A Valuation of Childcare Provided by Parents in the United Kingdom:

Inputs and Outputs

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Abstract

A recognised shortcoming of the present system of national accounting is the omission of non-market production from national accounts. Various attempts have been made to rectify this by developing measures of the monetary value of non-market production. This paper aims to estimate the monetary value of the childcare provided by households in the United Kingdom, exploiting a unique data source that contains information on the amount of time spent on childcare from two perspectives: that of parents, and that of children. Using this data it is possible to calculate the input into childcare by parents, and the output of care measured in terms of the time each child records being in the presence of, or at the same location as a parent. Information about children aged 0 – 7 years is not available directly. For these children the output was imputed based on information available directly from the output for children aged 8 – 13 years. With this imputation, combined with the available data it was possible to compute the output of care for all children aged 0 -13 years.

Having quantified the input and output of care, prices are assigned to get the valuation. The input method uses an experimental methodology developed by Folbre & Yoon (2006) whereby a spectrum of care intensity is defined and appropriate replacement prices are assigned to different points on the spectrum. For the output method, a number of prices were chosen, using data available on the prices UK childminders charge. In addition to this, a valuation of the output is presented, where the prices that are assigned to the output of care, are deflated to take into consideration different levels and types of interaction between parents and children. The ultimate effect of the deflation is to depress the value of the output for older children. The reason for this is that a higher proportion of the time that older children are around their parents is time when they are at the same location as those parents, but not directly interacting with them. The output measure is therefore calculated in three ways: including this time at the same location, excluding it, and finally including it but deflating the price that is assigned.

The paper presents results describing the ways in which the value of inputs and outputs vary across households with different numbers and age profiles of children, in both lone mother and two parent households. In addition, a range of values of childcare computed using the input and output methods, are compared to GDP (2005). What is shown is that the value of the input and the value of the output can, under certain circumstances, approximate each other. Methodologically, the paper shows that with appropriate time use data, it is possible to measure the inputs *and* outputs of childcare produced by households.

1. Introduction

If a parent chooses not to perform various childcare activities, but rather purchase those services in the market, there will be an increase in the national product. The famous paradox, where the housekeeper who marries her employer, reduces the national output, is played out in reverse in this scenario.[1] In the UK there is growing demand for childcare services, due to increasing numbers of women working in paid employment. Increased government expenditure to subsidise some of this 'extra' childcare requirement is an implicit recognition of the 'public-good' nature of the childcare provided by parents[2]. The increasing portion of childcare, which becomes 'visible' is likely, however, to remain small in relation to all of the care provided by parents, and it is inconsistent to imply that some of it is valuable, whilst the vast majority of it is not, simply by virtue of the fact that it is traded in the market, as opposed to being produced by parents within the home.

Two important implications follow from this. The first is that strictly speaking, any increase in gross domestic product (GDP) as a result of any increase in the production of childcare services in the market, be it from private enterprise, direct government expenditure, or some combination of both, may simply be a transfer of productive activity from one context to another. If households do not reduce their provision of childcare, then the growth in the product will be genuine. But if there is a one for one swap, then the growth in product is illusory. Secondly, there is much talk of the 'childcare sector'. This phrase in fact, refers to only a small fraction of the total childcare produced in society. It will not be possible to say anything meaningful about the entire production of childcare, without some measure of the value of the childcare produced within households. The aim of this paper is therefore to present a valuation of the childcare provided by parents in the UK.

Gershuny (1979) writes that time budget diaries present the best opportunity to measure the activities associated with household production. In measures of the value of household production, time budget data has invariably been used to quantify the time inputs to household production (Short 2000). This paper presents a valuation of

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[1] Clarke (1958) credits Pigou with this.

[2] It is estimated that UK government expenditure will need to increase to 2.6% of GPD (PricewaterhouseCoopers 2004) cited in:
http://www.eurofound.europa.eu/emcc/content/source/eu06016a.html?p1=ef_publication&p2=null

childcare, which is unique, in that it uses time budget data to estimate a value for the inputs to, and outputs from childcare provided by parents. Previous research lays the quantitative foundations for the valuation of home produced childcare set out here. Mullan (2007) focuses on the time that parents devote to childcare, which is the basis of the input valuation of childcare. Mullan (forthcoming) looks at care from the child's viewpoint. This latter paper exploited a unique feature of the United Kingdom Time Use Survey 2000-01 (hereafter UKTUS), as the survey systematically collected child diaries. Matching parent and child diaries, it is possible to gain a reliable estimate of the time that children are with their parents, which is the essence of a valuation of the output of childcare.

