mean for the post-1985 studies.

(c) Equivalence scale is for the "modest but adequate" budget standard averaged across gender and age of children and Australian capital cities. However the base income used for a childless couple family is for Sydney since the figures for childless couples in other cities is not estimated by Henman (2005). The budget standard for the childless couple is calculated for the case where both parents are working full-time. A number of assumptions were required to convert the Henman budget standard estimates to an equivalence scale and hence the estimates are only very broadly indicative of his results.

(d) Equivalence scale is for an average income and averaged across age of children.

Given the general similarity of the average of the Iso-prop and Rothbarth Studies and the average of all post-1985 studies, the average of the post-1985 studies can be used as the 'best' estimate of the costs of children derived from the recent Australian research. The equivalence scale is normalised to 1.00 for a childless couple with children and is 1.19 for a couple with one child, 1.38 for two children, 1.59 for three children and 1.66 for four children. It must be stressed that the average will be affected by the addition or

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21.   Australian studies which find economies of scale are Percival and Harding (2000, 2004), Bradbury (1994), Henman (2005) (finds economies of scale for 3rd and 4th children but not for the second, possibly related to assumptions about age and gender of children), and Valenzuela (1999) (economies of scale for second child but not for third child).

exclusion of particular studies. In addition, for some of the studies, different assumptions about the income level and age and gender of children will result in equivalence scale estimates which differ to those used in this paper.

The most recent estimates are those which have been produced for the Taskforce by Henman (2005) and Percival and Harding (2005). Consistent with the expectation that the budget standard estimates will tend to produce higher estimates of the costs of children than other methods, Henman's (2005) estimates are higher than the average of all Australian studies. Percival and Harding's (2005) results suggest that for an average income couple with one child, the equivalence scale estimate is 1.15, two-children is 1.26, three children is 1.35 and four children is 1.42. This estimate for one child is lower than the average for post-1985 studies of 1.19. The Percival and Harding estimate for two, three and four children are also lower than the average of other Australian studies.

4. The costs of children by income and age of children

Income
All Australian studies find that in absolute dollar terms the costs of children increase with income. However, there are relatively few Australian estimates of how the costs of children (in percentage terms) vary with income. Using a demand systems approaches, Tran Nam and Whiteford (1990) and Valenzuela (1999) find virtually no variation in the costs of children across income ranges. In contrast, Percival and Harding find that the equivalence scale costs of children decreasing as income increases (see Table 4). Henman (2005) finds a similar pattern with the proportion of income needed to meet the low cost standard higher than the proportion needed to meet the modest but adequate standard (Table 5).

Table 4. Estimates of the costs of children by income, Percival and Harding (2005)

	Number of children			
	1	2	3	4
	Equivalence scale			
Low income	1.21	1.38	1.53	1.66
Medium income	1.16	1.28	1.37	1.45
High income	1.12	1.21	1.27	1.33
Average	1.15	1.26	1.35	1.42

Source: Percival and Harding (2005). Estimated using the 1998-99 Household Expenditure Survey.

Table 5. Budget standards estimates of the costs of children by living standard, Henman (2005)

Methodology	Number of children			
	1	2	3	4
	Equivalence scale			
Low cost	1.26	1.51	1.69	1.87
Modest but adequate	1.23	1.46	1.61	1.79

Source: Derived from Henman (2005) and unpublished data.

Child age

A number of Australian studies have estimated how the costs of children vary with the age of the child. Almost without exception these studies have found that the costs of children increase with age. There is more difference between studies as to the extent to which the costs increase with the age of the child.

Australian studies which have found that the costs of children increase with the age of the child include Lee (1989)[22], Lovering (1984), Henman (2001, 2005), Percival and Harding (2000, 2005), Tran Nam and Whiteford (1990) and Saunders et al. (1998). A number of international studies have also found that the costs of children increase with the child age (e.g. Betson 1990; Lino 2004; Turchi 1983).

