Costs of Children and Equivalence Scales: A Review of Methodological Issues and Australian Estimates

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Abstract

Estimates of the costs of children are used in the design of a wide range of economic and social policies. This paper provides a review of the different approaches that have been used to define the costs of a child and the estimation methods used. The paper summarises the results of Australian estimates of the costs of children since 1985. An important conclusion is that there is no unambiguous 'true cost' of a child and that the estimated costs are sensitive to the estimation method used. One way of producing costs of children for policy purposes is to take the average of all available credible estimates. This approach is used in this paper.

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1. Introduction

Economists have long attempted to define and estimate the costs of children and how they vary by family income and the age of children. Estimates of the costs of children have been used in designing a wide range of economic and social policies. For example, the costs of children can be used by policy makers when setting the level of child related payments and how they differ between families of different size and with children of different ages.[1] Similarly, support is sometimes provided to families with children in order to reduce the private costs of children, with the objective of encouraging higher rates of fertility. Estimates of costs of children are also necessary for the purposes of measuring rates of poverty. Another example relates to the design of child support schemes and determining how much child support separated parents should receive and be required to pay. Estimates of the costs of children are also used

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[1] A recent review of the Australian tax-transfer system (the "Henry Review") has emphasised the importance of the costs of children in relation to family and youth assistance (e.g., Recommendations 90 and 91).

in court cases; for example in determining compensation from a failed sterilisation procedure. As emphasised by Saunders (1999a, p. 63) 'there is an ongoing need to ensure that the best possible estimates of the costs of children are available so as to inform public debate and policy formulation'.

There is no consensus on how to either define or estimate the costs of children, with several approaches having been developed and implemented. The lack of consensus on how to define and estimate the costs of children is problematic since the estimated costs of children are sensitive to the definition and estimation method used.

A useful definition of the costs of children, provided by Bradbury (2004, p. 1), is:

> 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.

The costs of children are often 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.

Empirically, there are several challenges to estimating the cost of children. First, a method is needed to divide a family's expenditure on shared goods into: (a) the portion that should be attributed to children, and (b) the portion that should be attributed to adults. Second, that most existing data sets do not identify the consumption of individual members of the household, and so a method is also needed to divide a family's expenditure on privately (individually) consumed goods (such as food).

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, a key component of which is assessing the costs of households of different size and composition (Citro and Michael, 1995). This review panel concluded that, '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, p. 161).

There have been a number of Australian estimates of the costs of children. These estimates have been made using a wide range of methods. This paper discusses the majority of Australian studies published in the last twenty-five years (studies published since the last comprehensive Australian review). The estimates exhibit considerable variability and given, as will be discussed in this article, no single method is entirely satisfactory, one approach to producing a 'consensus' estimate of the costs of children that 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). This paper updates the work of Whiteford (1985) by calculating the average of the majority of post-1985 Australian estimates of the costs of children. The scope of this paper is limited to considering the direct financial costs of children to their parents.[2]

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[2] The additional money that is needed by parents to raise children is only one of the costs of children. Children require (usually substantial) time inputs 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 to the costs of children in the form of public education and health care.

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The remainder of this paper is structured as follows. In section 2 the approaches that 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 and the evidence on the extent to which the costs of children vary with family income and the age of children is discussed. How research on the costs of children can be related to expenditures on children is discussed in section 4, and the final section concludes.

2. Defining the Costs of Children

A useful way of summarising the literature on the cost of children is in terms of the question that it is attempting to answer. Browning (1992, p. 1440) identified four distinct questions that the literature has sought to address. Of these questions, the following three are most relevant to the design of social policy:[3]

(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? This question relates to the consumption level of the children in the household – which is different to the cost of children to the parents.

(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?

