The Price, Cost, Consumption and Value of Children

Bruce Bradbury
Social Policy Research Centre,
University of New South Wales
b.bradbury@unsw.edu.au

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Abstract

Though they are related, the price, cost, consumption and value of children are not the same. This paper explores two aspects of the relationship between these concepts.

Even if we restrict attention to the domain of commodity consumption, the cost of children is not the same as children's consumption. In this context, the cost of children to their parents is often described with a consumer equivalence scale. It is shown here that, under reasonable assumptions, children's consumption of market goods is less than the 'equivalent income' of the household, but more than the 'cost of children'.

Expenditure costs, however, are only part of the cost of children. This paper uses a variant of the 'adult goods' method to estimate the full costs of children, including both expenditure and time costs. Adult personal time (comprising pure leisure, sleep and other personal care) is used as the adult good. Preliminary estimates using Australian data suggest a very large cost of children. The paper discusses the limitations of the estimation approach and considers the broader welfare implications of these costs.

1. Introduction

This paper has two main goals. The first is to elucidate the relationship between several inter-related and often confused concepts associated with the expenditure of time and money on children. The second is to show how time use data can provide insight into the total cost (in both time and money) of children.

Raising children requires the investment of substantial financial resources from both parents and the state, and most importantly, the input of parental caring and home production time. In thinking about these resource flows, we need to distinguish four different concepts.

- The *price* of a child is the commitment of resources required to raise a child of given 'quality'. It is the relevant concept when thinking about the factors that might influence fertility decisions.

- The *cost* of a child is a measure of the actual amount of 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 monetary cost to the parents is often expressed in the form of a *consumer equivalence scale*, and is often used when comparing the welfare level of different types of household – though this use is controversial.

- Neither the price nor the cost of a child are the same as child consumption, or lest I be accused of following Jonathan swift,[1] *children's consumption*. Most child welfare policies are intended to increase children's consumption in general, or some particular aspect of this (such as education). Because children can share in the consumption of household public goods, they can consume more than they cost their parents.

- Finally, all these concepts are related to, but do not determine, the social *value* of children. In deciding whether society should devote more or fewer resources to children (or parents), we need to consider the impact on parental welfare of the costs of children, our quantitative and ethical valuations of children's consumption, and also a range of externality issues associated with the optimal size and quality of the population. These include concerns about environmental congestion, the financing of pensions, as well as broader values about the type of society that we want leave behind us.

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[1] Swift's (satirical) proposal was that the 'Irish problem' could be solved by selling children to be consumed (eaten) by the rich. "I grant this food will be somewhat dear, and therefore very proper for landlords, who, as they have already devoured most of the parents, seem to have the best title to the children." Jonathan Swift (1729).

Though all four of these concepts are important, the focus of this paper is necessarily restricted to a narrower set of issues concerned with the intra-household allocation of resources, the price and cost of children to parents, and childrens' consumption.

In the next section, a household allocation model is outlined which encapsulates these different concepts. This encompasses the intra-household allocation of time and money between parents and children and household public goods and provides a framework for considering welfare questions such as the cost of children to parents and children's consumption. Sections 3 and 4 then use two simpler versions of this model.

In Section 3 the issue of home production and the time costs of children is ignored. The focus instead is on the intra-household allocation of consumption goods and the relationship between the cost of children and children's consumption. Since this simpler model is directly analogous to previous models of the demand and valuation of public goods in social welfare models, the results from this literature can be drawn upon to aid our understanding of intra-household allocation patterns. This section discusses the valuation of children's consumption, and shows how children's consumption is related to the costs of children to parents.

Children's consumption will generally be greater than the cost of children to their parents because children can share in the consumption of household public goods. That is, there are 'economies of sharing' in households. On the other hand, children will usually receive a smaller share than adults of household commodity consumption because parents value children's needs as less. If we use household equivalent income as the indicator of parental consumption, this implies that child consumption will be less than household equivalent income.

These valuation concepts are useful when we come to combine child consumption financed through the household with the value of services provided directly via the state. For example, in their study of the cross-national distributional impact of non-cash services, Smeeding et al. (1993), add estimates of per-capita noncash services to household equivalent income to obtain an index of the living standards of household members. The above considerations suggest that this approach under-estimates the relative importance for child consumption of state-provided noncash services.

The discussion of child costs and children's consumption in Section 3 is confined to the commodity-based resources consumed by children. However, the most important services consumed by children are the childcare services provided by their parents. This probably remains the case even if we use the 'third-party' criterion to restrict the scope of our attention to those goods and services that are not intrinsic to a particular inter-personal relationship (that is, we exclude 'love and affection' from our calculus).

In this paper, I do not attempt to estimate the contribution of these services to child consumption. Such an examination would need a more thorough-going examination of joint consumption within the household than is possible here. However, it is possible to gain some insight into the full costs of children to parents by drawing upon time-use data.

Section 4 of the paper uses a different simplification of the general model that includes time, but ignores the impact of household public goods. (The implications of this simplification are also discussed). This model then leads to a variant of the 'adult goods' method for the estimation of child costs. The adult good in this context is adult leisure and personal time. Using time-use data from the paper by Craig and Bittman presented at this workshop, simple (ie very approximate) estimates are made of the full costs of children. A notable feature of the model used here is that the time use patterns of the parents can be used to obtain an estimate of the full (both time and money) costs of children.

The estimates of the full costs of children obtained here show that children are *very* expensive.

2. The Modelling Framework

The different frameworks used in this paper are all special cases of the following single-period model describing the intra-household allocation of time and money. To keep the notation simple, I treat the two parents as a single unit, and focus on the allocation between parents and children (though some mother-father differences are discussed in Section 4). Because the framework of this paper is essentially that of a single period, it excludes consideration of the longer-term impacts of children – such as the impact of childrearing on mother's labour market human capital and subsequent earnings.[2]

Parents have an exogenously determined wage rate, w, and income that does not depend on labour hours Y. Their time can be allocated to

h_M market work,
h_A home production for the adults,
h_C home production for the children,
h_P public home production,
h_L or adult leisure and personal time.

Public home production involves the home production of goods and services that can be consumed by more than one member of the household. Activities such as household cleaning and cooking have large components of 'publicness', at least as long as household members respectively drop their dirt in the same place or have the same tastes in food.

Adult 'leisure and personal time' is all time that is not market work or home production. It is thus intermediate between the labour-economic and time-use concepts of leisure. That is, it includes both pure leisure and personal care activities such as sleep (personal care is normally excluded from the time-use concept of leisure), but excludes home production time (usually included in the labour-economic concept of leisure).

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[2] For Australian analyses of women's foregone earnings from childrearing, see Chapman et al (2001) and Breusch and Gray (2003).

The labour time of the parents returns a wage income $w.h_M$. This, together with the exogenous income Y, is spent on either a private consumption good (of which x_A, goes to the adult and x_C to the child) or on a household public consumption good, x_P. We define the private good to have a price of 1 and the public good a price of p.[3]

(Household) public expenditure might include expenditure on goods such as heating or the location of the dwelling. As for home production, many goods exhibit a large component of publicness, even if they not fully non-rival in consumption.[4]

The parents allocate household resources as if they are maximising a household welfare function defined over separate adult and child welfare indices ($U_A(.)$ and $U_C(.)$ respectively).[5] That is

$$\begin{aligned}&\text{maximise } W(u_a, u_c)\\ &\text{where } u_A = U_A(x_A, x_P, h_L, h_A, h_P)\\ &\text{and } u_C = U_C(x_C, x_P, h_C, h_P)\end{aligned}$$

subject to a time budget constraint $h_M + h_L + h_A + h_P + h_C \leq T$ and an income budget constraint $x_A + x_C + px_P \leq Y + wh_M$.