5. Relating the costs of children research to expenditures on children

Although equivalence scales provide a means of comparing estimates of the costs of children, the percentage costs of children they imply cannot be interpreted as the percent of family income which is spent on children. Equivalence scales show how much additional income is needed to maintain living standards as the number of children increase. This point can be illustrated by returning to the example of an equivalence scale of 1.00 for a childless couple and 1.20 for a couple with one child. If the childless couple has an income of $100 then the equivalence scale implies that the couple with one child needs $120 to achieve the same living standard as the childless couple. This implies an expenditure on children of $20. But the family would not spend $20 on children if they had an income of $100 – they would spend less. They only spend $20 on children at an income of $120. Therefore the proportion of family income spent on the child is $20/$120=16.7%. For the purposes of the expenditure costs of children the proportion of budget spent on children is perhaps the most intuitive presentation.

Table 6 presents the average equivalence scale estimates for Australia as the percentage of family income spent on children (derived from the equivalence scales presented in Table 3). The average Percival and Harding (2005) and Henman (2005) estimates are also shown in Table 6. The average of post-1985 Australian studies is that couples with one child spend 16% of their income on that child. Couples with two children are estimated to spend 28% of their income on their children, three children 37% and four children 40%. This average exhibits economies of scale with the first child requiring an additional 16% of income, the second an additional 12%, the third an additional 9% and the fourth an additional 3%.

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22. In Lee's study the only exception is that for ages 0 and 1 years the costs of children are higher than for some of the older age groups.

Table 6. Expenditure costs of children

	Number of children			
	1	**2**	**3**	**4**
	% of family income spent on children			
Pre-1985 Australian studies	14	23	32	-
Post-1985 Australian studies	16	28	37	40
Post-1985 Iso-prop and Rothbarth studies	18	31	42	
Henman (2005)	19	32	38	44
Percival and Harding (2005)	13	21	26	30

Notes: The expenditure costs of children are derived from the equivalence scales presented in Table 3. The formula for the calculation of the expenditure costs of children is the equivalence scale value minus 1 divided by the equivalence value scale. The equivalence scales are normalised to 1.0 for couples. For details of the construction of the underlying equivalence scales see the Table 3 Note.

6. Concluding comments

This paper provides a review of the different approaches that have been used to define the costs of a child and the methods used to estimate the costs of children. An overview of the strengths and weaknesses of the various approaches is provided. The most important conclusion is that there is no unambiguous 'true cost' of a child and that, in the end it is a matter for judgment, but that this judgment needs to be informed by the available empirical estimates.

No single method for estimating the costs of children is entirely satisfactory. The approach taken in this paper is to produce a consensus figure for the costs of children by taking the average of all available credible estimates of the costs of children. Calculating the costs of children as the proportion of family income spent on children for the average of Australian studies published in the last twenty-years, it is estimated that couples with one child spend 16% of their income on that child. Couples with two children are estimated to spend 28% of their income on their children, three children 37% and four children 40%.

The recent Australian research has found that, while in dollar terms the costs of children increase with income, as a proportion of income expenditure on children decreases as income increases. The available evidence also suggests that the costs of children increase with the age the child. This paper has focused on the costs of children in intact couple families. It is clear that the total costs of children will be higher to separated families because of duplicated fixed living costs and the costs associated with contact. There appears to be few estimates of the additional costs of children in separated families as compared to intact families. In US States where the child support system is based upon a 'cost share' model the costs of children in couple families are increased by 150% in order to arrive at a cost of children in separated families. Henman has produced estimates of the costs of contact for Australian families and duplicated infrastructure costs in separated families and these are discussed in Henman and Mitchell (2001) and Henman (2005).

The bottom line is that divorce increases living costs and is sometimes associated with a reduction in labour market earnings of fathers. The combination of these factors means

that on average there is less money available to separated parents to spend on their children than they would have had if they never separated. This means continuity of expenditure on children will be unaffordable for many low and medium income families.

References

Apps, P. and Rees, R. 2001 'Household Production, Full Consumption and the Costs of Children', *Labour Economics*, 8(6), pp. 621-648.

Australian Institute of Family Studies (AIFS) 1999. 'Costs of children in Australia', *Family Matters*, 53(Winter), pp. 62.

Barten, A. 1964. 'Family composition, prices and expenditure patterns', in P. Hart, G. Mills and J. Whitaker (eds), *Econometric Analysis for National Economic Planning*, Butterworths, London.

Betson, D. 1990. *Alternative estimates of the cost of children from the 1980-1986 Consumer Expenditure Survey*, Office of the Assistant Secretary for Planning and Evaluation, US Department of Health and Human Services, Washington, D.C.