To value the parental production of childcare, it is necessary to assign wages for the labour input, or prices for the output, which are observed in the childcare market. Estimates will vary depending on the wages or prices assigned, and also depending on how much time is included in the valuation. Instead of producing a single estimate, a range of estimates are presented both for the input and output methods. The estimates of the inputs and outputs of childcare, range as a result of assigning different shadow wages or prices respectively. Furthermore they differ in terms of what is included in the valuation.

The organisation of the remainder of this paper is as follows. Section two looks at the rationale for valuing household production, and also the reasons why it has been excluded from the core national accounts, and its ultimate inclusion in a satellite account. Section three outlines the two main methods for valuing household production; furthermore issues relevant to the choice of appropriate method are discussed. Some recent examples of valuations of home produced childcare are also reviewed. The data set is then described in section four, followed by a detailed exposition of the methods used in this valuation in section five. Results are then discussed in section six. Section seven concludes.

2. Rationale

From a feminist perspective, the point of extending national accounts is to make women's work, or, more generally, their contribution to society, visible (Waring,

1999). The basic thrust of the feminist argument is to gain recognition and appreciation of women in society. Ferber (1980) poses the question as to whether housework is 'Priceless or Valueless?' The contention is that "our failure to assign a price for the services of the homemaker has tended to convey the impression that they are valueless rather than priceless."[3] (p.387) Explicit in this is an assertion that in order for women's contribution within the domestic sphere to be fully appreciated, it is necessary to value that time in market terms. On the international stage, the United Nations International Research and Training Institute for the Advancement of Women (INSTRAW), has published a number of reports looking at the valuation of household production, and reviewing various estimations worldwide (INSTRAW 1995, 1996).

Households are the source of much welfare creation, and economists and national accountants are keenly aware that GPD is not a comprehensive measure of welfare. Nordhaus and Tobin (1973: P. 517) have argued that the exclusion of non-market work from national accounts casts doubt on measures of economic growth and gives 'the impression that economists are blindly materialistic.' Many of the key national accounts concepts and statistics were developed by Colin Clarke and Simon Kuznets in the UK and USA respectively, whose work focused on estimating national income. Both Kuznets and Clarke have conducted studies into the valuation of household production, Kuznets early in his career (1929)[4] and Clarke later in his career (1958). Clarke in particular, is uncompromising in his criticism of the exclusion of household production from the national accounts, saying that "[t]heoretically...it cannot be defended" (P: 205).

Goldschmidt-Clermont (1990) lists nine 'uses' for the accounting of the domestic sphere. Her coverage is expansive including economic policy, labour policy, income distribution policy, social policy, fiscal policy and population policy. To this are added benefits to the legal system (especially common law in divorce cases), improvements in the allocation of productive resources and finally to help in monitoring the economy. There is quite simply, from her point of view, not a single area of life in modern society that would not benefit from the added information

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[3] Eichler (1985) makes a similar point saying that women's contribution is valueless, as men are ascribed the role of money-making.
[4] Cited in Hawrylyshyn (1976)

generated from accounting for household production. Momentum built up from a variety of points, has resulted in a formal recognition of the importance of accounting for household production within the United Nations System of National Accounts (SNA), where in 1993, guidelines for accounting for household production in a satellite account, were incorporated into international guidelines for core national accounts.

2.1 Why is household production excluded?

The process of production is the locus of the national accounts, which focus on the monetary transactions that occur as a result of this process (Studentski 1958).[5] The development of the system of national accounts as we have it today is closely aligned with three developments in economic theory: input-output analysis associated with the work of Wassily Leontief, the Keynesian revolution and advances in econometric modelling (Bos 2003). On this latter development, the purpose of the national accounts was to merge two time patterns, one pattern being the overarching pattern of change, the second being the basic pattern of capital-using production (Hicks 1982: pp 221). Econometric models of the business cycle required good data on economic aggregates; clear definitions of both the variables themselves and the relationships between variables. Perhaps most importantly however, there was an emphasis on equality between inputs and outputs. This involved the utilisation of a system of double entry book keeping as the 'economic accounting approach' took hold (Carson 1975).