The two constraints can be combined into a full-income budget constraint of $x_A + x_C + px_P + wh_L + wh_A + wh_C + wh_P \leq Y + wT = F$ where F is full income, or the income that can be obtained if all time is devoted to market work.

The index $u_C = U_C(x_C, x_P, h_C, h_P)$ can be interpreted in two different ways. One approach is to think of this as a function indicating the welfare of the children in the household, with $U_A(.)$ providing a similar role for the adults. The overall welfare function $W(.)$ then reflects the parents' preferences as to the relative weights to be given to welfare of the adults and children in the household.

Alternatively, we might think of $U_C(.)$ as representing a production function for a good 'children' – which may include both the number and quality of children.

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[3] If the main interest were on the price of children, x_A and x_C could be defined to have different prices. The model could then be used to consider the impact of an increase in purchased childcare (for example).

[4] The simple model here assumes that goods are either private or pure public. See Atkinson and Stiglitz (1980), Lau (1985) and Bradbury (1997) for formulations where goods are intermediate between public and private.

[5] The functions $W(\cdot), U_A(\cdot)$ and $U_C(\cdot)$ are assumed to satisfy the usual monotonicity and concavity restrictions for welfare functions, which implies that the overall household welfare function $W(.)$ will also. See the discussion in Samuelson (1956, p18, note 1).

This second approach is the most useful approach when thinking about the *price of children*. If the price of any of the inputs to $U_C(.)$ increases then the price of raising children increases also. The price of children will thus be influenced by the relative price of the commodities consumed by children (eg children's clothing) as well as the price of the time spent caring for children (the wage rate).

The demand for children (in either quantity or quality terms[6]) will thus depend upon the income and substitution effects associated with changes in these prices. If adjustment takes place in the quality dimension, it is conceivable (though unlikely) that an increase in the price of children could lead to a *decrease* in the expenditure on each child as parents substitute towards other goods.

The cost of children is not quite the same as the expenditures on children because of the existence of household public goods. The clearest way to think about the *cost of children*, is to use the concept of a *situation comparison* (Pollack and Wales, 1992). The idea here is that we compare the situation of the parents when they have children to their situation when they do not have children. We then ask the question: How high would their income need to be when they have children in order for them to attain the same level of time and money-based utility as when they do not have children? The extra income required is the cost of children.

In other words, we assume that when the parents do not have children in their household they

$$\text{maximise } U_A(x_A, x_P, h_L, h_A, h_P)$$
$$\text{subject to } x_A + px_P + wh_L + wh_A + wh_P \leq Y + wT = F$$

We then seek to compare the full income levels in the households with and without children that lead to the attainment of the same level of $U_A(.)$. In order to make sense of this comparison, it is necessary to assume that the welfare function $U_A(.)$ is normalised so that it takes the same value when it has identical arguments in both household types.

This concept of the cost of children, by definition, does not take account of the direct benefits of parenthood. It does not, therefore, have any automatic implication for economic policies that might seek to maximise equity or efficiency. However, there are several reasons why we might be interested in this concept of child cost.

First, though it is not identical, the concept of child cost is closely related to the level of child consumption (see next section). Children do not receive the benefit of 'parenthood' and social observers and policy-makers might be particularly interested in the children's consumption.

Second, we might think of this one-period welfare model as being embedded within a broader lifecycle model. In this context we might think of the good 'parenthood' as being

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[6] See Becker (1981, Chapter 5) for a discussion of trade-offs between quantity and quality of children.

a state that parents wish to achieve at some stage in their life. However, the cost of this good is concentrated on a particular period of the lifecycle – when the children are living with their parents. An understanding of the costs of children in the single-period context can thus be used to aid our understanding of saving patterns across the lifecycle (Browning and Ejrnæs, 2000). If there are capital market imperfections, there may also be an efficiency role for transfers to families when they have high child costs (Bradbury, 2003).

3. Children's Consumption[7]

One of the most important reasons for looking at the intra-household allocation of resources is because we are interested in children's consumption. Children consume some of the commodities purchased by the household, they receive care and 'domestic services' provided by their parents and receive services directly provided or subsidised by the state (eg education and health).

There is a long tradition of research examining the cost of children from the perspective of the expenditures required by their parents. In this section I examine how this concept of commodity cost is related to the consumption of commodities by children.

In addressing these questions, this section ignores the role of the time costs of children and the parenting care that children receive. This is done so as to permit a linkage with the previous literature on the costs of children and household equivalence scales (all defined within the context of commodity consumption). Many of the principles discussed here will carry through to a broader understanding of child costs, though issues associated with the valuation of adult time costs might make this difficult in practice.

The model used here is a simplification of the general model in Section 2, only considering commodity-based consumption. In this simplified model, the parents

$$\begin{aligned} &\text{maximise } W(u_A, u_C) \\ &\text{where } u_A = U_A(x_A, x_P) \\ &\text{and } u_C = U_C(x_C, x_P) \end{aligned} \qquad (1)$$

subject to a budget constraint $x_A + x_C + px_P \leq Y$. As above, x_A is adult consumption of the private good, x_C is child consumption and x_P is public consumption – a good where each unit can be consumed by both adult(s) and child(ren). The relative price of the public good is represented by p.

This might be considered to be a separable part of a wider parental welfare function which also takes into account time costs to parents and time benefits to children, as well as possibly other factors such as the benefits of parenthood. The assumption of this section, nonetheless, is that that this sub-component of costs and benefits is of interest –

[7] This section is based on Bradbury and Saunders (2003).

even if this is only because it might be more concretely measurable and amenable to policy intervention.

This simple model captures the two key issues considered in the equivalence scale literature on the costs of a child. The 'economies of sharing' arise from the fact that each unit of x_P is consumed by both parent(s) and child. The relative needs of children vs adults arise from the relative weights given to u_A and u_C in the overall welfare function (and/or the normalisations used in $U_A(x_A, x_P)$ and $U_C(x_C, x_P)$).

To economists this model will also be recognised as identical to the model used in the 'pure' theory of public goods as developed by Samuelson (1954,1955). In this context the household welfare function $U(u_A, u_C)$ can be considered as a household equivalent of the social welfare function, with the household decision maker (the parent(s)) being the arbiter of the optimal distribution of consumption-based welfare for the household members.[8]

From public goods theory we know that the optimal consumption of the public good x_P will be that amount which ensures that the sum of the marginal rates of substitution for the adult and child is equal to the price, p. In a household with children the public good is effectively cheaper since both adult and child consume each unit of the commodity.

What does this simple framework imply for the valuation of child and adult consumption? There are three possible ways to value children's consumption. In the household, the child consumes an amount x_C of the private good and x_P of the household good. The first approach is to simply value this consumption at market prices. Total child consumption is thus valued at $x_C + px_P$ (adult consumption is $x_A + px_P$).

However, this assumes that each member values the public good identically. Conceivably, the public good could be something that the parents value, but the children do not (eg an expensive work of art, or possibly a water view). Moreover, the sum of marginal rates of substitution condition implies that consumption of the household good will be increased above the level that any individual would have chosen (unless the remaining individuals obtain zero marginal utility from the good). The marginal value to each individual is thus less than the market price.