Betson, D. 2004. 'Poverty Equivalence Scales: Adjustment for Demographic Differences across Families', Paper presented at the National Research Council Workshop on Experimental Poverty Measures, June 15-16, Washington, D.C. <Available: http://www7.nationalacademies.org/cnstat/Equivalence_Scales.pdf >[Accessed February 2005]

Blackorby, C. and Donaldson, D. 1993. 'Adult-equivalence scales and the economic implementation of interpersonal comparisons of well-being', *Social Choice and Welfare*, 10(4), pp. 335-61.

Blundell, R. and Lewbel, A. 1991. 'The information content of equivalence scales', *Journal of Econometrics*, 50(1), pp. 49-68.

Bradbury, B. 1989.'Family size equivalence scales and survey evaluations of income and well-being', *Journal of Social Policy*, 18(3), pp. 383-408.

Bradbury, B. 1994. 'Measuring the cost of children', *Australian Economic Papers*, 33(62), pp. 120-138.

Bradbury, B. 1997. *Family Size and Relative Need*, PhD thesis, Economic, University of New South Wales, Sydney.

Bradbury, B. 2004. 'The price, cost, consumption and value of children', *SPRC Discussion Paper No. 132*, Social Policy Research Centre, University of New South Wales, Sydney.

Browning, M. 1992. 'Children and household economic behavior', *Journal of Economic Literature*, 30(3), pp. 1434-1475.

Citro, C. and Michael, R. (eds) 1995, *Measuring Poverty: A New Approach*, National Academy Press, Washington, D.C.

Deaton, A. and Muellbauer, J. 1986. 'On measuring child costs: With applications to poor countries', *The Journal of Political Economy,* 94(4), pp. 720-744.

Durlak, J. 1995 'Understanding meta-analysis' in L. Grimm and P. Yarnold (eds) *Reading and Understanding Multivariate Statistics*, American Psychological Association (APA), Washington, DC.

Engel, E. 1895. 'Die Lebenskosten Belgischer Arbeiter-Familien Früher and Jetzt', *International Statistical Bulletin*, 9(5), pp. 897-930.

Flik, R. and Van Praag, B. 1991. 'Subjective poverty line definitions', *De Economist*, 139(3), pp. 311-330.

Gorman, W. 1976. 'Tricks with utility functions', in M. Artis and A. Nobay (eds), *Essays in Economic Analysis*, Cambridge University Press, Cambridge.

Henman, P. 2001. 'Updating Australian budget standards costs of children estimates', *Policy Research Paper No. 7*, Department of Family and Community Services, Canberra.

Henman, P. 2005. 'Updated costs of children using Australian budget standards', Report to the Ministerial Task Force on Child Support, May.

Henman, Paul and Mitchell, Kyle 2001. 'Estimating the Costs of Contact for Non-resident Parents: a budget standards approach', *Journal of Social Policy*, 30(3), pp. 495-520.

Jorgenson, D. and Slesnick, D. 1987. 'Aggregate consumer behaviour and household equivalence scales', *Journal of Business and Economic Statistics*, 5(2), pp. 219-232.

Lancaster, G. and Ray, R. 1998. 'Comparison of alternative models of household equivalence scales: The Australian evidence on unit record data', *Economic Record*, 74(224), pp. 1-14.

Lee, D. 1989. *Calculations of the direct costs of children based on the 1984 ABS Household Expenditure Survey*, Australian Institute of Family Studies, Melbourne.

Lewbel, A. 1989. 'Household equivalence scales and welfare comparisons', *Journal of Public Economics*, 39(3), pp. 377-391.

Lino, M. 2004. *Expenditures on Children by Families, 2003*, United States Department of Agriculture 2003, Center for Nutrition Policy and Promotion, Miscellaneous Publication No. 1528-2003, Washington.

Lovering, K. 1984. 'Cost of children in Australia', *Working Paper No. 8*, Institute of Family Studies, Melbourne.

Muellbauer, J. 1977. 'Testing the Barten model of household composition effects and the cost of children', *Economic Journal*, 87(347), pp. 460-487.

Nelson, J. 1988. 'Household economies of scale in consumption: Theory and Evidence', *Econometrica*, 56(6), 1301-1314.

Nelson, J. 1993. 'Household equivalence scales: Theory versus policy', *Journal of Labor Economics*, 11(3), pp. 471-493.