While both the needs and the iso-welfare questions involve estimating how much money families with differing numbers of children require to achieve a certain living standard, in fact the questions are quite different and are derived from very different intellectual approaches. The question about needs involves judgements being made about the bundle of goods and services needed to maintain children. It was the focus of much of the literature on the costs of children pre the 1940s (see Browning, 1992, for a detailed discussion). The iso-welfare question asks the question as to how much income families with differing numbers of children required to achieve the same level of welfare (utility).[4]

The question that is most appropriate depends upon the purpose for which the information will be used. For example, if the conceptual basis of a child support scheme is that parents should contribute what they would have pre-separation to the cost of their children, then the expenditure question is most 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.

An argument that has been made in the literature is that while children have

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[3] The fourth question identified by Browning (1992, p. 1440) was: '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 policy questions such as the design of child support schemes or the setting of income support and family payment levels.
[4] Bradbury's definition of the costs of children discussed above is the iso-welfare question.

costs associated with them they also bring benefits to parents and that these benefits need to be taken into account when comparing the welfare of childless people with parents and between parents with different numbers of children (e.g., Pollak and Wales, 1979). Pollak and Wales (1979) term equivalence scales which measure the cost of children but not their benefits as conditional equivalence scales and those scales which take account of choice of household composition by defining preferences over both demographic composition and consumption bundles (and hence the benefits of children) as unconditional equivalence scales.

Pollak and Wales (1979) argued that unconditional equivalence scales (and implicitly the cost of children) are needed to compare the welfare of different family types. According to this argument equivalence scales that do not measure the benefits of children will overestimate the costs of children.

Other researchers have argued that equivalence scales that do not measure the benefits to parents of children are valid for many policy applications, particularly those concerned with the expenditure that parents are required to make raising their children (e.g. Deaton and Muellbauer, 1986; and Nelson, 1993). For many policy applications it is the standard of living rather than subjective happiness that is the more relevant concept.

Needs Question

The needs question dominated most of the pre-1940 debate concerning the costs of children (Browning, 1992; Nelson, 1993; and Whiteford, 1985). Discussion of needs leads to prescriptive judgements about 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'.[5] The origins of the budget standards method can be traced back to the work of Rowntree (1901; 1942), who attempted to identify the minimum costs of maintaining a family at a subsistence standard of living in York in the United Kingdom.[6]

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,[7] to expert estimates of a comprehensive, detailed list of budget items.

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[5] This method is also known as the 'basket of goods', 'expert budget' or 'standard budget' method.
[6] The summary in this section of the history of Australian budget standards research draws heavily upon Saunders (1998; 1999b), Whiteford (1985) and Stanton (1973; 1980). The early history of poverty measurement and the use of equivalence scales is of interest. Charles Booth established a 'line of poverty' for his study of poverty in London in the 1880s and 1890s. He noted in his study that, 'to facilitate comparison, every family has been reduced to an equivalent in "male adults" – allowing three-fourths for a woman and in proportion for children'. (Booth, in Fried and Elman, 1971). Seebohm Rowntree played a key role in establishing the equivalences contained in the recommendations of the Beveridge Report – see Harris (1977, p. 397-399) and Veit-Wilson (1992). The pioneering work of Rowntree and Booth has been the subject of mis-representation in the literature – see Spicker (1990) and Veit-Wilson (1986).
[7] This is the approach adopted by Orshansky (1965; 1969) in the development of poverty lines in the US. Orshansky's estimates were based on expenditure on food. It has been reported that the Obama Administration in the US has recently adopted an alternative approach to poverty measurement, by taking a wider regimen of items into account beyond food, including expenses such as housing, utilities, child care and medical treatment. Goldstein (2010).

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. The longstanding and widely used Henderson poverty line was derived using budget standard estimates of the costs of children in the early 1970s. Interestingly, the budget standards data used by Professor Henderson were themselves taken from a 'Family Budget Standard', prepared for the Community Council of Great New York in 1954 to adjust their poverty line for differing family structures (see Saunders, 1998; 1999a; and 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). 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. The SPRC estimates provide the basis of the most recent and comprehensive set of Australian budget standards. The SPRC estimates were restricted to Sydney. Henman (2001; 2005) has updated and expanded the SPRC estimates to 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, p. 2). This definition emphasises:

- the material dimensions of wellbeing rather than its psychological or subjective determinants;
- that a very specific list of items that 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.[8] While this may seem like a simple exercise, in reality it is complex. Saunders (1999b) has identified three main approaches: the individualised, normative and difference methods. These differ in the way they allocate the cost of items (such as housing, transport, consumer durables and furniture) that are consumed by the household as whole, rather than by any specific individual within it.