This is illustrated in Figure 1, which describes the situation of either the adults or the children. An adult living alone and reaching utility level u_A will consume at point α. The absolute slope of the budget constraint passing through this point is p. However, because each unit x_P contributes to the consumption of more than one person, the optimal solution for the household is to consume a greater amount of the public good, x_p^0. At this point, the marginal value of x_P is relatively low. The 'shadow price' that would have led to this consumption point is indicated by the budget constraint with slope s_A.

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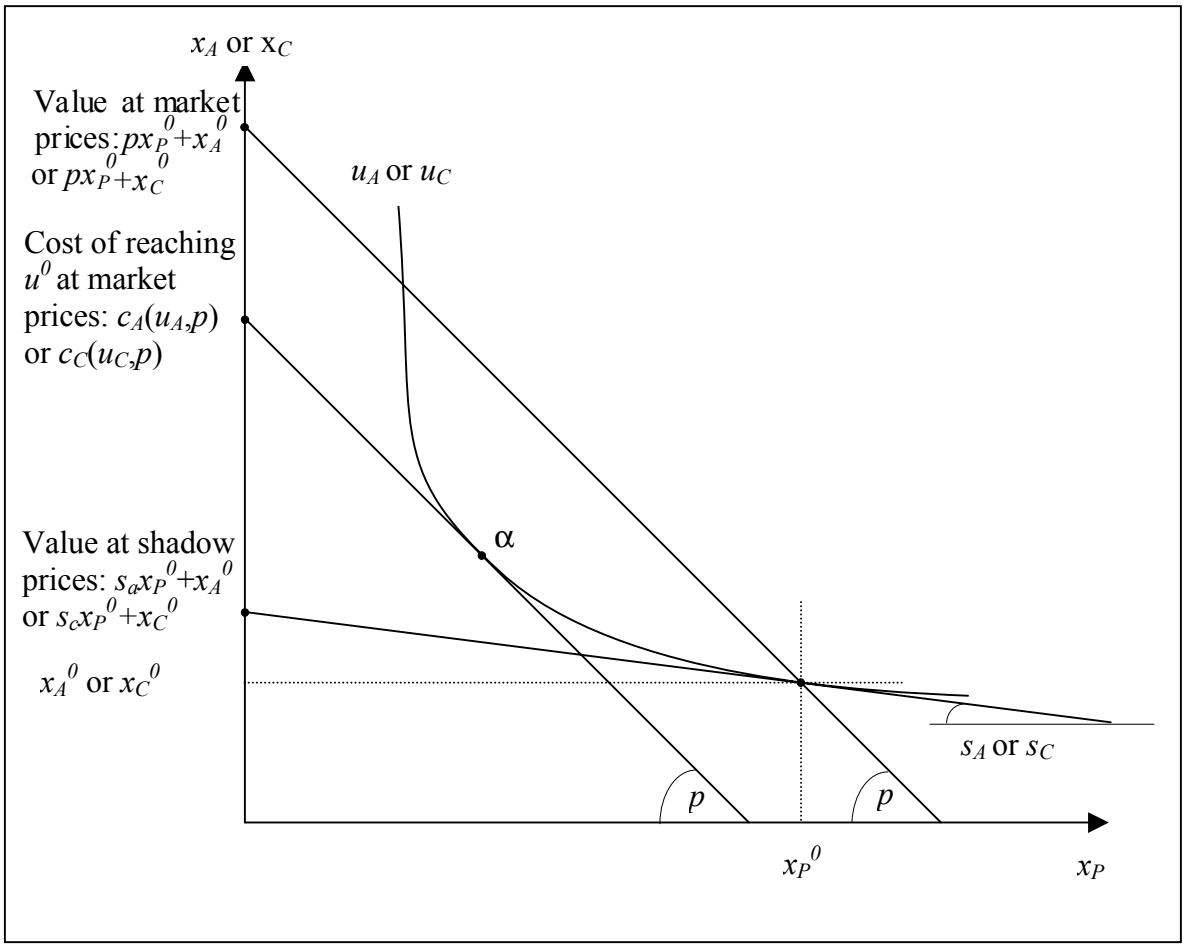
[8] When adults and children have identical welfare functions, this model simplifies to the Barten equivalence scale model (See Nelson, 1988).

Figure 1 Alternative Methods for Valuing the Consumption of Adults and Children



Note: This figure shows an indifference curve for one of the household members (ie corresponding to $U_A(x_A,x_P)$ or $U_C(x_C,x_P)$ in equation (1) where x_A or x_C as appropriate is measured on the vertical axis.

An alternative approach, therefore, is to value the household good at this lower marginal value. This takes into account the fact that the person is 'constrained' to consume more of the household good than they would have chosen at this welfare level. Since the price of the private good is set to 1, the intersection of the budget constraint with the vertical axis shows the value of $x_A + s_A x_P$ (or $x_C + s_C x_P$ for the children). This value is thus lower than the market price valuation of the x_P^0 consumption point.

This marginal valuation approach is used by Lazear and Michael (1988). The price of the household good is set equal to the marginal rate of substitution in the child's utility function when x_P^0 is consumed (and similarly for the adults). However, the sum of these marginal rates of substitution must equal the market price. Since all household members are consuming the same amount of household good, x_P^0, this method implies that the sum

of the value of consumption of each household member must equal the total household expenditure on the household good.

In other words, this approach simply allocates the expenditure on the household good to the different household members in proportion to their relative shadow price valuations. Because this approach does not value the intra-marginal value that each household member places upon the household good, it ignores the economies of sharing which is the essence of household economic life.

A more appropriate way to value the consumption of individual household members is to ask the counter-factual question: How much would it cost to reach the welfare level u_A if the person faced market prices? This is the concept of *situation comparison* introduced in the previous section. As can be seen in Figure 1, this will produce a valuation of consumption that is in-between the market and shadow price valuations.

When the household with children has an income of Y and faces a market price of p, the decision rule of (1) leads to an adult welfare level of u_A. When the adults live alone, the cost of reaching this welfare level is $c_A(u_A, p)$, the cost function corresponding to $U_A(x_A, x_P)$. The *consumer equivalence scale* for the adults is then defined as the ratio between the household income and the income that the adults would require to produce the same welfare level if they lived alone. That is

$$\text{Equivalence Scale: } m = \frac{Y}{c_A(u_A, p)} \tag{2}$$

The equivalence scale may depend upon both the income and price level, though for notational convenience it is denoted here simply as m.

For the household containing children, *equivalent income* is income divided by the equivalence scale, which is equal to the adult consumption level within the household.

$$\text{Equivalent Income = Adult's Consumption: } Y / m = c_A(u_A, p) \tag{3}$$

The *cost of children* can be defined as the additional expenditure required so that the parents can maintain their consumption-based welfare level. This is the expression (2) in difference form

$$\text{Cost of Children: } Y - c_A(u_A, p) \tag{4}$$

These expressions are all from the point of view of the adult's consumption-based welfare. In valuing the consumption level of children in households, it is sensible to use the same approach as for adults. That is, we ask the question: How much would it cost to ensure that the children had the same level of commodity-based welfare if all the commodities they consumed had to be purchased on the market?