Nicholson, J. 1976. 'Appraisal of different methods of estimating equivalence scales and their results', *The Review of Income and Wealth*, 22(1), pp. 1-11.

Orshansky, M. 1965. 'Counting the Poor: Another Look at the Poverty Profile', *Social Security Bulletin*, 28(1), pp. 3-29

Orshansky, M, 1969. 'Perspectives on Poverty 2: How Poverty is Measured', *Monthly Labor* Review, February, pp. 37-43.

Percival, R. and Harding, A. 2000. 'The public and private costs of children in Australia, 1993-94', *Discussion Paper No. 48*, NATSEM, *University of Canberra*, Canberra.

Percival, R. and Harding, A. 2005, 'The estimated costs of children in Australian families in 2005-06', Report to the Ministerial Task Force on Child Support, May, NATSEM, University of Canberra, Canberra.

Pollak, R. and Wales, T. 1979. 'Welfare comparisons and equivalence scales', *American Economic Review*, 69(2), pp. 216-221.

Ray, R. 1983. 'Measuring the costs of children: An alternative approach', *Journal of Public Economics*, 22(1), pp. 89-102.

Rothbarth, E. 1943. 'Note on a method of determining equivalent income for families of different composition', in C. Madge (ed) *War-time Pattern of Saving and Spending*, Cambridge University Press, Cambridge.

Rowntree, B.S. 1901. *Poverty: A Study of Town Life*, Macmillan, London.

Rowntree, B.S. 1942. *Poverty and Progress*, 2nd edition, Longmans, Green and Co., London.

Saunders, P. 1998. 'Using budget standards to assess the well-being of families', *SPRC Discussion Paper No. 93*, Social Policy Research Centre, University of New South Wales, Sydney.

Saunders, P. 1999. 'Budget standards and the costs of children', *Family Matters*, 52(winter), pp. 62-70

Saunders, P., Chalmers, J., McHugh, M., Murray, C., Bittman, M. and Bradbury, B. 1998. 'Development of Indicative Budget Standards for Australia', *Policy Research Paper No. 74*, Department of Social Security, Canberra.

Social Welfare Policy Secretariat (SWPS) 1981. *Report on Poverty Measurement*, Australian Government Publishing Service, Canberra.

Stanton, D. 1973. 'Determining the poverty line', *Social Security Quarterly*, Spring, pp. 18-32.

Stanton, D. 1980. 'The Henderson Poverty Line – a critique', *Social Security Journal*, December, pp. 14-24.

Tran Nam, B. and Whiteford, P. 1990. 'Household equivalence scales: New Australian estimates from the 1984 Household Expenditure Survey', *The Economic Record*, 66(194), pp. 221-234.

Turchi, B. 1983. *Estimating the cost of children in the United States*, National Institute of Child Health and Human Development, Washington, D.C.

Valenzuela, M. 1999. 'Costs of children and living standards in Australian households', *Working Paper No. 8/99*, Melbourne Institute of Applied Economic and Social Research, University of Melbourne, Melbourne.

van de Ven, J. 2003. 'Demand based equivalence scale estimates for Australia and the UK, *National Institute of Economic and Social Research Discussion Paper No. 228*, NIESR,

Watts, H. 1967. 'The iso-prop index: An approach to the determination of differential poverty income thresholds', *Journal of Human Resources*, 2(1), pp. 3-18.

Whiteford, P. 1985. 'A family's needs: Equivalence scales, poverty and social security'. *Research Paper No. 27*, Department of Social Security, Canberra.