The individualised method defines the costs of children to include expenditures that are entirely directed to the child (for example, clothing, education expenses, health care and food). This method excludes shared household costs from the costs of children. The normative method defines the costs of children as the expenditures entirely directed to the child and a proportion of the cost of shared items. This method requires decisions to be made on the proportion of each shared item that should be attributed to children. For the difference method, the costs of children are estimated by calculating the difference in the budget standards for households of different size and composition.

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[8] This discussion of the budget standards approach draws heavily on Saunders' (1999b) discussion of the budget standards methods.

Each method for estimating the costs of children has strengths and weaknesses. The individualised method is likely to underestimate the costs of children because it excludes shared household costs. Its advantage is that it is relatively straightforward to apply. The main advantage of the normative approach is that it attributes some of the shared costs to children. Its main limitation is that it can be difficult to determine what proportion of the costs of each shared item should be attributed to children. The main attraction of the difference method is that it is simple to apply and does not include in the costs of children the costs that would have been incurred in a childless household. Its main weakness is that some of the cost differences between households with and without children may reflect changes in the behaviour of adult household members in response to the presence or absence of children.

There are several limitations with the budget standards approach. It requires that normative judgements be made about the goods and services needed to achieve a particular living standard. For some goods and services, there are official or quasi-official guidelines that provide guidance to the developers of budget standards (e.g. food and housing standards). For others, there are no official standards and so the advice of experts is required.

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 that determine behaviour. Saunders (1998, p. 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'. However, it is difficult to determine what the basic needs are without being influenced by actual consumption that is itself constrained by available resources. Therefore normative standards based on social norms will reflect actual (and often constrained consumption) rather than a pure objective assessment of need. Whiteford (1985, p. 17) 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'. As Rein (1970, p. 49) has also noted, 'like the search for the philosopher's stone, the efforts to discover an absolute and value free definition of poverty based on the concept of subsistence proved abortive'.

The Expenditure Question

In principle, this question can be answered by using surveys that ask 'who gets what' in the household. However, the available data sets generally do not contain information on intra-household expenditures. What is possible to do using expenditure data is to identify how expenditure patterns vary across families with different numbers and ages of children.

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 further below). To infer expenditures on children from expenditures on adult goods requires identifying the

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assumptions made. 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. None of the assumptions used in the literature are entirely plausible.

The Equivalent Living Standards Question (Iso-Welfare Question)

The equivalent living standards concept of costs is a measure of the additional income required so that 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 raising of children as well as the extent of support received from outside the household. This question is often termed the iso-welfare question. 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

Several different approaches have been developed to estimate the equivalent living standards concept of the costs of children. The Engel procedure uses the share of the family budget devoted to food as an indicator of living standards Engel (1895). Engel argued that the share of food in the budget correctly indicates the standard of living across families of different types. Using this assumption, the cost of a child is calculated by estimating how much must be added to the budget to restore the family's food share to its original value.[9] Watts (1967) extended the Engel method to include both the share of food and other necessities, and this is called the Iso-prop approach.

The Engel and Iso-prop methods rely on the proportion of the budget spent on food (or other necessities) correctly indicating family welfare. A major limitation of the method is that, since a child consumes mostly food and clothing, providing an income that will allow the share of the family budget spent on food to return to the pre-child level will overestimate the costs of children (see Nicholson, 1976). A further criticism is that the Engel method ignores the impact of the addition of a child to a household's preference between items.