This is not the same as simply valuing their within-household consumption at market prices as we take account of the fact that, if they were living in a household where there was no incentive to purchase household goods, they might be able to attain a given level of well-being for a lower cost. For example, less expenditure on aesthetically pleasing housing and more on educational goods and services. Moreover, it is *not* assumed that children would be required to form sensible preferences as to what is best for their well-being (ie there is no desire to cost the effect of children substituting lollies for housing). It is assumed that the preferences $U_C(x_C, x_P)$ are fixed, and that these are determined by the parent's views of what is good for children. Child consumption is thus valued in an identical way to adult's consumption. Using comparable notation it is thus

Children's Consumption: $c_C(u_C, p)$ (5)

The level of children's consumption in the household is related to the cost of children and the consumer equivalence scale. The existence of household goods means that the relationship is not one-to-one, but if we define the equivalence scale as in equation (2) [9] then knowledge of the equivalence scale can be used to place bounds on the value of children's consumption.

We begin by noting that equivalent income is the same as the adult's consumption level. If we recast the above discussion in terms of the consumption level of one particular adult, and compare their situation in the household to that when living alone then it is reasonable to assume that per-adult consumption will be greater than the consumption of each child. In other words, each child's consumption will be less than *Y/m* (where *m* is the equivalence scale for the household compared to that for a single adult).

A bound from the opposite direction can be obtained using the relationship between shadow prices and costs shown in Figure 1. For given *Y* and *p* the household will consume amounts x_A, x_C and x_P with the adults and children achieving welfare level u_A and u_C respectively. Valued at shadow prices s_A, the adults consume an amount $s_A x_P + x_A$. This is an underestimate of the cost of achieving welfare level u_A at market prices, $c_A(u_A, p)$. The same applies for children. Combining these results, and using the result that the sum of the shadow prices will equal the market price, gives

$$c_A(u_A, p) + c_C(u_C, p) \geq s_A x_P + x_A + s_c x_P + x_C = p x_P + x_A + x_C = Y$$

re-arranging… (6)

$$c_C(u_C, p) \geq Y - c_A(u_A, p)$$

or

[9] We might term equivalence scales defined as in equation (2) as 'consumption-based' equivalence scales as they describe the conditions necessary for consumption-based welfare to be constant in different family environments. An alternative approach is to see the equivalence scale as a political statement expressing a social valuation of the needs of different family types. In this case, the link between the equivalence scale and consumption levels is more tenuous.

$$c_C(u_C, p) \geq Y - Y/m$$

We thus have upper and lower bounds for children's consumption

$$\left(1 - \frac{1}{m}\right)Y \leq \text{Children's consumption} \leq \left(\frac{1}{m}\right)Y$$

or

$$\text{Cost of children} \leq \text{Children's consumption} \leq \text{Equivalent income} \qquad (7)$$

Children's consumption is generally greater than the cost of children because there are public goods in the household, which the children consume without incurring additional costs for the parents. On the other hand, children's consumption is generally less than equivalent income, because equivalent income is an indicator of adult consumption, and children generally consume less than adults. If, for example, we are comparing a single adult household with a sole parent with children, and we assume that the equivalence scale is 2.0, then these inequalities become equalities, since this implies that there are no economies of sharing and that children consume as much as adults. Otherwise, the bounds may be quite wide.[10]

This result, it should be remembered, only applies to children's consumption of purchased commodities within the household. If we were to extend this model to include the consumption of childcare and home production services by children, then only some of this would still apply. The impact of public goods is likely to be unchanged; there are public elements to home production in the same way as there are household public goods. Hence, children's consumption, more broadly defined, will still be greater than the cost of children. However, when we take home production into account, we cannot now assume that children consume less than adults, and so the right inequality in the above expression will no longer apply.

4. The Time and Money Costs of Children

There is a large body of research attempting to estimate the cost of children.[11] As noted in Section 2 above, this concept of cost is most clearly understood as a 'situation comparison'. It 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, but does not take into account any direct benefits of parenthood. This cost to parents will be a function of the social norms for the raising of children, as well as the extent of support received from outside the household. For example, a reduction in state subsidies to education will increase the cost of children to parents (other things equal).

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[10] In other work, we are exploring the use of budget standards data as a way of identifying the level of x_C and x_P. See Bradbury and Saunders (2003) for a preliminary exploration of this approach (as well as evidence of non-cash transfers to children in Australia).

[11] For introductions to the literature see Deaton and Muellbauer (1980) and Buhmann (1988).

Most research on the cost of children is developed within the commodity expenditure model described in the previous section. That is, it estimates the increase in income that would permit the parents to have the same level of commodity consumption as they would have in the absence of children. As well as money, however, children also require substantial time inputs from their parents. As Apps and Rees (2002) argue, to restrict attention to monetary costs alone misses out on a key aspects of the cost of children.

One counter-argument is that we are often primarily interested in the costs of children for parents whose labour market participation is constrained (eg the unemployed). Even here, however, it seems extreme to assign a zero marginal value to their time.

This section therefore explores the estimation of the full costs of children, using an adaptation of the 'adult good' method for the estimation of child costs.[12] As will be seen, there are formidable difficulties in the estimation of such a model, both theoretical and econometric. The estimates here should therefore only be considered as indicators of likely magnitudes and as pointers to the issues that need to be resolved when estimating the full costs of children. They also provide a useful entry point to a discussion of the broader interpretation of the costs of children to parents.

The essence of the conventional adult goods approach is that expenditure on goods consumed only by adults (eg adult clothing, tobacco, alcohol) is used an indicator of the commodity-based welfare of the adults. An equivalence scale can then be estimated which shows the (money) income required by a family with children so that the adults can have the same welfare level as when they do not have children in their household.

This paper modifies this approach by using adult leisure and personal time as the adult good.[13] The relationships between this good, family size and full income can similarly be used to obtain estimates of the full costs of children – subject to the caveats outlined below.[14]

To justify the use of the adult good method, we need to simplify the model introduced in Section 2, and ignore the presence of public goods and public home production. The possible bias introduced by this simplification is discussed later. We begin by discussing the costs of a single child for a lone parent.

In this simplified model, an adult living alone divides their time between labour market work, h_M, home production for the adult, h_A and leisure/personal time, h_L, so as to

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[12] Sometimes called the 'Rothbarth' method after Rothbarth (1943). See Deaton and Muellbauer (1986), Bradbury (1994) and Nelson (1992) for further discussion.

[13] Tests of the suitability of the model could be introduced by examining the consumption patterns of various sub-groups of this consumption aggregate (eg sleep, watching TV, other recreation, personal care etc). See Deaton, Ruiz-Castillo and Thomas (1989) for an example of this in the context of commodity consumption.

[14] The closest antecedent in the literature appears to be Apps and Rees (2002) use of adult leisure in the identification of their child costs model, though their estimation approach is quite different to that used here.

maximise $U_A(x_A, h_L, h_A)$. This choice is made subject to a time budget constraint $h_M + h_L + h_A = T$ and an income budget constraint $x_A = Y + wh_M$. The two constraints can be combined as $x_A + wh_L + wh_A = Y + wT = F$ where F is the 'full income' when all available time is devoted to market work.

Implied by this decision process are demand functions for the three goods, income, home production and leisure as a function of the wage rate and full income.

$$\begin{aligned} x_A &= X_A(w, F) \\ h_A &= H_A(w, F) \\ h_L &= H_L(w, F) \end{aligned} \tag{8}$$

When they have a child in their household, the person maximises the household welfare function described in Section 2 (without the public goods). That is,

$$\begin{aligned} &\text{maximise } W(u_A, u_C) \\ &\text{where } u_A = U_A(x_A, h_L, h_A) \\ &\text{and } u_C = U_C(x_C, h_C) \end{aligned} \tag{9}$$

subject to the full-income budget constraint of

$$x_A + x_C + wh_A + wh_L + wh_C = Y + wT \quad \text{or}$$
$$F_A + F_C = F \text{ where}$$
$$F_A = x_A + wh_A + wh_L,$$
$$F_C = x_C + wh_C \text{ and}$$
$$F = Y + wT$$

where x_C is income devoted to child consumption, h_C is parental time devoted to child consumption and U_C can be interpreted either as the child's welfare function, or a production function for the good 'child quality'. Note that h_C includes both childcare time, but also time devoted to home production for the child's benefit (eg cooking for the child, or cleaning up after the child).