The national accounts therefore present a picture of the entire formal economic system; a record of market activity. A body of knowledge on national accounting became formalised in a set of guidelines called the System of National Accounts, which are periodically updated and published by the United Nations, the most recent in 1993 (UNSNA 1993).[6] These guidelines specify a clear production boundary (PB),

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[5] Gershuny (2005) proposes that the locus of national accounts shift to the ultimate consumption of 'final service functions'. In this formulation the relative contributions of home and market production in the final provision of these 'service functions' can be presented within a unified framework.

[6] There are three generations of international guidelines (Bos 2003: p 17). For the United Nations the three generations are marked by the publication of successive versions of The System of Nation Accounts (SNA), first published in 1953 (SNA53) followed by SNA68 and most recently SNA93. The European Union began to take concrete shape during the second generation and published in 1970 the

within which labour is fully remunerated, goods and services are purchased, and it is therefore possible to sum the value added at each successive stage in the production process, which should when summed across the entire process, equal the total income and expenditure separately. The PB is drawn where this process is no longer feasible. It has been drawn, and remains firm, so as to exclude most household production for own consumption.

The absence of a price for the goods and services provided by households for own consumption, ensures that this PB will not be redrawn to include household production for own consumption. To do so would be to include a significant amount of non-monetary information, which could severely inhibit the accounts' usefulness for economic analysis (UNSNA, 1993: Para 1.21). SNA93 contains details of developments concerning satellite accounts for household production, which remain clearly outside of the PB but fall within what is termed a General Boundary (GB).[7] Landberg & McCulla (2000), argue that a satellite account achieves two objectives. Firstly it simply illuminates the productive activity ongoing within the household. Secondly, it offers a structure that is more flexible by altering what is regarded as productive, or utilising alternative methods of valuation. The use of a satellite account is progressive in that household production will be counted; that the inputs to and outputs from, are clearly identified and assigned monetary value, the magnitude of which can be compared with production in the market.[8]

3. Valuing Household Production: A review of methods and literature

Methods of valuing household production take their lead from the core national accounts. In the core accounts there is an income account that sums all incomes generated from production, and an expenditure account that sums all expenditure on goods and services produced.[9] Methods of valuing household production have sought

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European System of Accounts (ESA70), which are actually legally binding for member states, and in the third generation (ESA95). The communist bloc also established guidelines known as the Material Product System (MPS69).

[7] The ESA95 is much more limited in terms of experimental developments, perhaps because of its legally binding character.

[8] Bos (2003: P. 147) argues that this is the only real use for a measure of household production.

[9] The core accounts actually use three methods, the third being the Production Account, which is the sum of the value added at each successive stage in the production process. Taken together the three

to impute a shadow wage for the work done (an extension of the income account) or impute prices for the outputs produced (an extension of the expenditure account). The two methods for valuing household production are now discussed beginning with the input method and continuing with the output method.

3.1 Extending the Income Account: The Input Method

For the purposes of valuing time in an economic sense, the activity being performed needs to be understood in association with the specific outcomes and how, if at all, these mirror similar activities performed in the market. Quah (1993) divides domestic work into three categories. These are 'non-replaceable household production' (NHP), 'market replaceable household production' (MHP), and 'near-market replaceable household production' (NMHP). NHP will include aspects of personal care like brushing ones teeth, but also providing love, comfort and security to others in the home, much of which is undoubtedly associated with childcare. MHP is a restatement of the most intuitive and widely cited criterion, for deciding if an activity carried out within the household, can be considered work for the purposes of national accounts: the third person criterion. The criterion states that:

> *…unpaid activities which are carried on by and for the members, which activities might be replaced by market goods, or paid services, if circumstances such as income, market conditions, and personal inclinations permit the services being relegated to someone outside the household group* (Ried, 1934, p. 11, cited in INSTRAW 1995, p. 11)

Examples of MHP include cooking, various cleaning activities and many aspects of childcare. This is the main reference point for defining housework as 'work'. Sanik and Stafford (1983) make the point that Ried not only defined household production, but in doing so delimited it. This definition tends to focus attention on relatively menial aspects of household production, like cooking and cleaning, and the more physical aspects of childcare. Quah's NMHP attempts to capture some further aspects of household production that are market replaceable, but often tend to be ignored by a

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accounts must equal, thereby providing a triangulated observation of the value of market production at any point in time.

strict adherence to the third person criterion. These are activities of a higher order like supervision and management tasks, providing tuition, counselling and advice to children and other family members. These are activities that are performed in a formal market context, and therefore should be incorporated into a measure of the value of household production. They are also activities closely associated with childcare.