Rothbarth Method

An alternative measure of the standard of living of a family is expenditures on goods that are consumed only by adults (Rothbarth or adult goods approach). As discussed above, a variant of this approach has been used to estimate how much parents spend on their children. The logic underlying this method is that children bring needs but not resources to a family, and those needs can be met only by making cuts elsewhere in the budget.[10] 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.

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[9] 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.

[10] In Australia (and most other developed countries), many families with children receive child-related income supplements from the government to assist with the costs of bearing and raising children. Therefore, in reality, children bring additional resources to a family.

The Rothbarth method defines the costs of children as the reduction in income that 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 serious 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' income. It is therefore difficult to find adult goods where consumption is unaffected by children. In practice, tobacco, alcohol or adult clothing are often used as adult goods. However, it does seem rather strange to equate welfare, for the purposes of estimating the costs of children, with consumption of tobacco or alcohol given the addictive nature of such goods and the negative effects on children that can be associated with the consumption of these goods. While expenditure on adult clothing does not suffer from the same plausibility issue as does tobacco or alcohol, it accounts for only a small share of the budget and hence estimates based on this method tend to be imprecise.

'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. 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 various items. For example, the birth of a child will increase the price of outside entertainment for a couple if babysitting 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).

These methods assume a particular relationship between the consumption of each category of goods (also termed demand), the number and age of family members, and the level of wellbeing within the family. Once this relationship is specified, it is possible to determine how much expenditure would have to increase in order to hold wellbeing 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 that 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.[11]

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.[12] This approach has been widely used overseas, particularly in Europe, but not in Australia. The main advantage of the subjective

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

[12] For discussion of the subjective method, see Bradbury (1997), and Citro and Michael (1995).

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 living standards to that of people in similar families and not to other family types. Bradbury (1989) argued 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.

3. Australian Estimates of the Costs of Children

In this section, Australian estimates of the costs 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 an extensive international literature on the costs of children that is not considered in this paper.[13]

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 per cent of the income of the childless couple in order to enjoy the same standard of living.

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 to an equivalence scale of budget standards estimates of the costs of children to achieve a certain standard of living requires the conversion of the dollar costs to a percent of income. The level of income relative to which the costs of children are expressed will affect the percentage costs of children.

A feature of most estimates of the costs of children is each additional household member adds less to the costs of the household than the addition of the previous household member (i.e. economies of scale in consumption). Economies of scale in consumption can be generated by the existence of goods and services that are jointly consumed[14] or from purchasing produce in bulk, which might be cheaper.

Sensitivity of the Costs of Children to the Estimation Method

The effect of the estimation method on the costs of children is illustrated by Lancaster and Ray (1998) who used the 1984 and 1988-89 Household Expenditure Surveys for Australia to estimate the costs of children using eight different methods: two variants of the Engel method, two variants of the Rothbarth method and four variants of demand system methods.

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[14] See discussion in Whiteford (1985) and Henman *et al*. (2005)for information on overseas estimates.
[14] 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.

A summary of Lancaster and Ray's (1998) estimates is shown in table 1. It is apparent that the estimates 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 to 1.33 when estimated using the Rothbarth method. The sensitivity of the Rothbarth method to the precise choice of adult goods is clearly demonstrated by Lancaster and Ray (1998). For example, for a household consisting of two adults and one child the equivalence scale varies from 1.05 when the adult good is 'adult entertainment' or 'food out (takeaway)' to 1.30 when the adult good is 'adult education' (tertiary education).[15]

Table 1 - Sensitivity of Estimated Costs of Children to Estimation Method, Estimates of Lancaster and Ray

	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 Barten Almost Ideal Demand System	1.08	1.16	1.24
Price Scaled Almost Ideal	1.21	1.42	1.63
Price Scaled Linear Expenditure System	1.12	1.24	1.36
Price Scaled Generalised Almost Ideal Demand System	1.12	1.23	1.35

Source: Lancaster and Ray (1998, table 7).

The Average of Australian Estimates of the Costs of Children

One of the aims of this paper is to assess the extent to which the estimated costs of children has changed in the 25 years since Whiteford (1985) reviewed estimates of the costs of children and used the average of the existing equivalence scale estimates to provide an estimate of the costs of children that can be used for social policy purposes. Whiteford (1985, p. 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!'