Following the reasoning of Section 2, we define the cost of children as being the difference in household incomes that permits the adult welfare levels given by $U_A(x_A, h_A, h_L)$ to be identical in the two household types. This is the key normalisation that makes it possible to compare welfare levels between the two household types. It could be motivated by the lifecycle model described in Section 2.

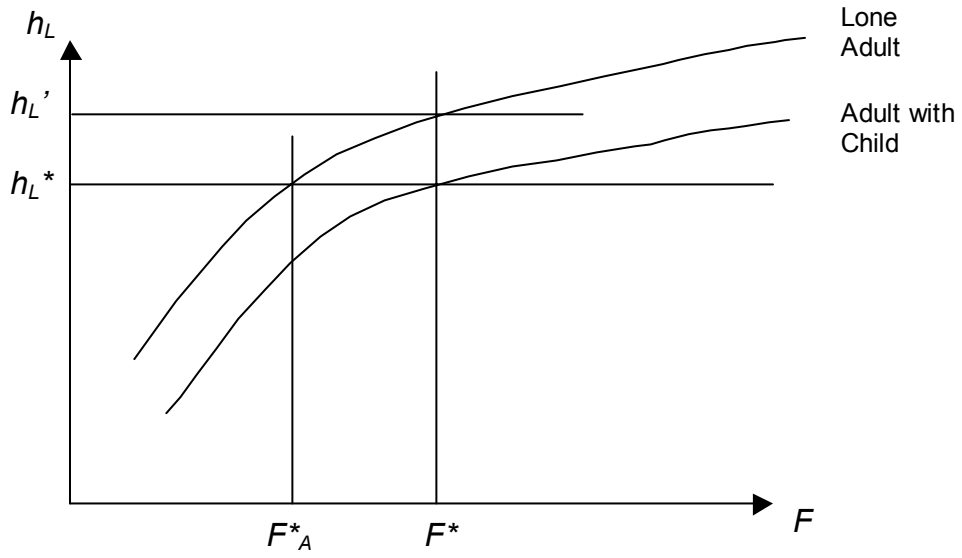
The separable structure of the household welfare function without public goods means that we can consider this as a two-stage problem. In the first stage, full income is divided into adult and child components (F_A and F_C). In the second stage, this income is allocated to consumption of the adult and child goods and time respectively. That is, adult demands will be a function of w and F_A and child demands a function of w and F_C. For adults, this

second stage will be the same as for the single adult (though with F_A replacing F in the demand functions).

Typically, we cannot observe x_A separately from x_C. When we can observe components of x_A (eg adult goods such as adult clothing, alcohol, tobacco), they only form a small part of the budget and are not very reliably estimated.[15]

We also may not be able to separately observe h_A from h_C (home production for adult and child). But we can observe h_L. This is time spent on personal care, sleep, and leisure activities for the adult. We describe this here as 'adult leisure and personal' time. The observed demand function for this can, in principle, be used to recover the full costs of children.

Figure 2 Adult Goods Estimation of the Full Cost of Children



The estimation process is illustrated in Figure 2. We assume that adult leisure and personal time is a normal good, with demand increasing with full income. (The method will also work if the good is inferior as long as the income relationship is monotonic).

For the single adult living alone, we choose a value of full income, F_A^* and a wage rate (w^*). We estimate (8) and obtain the corresponding expected value of adult leisure hours, h_L^*. The family, however, needs to have a higher full income, F^*, before it reaches the same level of adult hours. The two-stage budgeting implied by separability means that adult hours will depend only upon the adult share of full income. Hence, when the family has income F^*, the adult's share of income is F_A^*. Because of separability and the

[15] If we did have data on adult expenditure goods then, in this model, they could also be used to estimate full child costs. Note however, that this would not be a conventional adult good model, since here we require an estimate of the adult good demand as a function of full rather than money income.

monotonicity of the hours function, equality of adult's income means equality of adult welfare. The cost of children is thus F^*- F_A^*. This is the amount by which the family's full income must be higher in order for adult consumption (and hence welfare) in the single adult and family households to be identical.

As is clear from Figure 2, the estimation of this cost requires information on both the slope of the adult personal hours function as a function of full income (holding wage rates constant), and the difference in the adult leisure and personal hours function between the two family types (the vertical distance between the curves). It is generally difficult to estimate both these relationships within the same dataset.

We therefore decompose the difference between F^* and F_A^* by noting that

$$F^* - F_A^* \approx (h_L' - h_L^*) \Big/ \frac{\partial h_L}{\partial F}$$

where $\frac{\partial h_L}{\partial F}$ is the slope of the adult leisure demand curve for the adult living alone (with the wage rate held constant). The numerator of this expression is the (negative) increase in adult hours associated with the presence of the child in the household (holding the wage rate and full income constant). This can be derived from time-use data collections by controlling for proxy variables for wage rates and full income.

Since the only part of F that varies is Y, we can write $\frac{\partial h_L}{\partial F} = \frac{\partial h_L}{\partial Y}$ and then use the constraint $h_M + h_A + h_L = T$ to write $\frac{\partial h_L}{\partial Y} = -\frac{\partial h_A}{\partial Y} - \frac{\partial h_M}{\partial Y}$. The last term is the labour supply income derivative, for which there is a substantial (if not conclusive) body of empirical research.

The term $\frac{\partial h_A}{\partial Y}$ is the income derivative of home production time. There are no research results on this,[16] so here we consider two assumptions. For a low response assumption, we assume that this is zero. That is, an exogenous change in income has no impact upon home production time. For a high response assumption, we assume that the elasticity of home production with respect to income is equal to the elasticity of labour supply with respect to income.

Labour supply responses to exogenous changes in income are usually described in terms of the 'total income elasticity' (Pencavel, 1986). This is defined as $e = w\frac{\partial h_M}{\partial Y}$ and describes the increase in earnings associated with a one-unit increase in non-wage income

[16] Though time use studies have studied the relationship between money income and time use, what we require here is the relationship between time use and exogenous income, ie income that does not vary with labour market time.

(if non-work is a normal good, e is negative).[17] Using this notation, and drawing upon the two alternative assumptions for the magnitude of the home production income response leads to estimates of child costs of

$$F^* - F_A^* \approx w\left(h_L^* - h_L'\right) \Big/ \alpha \, \mathrm{e} \tag{10}$$

$$\text{where } \alpha = \begin{cases} 1 \text{ or,} & \text{(zero home production income elasticity)} \\ \left(1 + \dfrac{\bar{h}_A}{\bar{h}_M}\right) & \text{(home production elasticity equal to labour supply elasticity)} \end{cases}$$

where $\bar{h}_A$ and $\bar{h}_M$ are the mean hours of home production and labour market time for the no-child household respectively.