Appendix A. Detailed equivalence scales

Table A1. Equivalence scale estimates for Australia published post-1985

Source	Methodology	Data	Number of children			
			1	2	3	4
Engle, Iso-prop and Rothbarth						
Percival and Harding (2005: Table 2)	Iso-prop	1998-99 HES	1.15	1.26	1.35	1.42
Percival and Harding (2000: Table 6)	Iso-prop	1993-94 HES	1.16	1.29	1.40	
Tran Nam and Whiteford (1990: Table 3.1)	Iso-prop	1984 HES	1.25	1.57	1.97	
Tran Nam & Whiteford (1990: Table 3.1)	Engel	1984 HES	1.29	1.66	2.16	
van de Ven (2003: Table 3)	Engel	1993-94 HES	1.24	1.50	1.78	2.06
Lee (AIFS 1999: page 62)	Engel	1984 HES	1.42	1.65	1.83	
Lancaster and Ray (1998: Table 7)	Engel (food excluding takeway food)	1984 & 1988-89 HES	1.22	1.50	1.83	
Lancaster and Ray (1998: Table 7)	Engel (all food)	1984 & 1988-89 HES	1.21	1.45	1.75	
Bradbury (1994: Table VII)	Rothbarth	1988-89 HES	1.16	1.28	1.35	
Lancaster and Ray (1998: Table 7)	Rothbarth (adult clothing)	1984 & 1988-89 HES	1.15	1.32	1.52	
Lancaster and Ray (1998: Table 7)	Rothbarth (adult education)	1984 & 1988-89 HES	1.33	1.76	2.33	
van de Ven (2003: Table 3)	Rothbarth	1993-94 HES	1.06	1.18	1.32	1.47
Budget standards						
Henman (2005)	Budget standards, modest but adequate		1.23	1.46	1.61	1.79
Complete demand systems						
Lancaster and Ray (1998: Table 7)	Barten AIDS	1984 & 1988-89 HES	1.08	1.16	1.24	
Lancaster and Ray (1998: Table 7)	Price Scaled AI	1984 & 1988-89 HES	1.21	1.42	1.63	
Lancaster and Ray (1998: Table 7)	Price Scaled LES	1984 & 1988-89 HES	1.12	1.24	1.36	

Lancaster and Ray (1998: Table 7)	Price Scaled GAID	1984 & 1988-89 HES	1.12	1.23	1.35	
Valenzuela (1999: Table 5)	ELES	1993-94 HES	1.18	1.25	1.34	
Tran Nam and Whiteford (1990: Table 5)	ELES	1984 HES	1.20	1.27	1.44	
van de Ven (2003: Table 3)	Demand system - fixed price effects	1993-94 HES	1.18	1.36	1.54	1.70
van de Ven (2003: Table 3)	Demand system - demographic dependent price effects	1993-94 HES	1.12	1.26	1.39	1.52

Notes: Includes studies published post-1985. The reference family type is a childless couple for whom the equivalence scale takes the value 1.00. HES: Household Expenditure Survey.

Table A2. Equivalence scale estimates for Australia, Budget standards method

Source	Methodology	Data	Number of children			
			1	2	3	4
Henman (2005)	Budget standards, low costs standard		1.28	1.57	1.76	1.96
Simplified Henderson						
Simplified Henderson – Head working, spouse not working (NATSEM version)	Budget standards	Based on 1954 New York data	1.22	1.37	1.59	1.74
Simplified Henderson – Head and spouse NILF (NATSEM version)	Budget standards	Based on 1954 New York data	1.08	1.23	1.45	1.60
Simplified Henderson – Head and spouse working (NATSEM version)	Budget standards	Based on 1954 New York data	1.40	1.55	1.77	1.92
Lovering (1985)	Budget standards	1983 AIFS Survey	1.12	1.28	1.47	

Notes: The reference family type is a childless couple for whom the equivalence scale takes the value 1.00. The estimates of Saunders et al. (1998) are not included since Henman's figures are an updating and extension of the original SPRC work.

Table A3. Selected international equivalence scales

Source	Methodology	Data	Number of children			
			1	2	3	4
Citro and Michael (1995) National Academy of Science	Expert committee ('average of other studies')		1.23	1.45	1.65	1.85
US Department of Agriculture (medium income family) (Lino 2004)		1990-92 CEX (Average income)	1.22	1.36	1.43	1.57
Official US Poverty Threshold (cited in Citro and Michael 1995)			1.20	1.51	1.78	1.99
OECD New			1.20	1.40	1.60	1.80
OECD Old			1.29	1.59	1.88	2.18
Square root of household size			1.22	1.41	1.58	1.73
UK Child support scheme	Program rules	2005	1.15	1.20	1.25	1.25

Notes: The reference family type is a childless couple for whom the equivalence scale takes the value 1.00. The US Department of Agriculture estimates are based on the following assumptions about the ages of children. For 1 child assume child is 9-11 years, 2 children: 3-5 years and 9-11 years; 3 children: 3-5 years, 9-11 years and 15-17 years; 4 children: 3-5 years, 9-11 years, 12-14 years and 15-17 years.