As argued in this article, despite the large number of studies that have been undertaken in the two decades since Whiteford's original study, it still holds that there is no objective procedure for measuring the costs of children, and taking the average of all approaches is a valid method of estimating the costs of children for policy purposes.

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[15] The equivalence scales are from Lancaster and Ray (1998, table 3) and are for the quadratic specification. When the adult good used is Tobacco the equivalence scale for a couple with one child is 0.89.

In this section, the results of the majority of Australian studies since 1985 (when Whiteford conducted his review) are summarised. 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.[16]

Table 2 presents the average of all post-1985 Australian equivalence scale estimates[17] and the average of the pre-1985 studies (from Whiteford, 1985). Also presented in table 2 is the average of the post-1985 studies that use the Iso-prop and Rothbarth methods.

Table 2 - 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	1.58	1.66
Post-1985 iso-prop and Engel estimates	1.23	1.46	1.71	1.74
Post-1985 Rothbarth method estimates[c]	1.18	1.39	1.63	
Post-1985 iso-prop and Rothbarth method estimates	1.21	1.44	1.69	1.65
Post-1985 budget standard study (Henman, 2005)[d]	1.23	1.46	1.61	1.79

Notes: [a] The pre-1985 Australian average is that calculated and reported in Whiteford (1985). The geometric mean is reported. Whiteford did not calculate the average of equivalence scales for 4 children. [b] The equivalence scales used to construct the average of the post-1985 estimates of the costs of children are shown in Appendix A, table A1. Not all studies provide an estimate of the costs of children for four children and therefore the average for four 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] There is only one Rothbarth method estimate for four children and so the mean is not presented for estimates of the couple with four children equivalence scale. [d] The 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.

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[16] Although more sophisticated meta-analysis techniques which take account of the precision with which the costs of children are estimated are available, the simple average is preferred in this paper for several reasons. First, the use of the average allows a direct comparison with Whiteford's 1985 review of equivalence scales. Second, with the exception of the budget standards estimates, all of the Australian estimates are based upon data from the Household Expenditure survey and are therefore not subject to large variations in sample size which affect the precision of estimates (an issue which the more sophisticated meta-analysis techniques are designed to take account of). Third, the budget standard estimates because they are not based on a statistical analysis of survey data therefore do not have standard errors associated with the estimates. Fourth, it is not clear that estimation methods, which result in a higher standard error should be discounted given the quite different estimation techniques used.
[17] The average for the post-1985 studies includes the equivalence scales presented in Appendix A, table A1. For the budget standards estimates for Australia made post-1985, the results of Henman (2005) are included. Saunders *et. al* (1998) are not included because the Henman (2005) estimates are largely an update and extension of the earlier estimates. Appendix A, shows equivalence scale estimates for Australia made using the budget standards method.

A number of points can be made about the average costs of children presented in table 2. 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 that 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, however, strong economies of scale for the fourth child. This 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.[18] 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 addressing the equivalent living standards (iso-welfare) question and are therefore concerned with how much income is needed to maintain living standards rather than what families actually spend.

Fourth, consistent with the discussion of the different estimation methods, the average equivalence scale made using the Iso-prop/Engel method are higher than those made using the Rothbarth method (1.23 cf 1.18 for a couple with one child; 1.46 cf 1.39 for a couple with two children; and 1.71 cf 1.63 for a couple with three children). Fifth, there is very substantial variability between equivalence scales estimated using the Iso-prop/Engel method and substantial variability between equivalence scales estimated using the Rothbarth method. For example, for a couple with one child the difference between the maximum and minimum equivalence scales estimated using the Iso-prop/Engel method 0.28 and for the Rothbarth method the difference between the maximum and minimum equivalence scale estimates is 0.27 (see Appendix A).