The cost of children is thus the wage rate times the drop in adult leisure personal hours, divided by a scaling of the total income elasticity of labour supply. If we were not dividing by the total income elasticity, this measure would simply be the opportunity cost of lost leisure, valued at the (net) market wage rate. Dividing by the total income elasticity (the absolute value of which is smaller than 1), increases this cost estimate. This is necessary because the reduction in parental leisure is only one impact of the presence of children in the household. There may also be reductions in adult consumption of commodities (x_A) as well as home production for the adult (h_A). The maintained assumption of this model is that the diversion of resources to child consumption will have an income effect on all these aspects of adult consumption rather than on just the one (leisure) that we can easily observe. This seems reasonable in general, even if the separable structure of the welfare function that produces this result mighty not be a precise reflection of actual behaviour patterns.

The relative cost of the child is thus higher when there is a large drop in adult hours associated with the presence of a child and higher when the (absolute value of) the labour supply income response is lower. The impact of the labour supply response can be observed in Figure 2. A low total income elasticity of labour supply means that the curves will be flat. Holding the vertical distance between the curves constant, it can be seen that equality of adult hours will be achieved when there is a large difference in income levels in the two family types.

This model can be readily extended to couple families in several ways. First, we might simply treat the adults and children as the adult and child is treated in the above model. That is, we have a welfare function for the adults and a welfare function for the children. The results flow through, but now we compare the situation of a couple with no children with a couple with a specified number of children.

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[17] e is not an elasticity, but it is conveniently unitless. It is equal to the uncompensated labour supply elasticity minus the income-compensated labour supply elasticity.

Alternatively, we might add in welfare functions for each adult. The separable structure means that the same results will again flow through. In this case we look at the change in the non-labour hours for each adult, compare it with their own wage and total income elasticity and arrive at cost of children borne by each adult.

How would we expect these costs of children to vary with other factors that vary between households such as parental wage rates, the ages of the children, the patterns of childcare used in the household, and the magnitude of state support for families? There is little evidence of systematic variation in the total income elasticity between different groups (see below), and so we assume this is constant across groups.

Wages

The wage rate enters equation (10) explicitly: children cost more when parents have a higher wage rate (unless there are strong offsetting leisure hours responses).

However, if we express child costs as a proportion of money income there is no clear pattern. For example, if all household income is from wages then the cost of children as a proportion of money income is given by

$$\frac{F^{*}-F_{A}^{*}}{wh_{M}} \approx \left((h_{L}^{*}-h_{L}^{\prime})/h_{M}\right)/\alpha \mathrm{e} \tag{11}$$

That is, the change in leisure hours as a proportion of market work hours, divided by the total income elasticity. If we are prepared to assume *e* constant, then this will only vary with the wage rate if the change in leisure hours (as a proportion of market work) is different for high and low wage workers. It is difficult to predict in which way this might vary.

Gender

Since men have higher average wages than women, the above discussion implies that the costs of children for men will be correspondingly higher. However, as we shall see below, the drop in leisure hours is generally greater for women (at least for young children). This also assumes that the total income elasticity of labour supply is equal for men and women, and that the home production derivative is identical.

Age

Older children require less time parental time, suggesting that the drop in adult leisure and personal time will be less for older children. However, older children also require greater monetary expenditures than younger children. This lowers the parents' living standards. In response, they might reduce their leisure and increase their labour supply. The associated drop in adult personal time could, in principle, be large enough for us to find that older children cost more than younger children.

This example emphasises the fact that though this approach is derived from time-use data, it provides an estimate of *total* child costs including those that find expression in commodity expenditures.

Childcare and other Child Services

Consider first state-provided or subsidised services for children that do not vary with the parent's labour market time. These might include schooling, health care and childcare for non labour market time. In the simple model presented here, the provision of these non-cash services reduces parental expenditure on children (x_C) by the amount that the parents save on these services (which depends in part on whether the parents would have chosen these services in the absence of state provision). These additional resources effectively increase parental income, should be reflected in an increase in parental leisure and personal time and hence will be captured in the measure of child costs presented.

However, the value of some childcare subsidies also depends upon the extent of parental labour market time. Even though this is not explicitly incorporated into the model, these effects are, in principle, captured. If parents of young children increase their hours of labour market time, they often[18] adjust the inputs to child welfare $U_C(x_C, h_C)$ by decreasing h_C (spending less time caring for their children) and increasing x_C (purchasing childcare services). The introduction of a childcare subsidy reduces the price of childcare services, leading to a substitution towards x_C and away from h_C, which may in turn lead to an increase in h_M, market work. It also produces an income effect. It is this income effect that should, in principle, be captured by the patterns of adult leisure time.

5. Initial Estimates of the Full Cost of Children

5.1 Estimates of the Total-Income Elasticity of Labour Supply

A number of studies have surveyed the estimates of the total-income elasticity e arising from the labour supply literature. Pencavel (1986) surveys the US and UK non-experimental labour supply literature. Across the 15 studies that he summarises the median estimate of e for men is –0.29.[19] However, the range of estimates is broad. Excluding the 2 most extreme values at either end, e ranges from –0.06 to –0.44. He concludes that a 'best' estimate of e for men is –0.20. Killingsworth and Heckman (1986) conduct a similar survey for women, finding a median total-income elasticity of –0.09. The variation of estimates is similarly broad.[20] Blundell and MaCurdy (2000) survey

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[18] Alternative strategies are to reduce h_A or h_L (adult home production or leisure). For example, parents might arrange non-overlapping work times to reduce the need to purchase formal childcare.

[19] Calculated from his Table 1.19 and 1.20. This excludes the Wales and Woodland study (for the reasons mentioned by Pencavel) and also excludes those studies which estimate a negative compensated price elasticity for labour supply. The median result for experimental studies is somewhat lower –0.10 which is consistent with Metcalf's (1974) hypothesis of the impact of the non-permanent nature of the experimental change.

[20] This is the median of the 82 estimates of the total-income elasticity presented in their Table 2.26.

more recent studies. They find a median total-income elasticity of –0.07 for men and –0.17 for women. Again, however the range of estimates is broad.

In most of these studies, the primary question of interest is the magnitude of the wage elasticity of labour supply. Identification of the income effect is usually achieved via strong assumptions about the exogeneity of capital or spouse income. A limited number of studies have more directly addressed income effects by seeking empirical examples where there is exogenous variation in incomes. A recent example is Imbens, Rubin and Sacerdote (1999) who look at the changes in behaviour associated with lottery winnings. They estimate a total income elasticity of around –0.03 to –0.06. They find little variation by sex and age.

It is clear that there is no simple consensus value of *e* arising from the research literature. The exogeneity of lottery winnings makes the results of Imbens et al particularly appealing. However, many of the labour supply surveys estimated a much stronger income response. As a compromise I take –0.1 as my preferred value for *e*. However, values of *e* ranging from –0.05 to –0.2 could be justified on the basis of some sub-sets of the research literature. This implies that the estimates of child costs could be between half and double those presented here. Finally, given the wide variation in results for both men and women, there does not seem to be any justification for assuming that men and women have different income elasticities.

5.2 Estimates of the Full Cost of Children

The starting point for this calculation is the paper by Craig and Bittman (2004) presented at this workshop. They describe how parental time use patterns vary as the composition of their household changes. For the estimation method presented here, the key relationship is that between parental leisure/personal time and family composition. Table 1 presents Craig and Bittman's estimates of this relationship controlling for the age and education level of the parents.[21] The estimates differ slightly from those presented in their paper for the reasons described in the note to the table. Leisure and personal time is defined as all time other than time spent in market work or in home production (which includes childcare).

The sample size for these calculations is not very large, and so some of the patterns observed here are likely to be due to sampling error.[22] Nonetheless there are some interesting patterns. Starting with the 'both parents' panel, it can be seen that, when the youngest child is aged 0-2, the parents' leisure time is reduced by around 2 hours (per day) when they have one child and 3.6 hours when they have two. Having three children

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[21] Age and education serve as (an imperfect) proxy for the full income of the household. One possible improvement would be to take explicit account of the child-related income transfers received by families with children. Doing this would tend to increase the cost of children estimates shown here. Child-specific transfers mean that parents have a higher full income than an age and education matched group of non-parents. Removing this difference would reduce their full income and hence leisure hours.

[22] See Craig and Bittman (2004) for approximate standard error estimates (based on the assumption of independent diary-days).

actually leads to an increase in parental leisure time. Craig and Bittman speculate that this might be due to the capacity for the older child to supervise the younger.

When the youngest child is aged 3-4 the time cost is around 3 hours for both one or two children, and again lower for the three child household. With older children (up to age 11, Craig and Bittman don't consider older children), the time cost is lower for the first child then increases more steadily with increasing numbers of children.

Table 1 Change in Parental Leisure and Personal Time Associated with the Presence of Children, Australia 1997 (hours per day)

Number of Children	Age of Youngest Child 0-2	3-4	5-11
	Both Parents		
0	0	0	0
1	-1.9	-3.0	-0.8
2	-3.6	-2.9	-1.9
3+	-2.5	-1.9	-2.2
	Mother		
0	0	0	0
1	-1.4	-1.5	-0.5
2	-2.3	-1.7	-0.9
3+	-1.7	-1.5	-1.1
	Father		
0	0	0	0
1	-0.3	-1.5	-0.5
2	-1.4	-1.0	-1.1
3+	-0.6	-0.5	-0.9

Notes: ABS *1997 Time Use Survey*, Confidentialised Unit Record File. Estimates provided by Craig and Bittman, based on those in Craig and Bittman (2004) using an OLS regression of combined paid and unpaid work time controlling for education, age, day of the week and disability status. Parental leisure and personal time is all time other than paid or unpaid work. The regression is estimated over couple-headed households where the head is aged 25 to 54, and there are either no children, or children aged under 12 only. The corresponding estimates in Craig and Bittman (2004, Figure 2.4) also control for household income.

The second and third panels of the table show how this time cost accrues to the mother and father respectively. As Craig and Bittman show, most of the adjustment of the mother comes about via increases in home production (including childcare) time, whereas most of the father's adjustment arises through increases in labour market participation. For the youngest children, more of the time cost falls on mothers, while for the oldest age group the adjustment is more equally shared (though see below for the limitations of this time use measure).

The data in this table represents the term $-(h_L^* - h_L')$ as defined in equation (10). This can be combined with estimates of the net marginal wage rate ($12.00 and $10.30/hour

for men and women respectively)[23] to obtain estimates of the cost of children as they accrue to mothers and fathers. Some initial estimates are shown in Table 2, for families with two children only.

Table 2 Full Cost of Two Children, Australia 1997, $ Per Week

Age of Youngest Child	Change in Leisure/ Personal Time (hours/week)	Home Production Elasticity: Zero	Home Production Elasticity: Same as Market Labour
	Mother		
0-2	-16.1	$1,658	$1,036
3-4	-11.9	$1,226	$766
5-11	-6.3	$649	$406
	Father		
0-2	-9.8	$1,176	$735
3-4	-7	$840	$525
5-11	-7.7	$924	$578

Notes: Calculated using expression (10) using wage rates of $10.30 and $12.00/hour for mother and father respectively. The parameter α is calculated using mean market and non-market hours of 3.0 and 5.0 hours for both men and women (in couples without children).

Apart from the large absolute value of child costs (discussed further below), the most interesting feature of this table is the relative values for men and women. For young children, mothers bear a higher cost, but this is reversed when the youngest child is aged 5-11. The latter result is due to the relatively equal hours cost as shown in Table 1, together with the higher wages (and hence higher opportunity cost) of fathers.

There are two main reasons why we should be very cautious with respect to this conclusion. First, it does assume that the labour supply and non-market home production income 'elasticities' are the same for men and women. Even though the literature doesn't provide evidence of different elasticities, this has not been subject to tests of any great power.

Second, the time use patterns shown in Table 1 are based upon primary time patterns only. Craig and Bittman (2004) show that much time which is recorded in the survey as a primary activity of leisure or personal care, is also coded as having a secondary activity of child supervision. Moreover, this is more likely to happen for mothers rather than

[23] In 1997 the mean gross weekly wage for male and female employees paid for between 35 and 39 hours was $691 and $591 respectively (ABS *Weekly Earnings of Employees (Distribution), August 1997*, Cat No. 6310.0, Table 6. For both men and women, this is the modal hours category presented in this table). Assuming a mid-point of 37 hours implies gross wage rates of $18.68 and $15.97 per hour for men and women. For people earning this wage all year, the marginal income tax rate (including Medicare levy) was 35.5%. We therefore use net marginal wage rates of $12.00 and $10.30 per hour for men and women respectively.

fathers. A narrower definition of leisure which excluded this time would show a greater share of the cost of children as falling on mothers.

A more meaningful way to gain a feeling for the magnitude of these child costs is to compare them with the money income level of the average household. One way of doing this is to use expression (11). The time use survey reports mean hours of market work as 39 hours per week for fathers and 19 hours for mothers.[24] Using the total of these hours (58) as h_M in expression (11) yields the estimates shown in Table 3.

Table 3 Household Full Cost of Children Relative to Mean Money Income, Australia 1997

Number of Children	Age of Youngest Child 0-2	3-4	5-11
Home Production Elasticity = 0			
1	2.2	3.6	1.0
2	4.3	3.5	2.3
3+	3.1	2.3	2.7
Home Production Elasticity = Market Labour Elasticity			
1	1.4	2.3	0.6
2	2.7	2.2	1.4
3+	1.9	1.4	1.7

Notes: Calculated using expression (11) using a mean weekly market hours of 58, e=-0.1, and α=1 or 1.6.

It is clear, first of all, that the estimates are very sensitive to our ignorance of the magnitude of the income response of home production. Recall also, that arguable values for the total income elasticity of labour supply could lead to results that were between half and double these estimates. Nonetheless, even with these caveats these results do serve to illustrate the large magnitude of the full cost of children to their parents.

By way of comparison we could note that the simple square root equivalence scale often used in income distribution analysis implies that a two-child family requires an income 1.4 times that of the couple without children. In other words, the additional cost of two children is 0.4 times the money income of the couple without children. The per-capita equivalence scale (usually considered the largest feasible scale) implies an additional cost ratio of 1.0. For a two-child household where one child is aged 0-2, Table 3 shows a corresponding ratio of either 2.7 or 4.3. Even if we were to double the income elasticity, this would still be well above the per-capita equivalence scale.

However, this result is not implausible. The idea that the per-capita scale is an upper bound arises from the assumption that children consume less than adults (and that their are no dis-economies of household scale). When time costs are included, there is every

[24] This is mean hours of work per week as reported in the questionnaire part of the survey rather than the time diaries. It is for all families included in Table 1. Corresponding hours for couples without children would be somewhat higher.

reason to believe that young children will have a greater impact upon the parents' living standard than would the presence of another adult in the household.

Finally, the table also shows how costs vary with the age of the youngest child. For the two-child household they decreases with age, but for larger and smaller households there are U and inverse-U shaped patterns. A decline with age is what we would expect with respect to the time spent caring for children. However, these results also include the impact of expenditures on children (via their impact on parental labour supply). Though these particular patterns might not be statistically significant, there is no theoretical reason that would require the total cost of children to fall with age.