For a couple with three children the difference between the maximum and minimum equivalence scale estimates is 0.81 for the Iso-prop/Engel method and 1.01 for the Rothbarth method (see Appendix A).

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 and is 1.19 for a couple with one child, 1.38 for two children, 1.58 for three children and 1.66 for four children. It must be stressed that the average will be affected by the addition or 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 that differ to those used in this paper.

The Costs of Children by Income and Age of Children

All Australian studies reviewed found that, in absolute dollar terms, the costs of children increase with income. However, there are relatively few Australian estimates of how

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[18] Australian studies that found economies of scale were Percival and Harding (2000; 2005), Percival, Payne, Harding and Abello (2007), Bradbury (1994), Henman (2005; economies of scale for the third child but not the second), and Valenzuela (1999; economies of scale for the second child but not the third).

the costs of children vary with income in percentage terms. Using the demand system approach, Tran Nam and Whiteford (1990) and Valenzuela (1999) found little variation in the costs of children across income ranges. In contrast, Percival and Harding (2005) and Percival, Payne, Harding and Abello (2007) found that the equivalence scale costs of children decreases as income increases. Henman (2005) found a similar pattern, with the proportion of income needed to meet the low cost standard being higher than the proportion needed to meet the modest but adequate standard.

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 that have found that the costs of children increase with the age of the child include Lee (1989),[19] Lovering (1984), Henman (2001; 2005), Percival and Harding (2000; 2005), Percival, Payne, Harding and Abello (2007), 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 age of the child (e.g. Betson, 1990; Lino, 2004; and Turchi, 1983).

4. Concluding Comments

This paper has provided a review of the different approaches that have been used to define the costs of a child and the estimation methods used. 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 judgement; but this judgement needs to be informed by the available empirical estimates.

No single method for estimating the costs of children is entirely satisfactory. For all practical purposes an approach is needed to synthesise the results from all available credible studies into a single estimate of the costs of children. While a variety of approaches can be taken to producing a 'consensus' estimate of the costs of children one approach is to take the average. This approach was taken by the Ministerial Taskforce on Child Support when developing a new child support formula to determine the amount of child support that separated parents are required to pay to the other parent of their child (Ministerial Taskforce on Child Support, 2005).

There is a gap in the literature as there are very few studies providing estimates of how the costs of children differ between intact couple families and separated families. It is clear that the total costs of children will be higher for separated families because of duplicated fixed living costs and the costs associated with contact. 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). This is an area in which there is a need for further research.

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[19] In Lee's (1989) study, the only exception is that for ages zero and one year the costs of children are higher than for some of the older age groups.

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
Engel, iso-prop and Rothbarth						
Percival, Payne, Harding and Abello (2007, Table 2)	Iso-prop	2003-04 HES	1.14	1.26	1.35	
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 (1989, p. 62)	Engel	1984 HES	1.42	1.65	1.83	
Lancaster and Ray (1998, Table 7)	Engel (food, excluding takeaway 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 GAIDS	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. Some of the papers report equivalence scales for different demographic groups (e.g., age of children) or income levels. In order to maximise comparability between studies the equivalence scale for the average income level or all income groups combined is reported in this table.

References

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

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.

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), 335-61.

Bradbury, B. (1989), 'Family Size Equivalence Scales and Survey Evaluations of Income and Well-being', *Journal of Social Policy*, 18(3), 383-408.

Bradbury, B. (1994), 'Measuring the Cost of Children', *Australian Economic Papers, 33(62), 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*, 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), 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), 720-744.

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

Flik, R. and Van Praag, B. (1991), 'Subjective Poverty Line Definitions', De Economist, 139(3), 311–330.

Fried, A and Elman, R. (eds.) (1971), *Charles Booth's London*, Pelican Classics, Middlesex.

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

Goldstein, A. (2010),'New formula to give fresh look at U.S. poverty', *The Washington Post*, 3 March. http://www.washingtonpost.com/wpdyn/content/article/2010/03.02/ Accessed 11 March 2010.

Harris, J. (1977), *William Beveridge: a Biography*, Clarendon press, Oxford.