5.3 Limitations

First, and most obvious, are the econometric limitations of the estimates presented here. Even though concepts such as the income elasticity of labour supply have been subject to much econometric research they still remain very imprecisely measured. Even less is known about the income elasticity of home production time. The model does also not explicitly incorporate any labour market rigidities. The estimates presented here should thus be considered as indicating the type of information required to estimate the costs of children, and only as very broad estimates of likely magnitudes.

Assuming that we could indeed reliably estimate it, what are the theoretical limitations of the model and what do these suggest more generally about other attempts to measure the cost of children? I list some key issues here, starting with an issue particular to the adult good model, but then moving on to consider issues that also have wider applicability.

Joint consumption/production in the household

This is a standard criticism of the adult good model. The adult good model, whether in expenditure or in time, does not take account of the economies of household scale in consumption and/or home production. For example, elements of household expenditure may include household public goods. In this case, each unit of the good provides consumption services to all household members, and there is no need to purchase more when there are more people in the household. Similarly, the home production for the adult may be produced jointly with home production for the child. For example, sweeping the house requires much the same effort irrespective of the amount of dirt, and cooking a larger meal requires only a little more effort (assuming the tastes of adult and child are sufficiently similar).

Though joint consumption/production clearly has major implications for household economic behaviour and welfare, the omission of this from the model is not as serious as it might seem at first glance. We can think of joint consumption/production as having both and income and a substitution effect. The income effect arises because it is now possible to produce more final consumption for the same amount of expenditure or time input. The substitution effect arises because these jointly produced goods are now effectively cheaper than in smaller households.

The adult good model captures the income effects of joint consumption, but not the substitution effects. To the extent to which joint consumption raises the real income of the household, this will (appropriately) be reflected in demand for the adult good.

The omission of public good substitution effects probably leads to an over-estimation of the cost of children. This is because joint consumption/production will make goods other than adult personal time relatively cheaper in the larger household. (This assumes no joint production of adult personal time – this possibility is addressed separately below). The substitution effect will mean a shift towards these jointly consumed goods in the larger household, and hence less consumption of the adult good. The adult good method, however, will interpret this substitution as representing an income effect and hence will over-estimate the drop in real adult income, and hence over-estimate the cost of children.[25]

The magnitude of this over-estimation will depend upon the extent of joint production or consumption and the price elasticity of adult personal time.

Secondary Time Activities

The time use described here only refers to 'primary activities'. As mentioned above, many parents (particularly mothers) record a leisure/personal activity as primary, but are also undertaking a secondary childcare activity at the same time. If we were to conduct the adult good examination of the basis of the narrower activity of leisure and personal time where there is no secondary childcare, then the estimated costs of children would be larger.

Joint Consumption of Adult Personal Time

However, if we are prepared to consider joint consumption of different types of adult good, then we might conclude that the estimates are biased in an opposite direction. In particular, what if adult personal time is jointly produced/consumed along with time devoted to childcare? This is a fundamental issue for this and any other method used to estimate the time costs of children.

Adult leisure and personal time includes sleep, personal care and leisure activities. If we think of the good 'leisure' then it is conceivable that time spent on some aspects of childcare might be effectively jointly producing leisure at the same time. Supervising children in play activities might both count as childcare service to the child, but also be an activity very close to leisure for the adult. If this is the case, then the adults are effectively consuming more leisure than time-use studies would reveal. In other words, they are not as badly off when they have children, and the method will over-estimate the cost of children.

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[25] This result might not occur if the adult good is a strongly complimentary to the goods that have joint production or consumption. However, given the wide range of goods that are likely to experience jointness, this does not seem very likely. This relationship was first pointed out by Nelson (1992). See Bradbury (1997) for a diagrammatic representation.

Another way of thinking about this is to think of childcare (or part of childcare) and leisure as close substitutes in the household welfare function. Because childcare and adult leisure belong to different sub-branches of the separable welfare structure in (9) such a particular pattern of substutition is not incorporated into the model used here.

Violation of Preference Stability Assumption

Despite all these limitations, the conclusion that the total cost of raising children is extremely large does not seem implausible. Can we derive any welfare and/or policy conclusions from this?

The model used here assumes that adults maintain the same preferences for their own consumption whether they do or do not have children, and the real value of this consumption is used as the welfare index. This is thus a 'situation comparison' in the terminology of Pollak and Wales (1992). Is this a sensible comparison to make?

Above, I have described this as being part of a lifetime welfare model where the benefits of being a parent enter at the lifetime level, with the costs entering each period's sub-welfare function. If the sub-welfare functions enter the lifetime welfare function symmetrically, then the situation comparison is sensible. We can use methods like the adult good approach to talk about how child costs are spread across the lifecycle. However, there are reasons for thinking the actual function might be non-symmetrical.

Parents might be happy to have a relatively low standard of parental living when they are raising their children.[26] In part, this acceptance might reflect the fact that this pattern is the norm. In this case we might argue that this norm reflects an inefficient situation and so should be rejected. However, other reasons are harder to reject. For example, parents' health and vitality generally diminishes as they age. The steady reduction in child time burden as children age might be seen as an appropriate complement to this.

Ultimately, these sorts of issues are not likely to be resolved easily. Nonetheless, we need to bear them in mind when interpreting the results of any child cost comparison.

6. Concluding Comments

When thinking about family and social expenditures on children, it is important to remember that the price, cost, consumption and value of children are related, but nonetheless distinct, concepts. This paper has explored some, but by no means all, facets of the relationships between these concepts.

The cost of children is not the same as children's consumption – even if we restrict attention to the domain of household commodity consumption. Section 2 considered the difference between these two concepts in the context of the allocation of private and

[26] Indeed one might test this by identifying people who are not capital market constrained and observing how they move resources between their childrearing and other stages of their lifecycle.

household-public purchased commodities within the household. In this context, the cost of children is typically expressed in the literature in terms of the consumer equivalence scale. Under reasonable assumptions, it was shown that children's consumption is less than the 'equivalent income' of the household, but more than the 'cost of children' to the parents. The first relationship stems from the pattern of intra-household sharing of resources, and the likelihood that adults will be judged to need more than children. The second relationship arises from the existence of household public goods, which means that some of children's consumption does not require additional expenditure.

Expenditure costs, however, are only a small part of the cost of children. Parent's reduce their leisure and personal hours considerably when they are raising their children. In the model presented here, this change in time use arises from a combination of the time and the expenditure costs of children. The expenditure costs enter via the pressures they place on parental labour supply. Time use data thus has great potential to enable us to ascertain the full magnitude of the cost of children.

Some simple estimates based on the time use results of Craig and Bittman (2004) suggest that the full costs of raising children are very large indeed. Though difficult econometric problems (and theoretical simplifications) mean that these estimates should only be considered broad estimates of magnitude, some of the results are more robust.

For example, if we are prepared to assume that income elasticities are constant across groups, then the change in adult leisure across the lifecycle can be used to conclude whether the time costs of younger children are outweighed by expenditure costs of older children. Here, we find that children aged 5 to 11 generally cost less than younger children – at least for families with one or two children. This has implications for policies that might seek to assist parents spread their childrearing costs across the lifecycle.

Finally, we should remember that all these estimates of the costs of children to parents are specific to the social and economic context in which the families are located. Cross-national differences in state support for parents and children are likely to lead to different pattern of child costs, and different patterns of children's consumption.

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