Henman, P. (2001), 'Updating Australian Budget Standards Costs of Children Estimates', *Policy Research Paper*, 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, Canberra.

Henman, P. and Mitchell, K. (2001), 'Estimating the Costs of Contact for Nonresident Parents: a Budget Standards Approach', *Journal of Social Policy*, 30(3), 495-520.

Jorgenson, D. and Slesnick, D. (1987), 'Aggregate Consumer Behaviour and Household Equivalence Scales', *Journal of Business and Economic Statistics*, 5(2), 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), 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), 377-391.

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

Lovering, K. (1984), 'Cost of Children in Australia', *Working Paper,* 8, Institute of Family Studies, Melbourne.

Ministerial Taskforce on Child Support (2005), In the Best Interests of Children: Reforming the Child Support Scheme, Report of the Ministerial Taskforce on Child Support, Canberra.

Muellbauer, J. (1977), 'Testing the Barten Model of Household Composition Effects and the Cost of Children', *Economic Journal*, 87(347), 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), 471-493.

Nicholson, J. (1976), 'Appraisal of Different Methods of Estimating Equivalence Scales and Their Results', *The Review of Income and Wealth*, 22(1), 1-11.

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

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

Percival, R. and Harding, A. (2000), 'The Public and Private Costs of Children in Australia, 1993-94', *Discussion Paper*, 48, National Centre for Social and Economic Modelling, 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.

Percival, R., Payne, A., Harding, A. and Abello, A. (2007), 'Australian Childcare Costs in 2007', *AMP.NATSEM Income and Wealth Report*, Issue 18, AMP and the National Centre for Social and Economic Modelling.

Pollak, R. and Wales, T. (1979), 'Welfare Comparisons and Equivalence Scales', *American Economic Review*, 69(2), 216-221.

Ray, R. (1983), 'Measuring the Costs of Children: an Alternative Approach', *Journal of Public Economics*, 22(1), 89-102.

Rein, M. (1970), 'Problems in the Definition and Measurement of Poverty', in P. Townsend, (ed.), *The Concept of Poverty*, Heinemann, London.

Report of Australia's Future Tax System Review Panel (2009), *Australia's Future Tax System*, Report to the Treasurer, Commonwealth of Australia, Canberra (the "Henry Review").

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*, 93, Social Policy Research Centre, University of New South Wales, Sydney.

Saunders, P. (1999a), 'Budget Standards and the Poverty Line', *The Australian Economic Review*, 32(1), March, 43-61.

Saunders, P. (1999b), 'Budget Standards and the Costs of Children', *Family Matters*, 52(Winter), 2-70

Saunders, P., Chalmers, J., McHugh, M., Murray, C., Bittman, M. and Bradbury, B. (1998), 'Development of Indicative Budget Standards for Australia', *Policy Research Paper*, 74, Department of Social Security, Canberra.

Spicker, P. (1990), 'Charles Booth: the Examination of Poverty', *Social Policy and Administration*, 24(1), 21-30.

Stanton, D. (1973), 'Determining the Poverty Line', *Social Security Quarterly*, Spring, 18-32.

Stanton, D. (1980), 'The Henderson Poverty Line: a Critique', *Social Security Journal*, December, 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), 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*, 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*, 228, NIESR, London.

Veit-Wilson, J.H. (1986), 'Paradigms of Poverty: a Rehabilitation of B.S. Rowntree', *Journal of Social Policy*, 15(1), 69-99.

Veit-Wilson, J.H. (1992), 'Muddle or Mendacity? The Beveridge Committee and the Poverty Line', *Journal of Social Policy*, 21(3), 269-301.

Watts, H. (1967), 'The Iso-prop Index: an Approach to the Determination of Differential Poverty Income Thresholds', *Journal of Human Resources*, 2(1), 3-18.

Whiteford, P. (1985), 'A Family's Needs: Equivalence Scales, Poverty and Social Security'. *Research Paper*, 27, Department of Social Security, Canberra.