INSTRAW (1996) points out that the lack of a clear valuation criterion is a major problem associated with valuing the time allocated to household production. This has led to a number of approaches to valuing the time spent doing activities associated with household production. One of these is known as the opportunity cost approach. This is based on an extension of the proposition in economic theory that, at the margin, the value of leisure is the wage rate. The extension states that the wage rate not only reflects the opportunity cost of leisure time, but also the opportunity cost of time spent in home production.[10] This method is criticised because it necessitates that time spent doing the same housework task, by individuals with differing levels of human capital, will be valued using different shadow wages. This is likely to lead to a distorted picture of the relative contributions of men and women.

The second major method of valuing the time input into household production is known as the replacement cost approach, and has two variants. It is possible in the first instance, to find a housekeeper who could perform all the tasks. This is known as the generalist replacement cost measure. Alternatively, there are workers performing specific tasks like cooking, cleaning or childcare. Imputing a shadow wage for distinct jobs is known as the specialist replacement cost measure.[11] The input method in this valuation will use a specialist replacement cost measure.

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[10] This method follows directly from the household production function developed by Becker (1965). Indeed Gronau (1997) cites Becker's work as, amongst other things, stimulating a renewed interest in valuing household production.

[11] In studies that employ the input approach there is often a comparative element and a discussion of the merits of the opportunity cost approach compared with a number of the replacement cost approaches. Murphy (1978, 1982) having compared opportunity cost and the market cost approaches at length, remains unable to state what the appropriate valuation of time should be. This is largely due to the fact that there was little difference in using either the opportunity cost or the replacement cost method. Alder and Hawrylyshyn (1978) also find little difference in either method concluding that household work measured about 40% of GNP. Ferber and Greene (1983) on the other hand urge caution in using the opportunity cost approach, preferring instead the replacement cost approach but conclude overall that their findings are suggestive rather than conclusive. Hawrylyshyn (1977) concluded that insecurity about methodology was the main reason that the research had no bearing in

3.1.1Recent examples of valuing childcare using the input method

Sousa-Poza, Schmid & Widmer (2001) carry out an input based estimation of childcare and other household production. To quantify the childcare they asked respondents, in a telephone interview, to recall how much time they spent the previous day doing childcare. They then apply a six different wages to this time. They use the wage of a general housekeeper and a specialist wage, both of which are replacement cost methods. In addition they employ three variations of the opportunity cost method. Firstly, they use gender specific average wages as a measure of opportunity cost.[12] For non-employed people they use an estimated potential and reservation wage. These various approaches to valuing the time doing childcare result in an estimate ranging from 5% to 8% of Swiss GDP (1997). They find that the specialist replacement cost produces the highest value, whereas the generalist replacement cost method produces the lowest.

Varjonen & Aalto (2006) value childcare as part of a broader household satellite account. They use time use data derived from time budget diaries, focusing on primary childcare activities. Childcare is valued using a generalist replacement cost measure. They find that valued in this way, childcare is approximately 4% of Finnish GDP. This is less than the previous example. There are three likely reasons for this. The first is that, as noted, the generalist replacement cost method produced the lowest value in the Swiss estimate. Secondly the quantity of time valued by the Finnish estimate is less than that valued by the Swiss estimate. This is because estimates from time budget data tend to be less than those derived from recall methods. Finally, and perhaps most importantly, state involvement in childcare, and female labour force participation, are relatively high in Finland.

Folbre & Yoon (2006) conduct a valuation of childcare using a broader definition of the input of care. They include not just specific care activities, but also all time when a parent regarded a child as being 'in their care', which constitutes a significant body of additional time. Further to this they include in their valuation, what they call 'indirect childcare'. This is time spent doing other housework activities, where the

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the policy arena. Ferber & Birnbaum (1980) echo this in arguing that the inability to resolve the argument between the two methods is one reason why it has not been included in GDP.
[12] Goldschmidt-Clermont (1993a) criticises this, arguing that average wages are not the same as opportunity cost.

motivation for the activity is the care of a child. Cooking a child's dinner would be one obvious example. As opposed to using the wage of a childcare worker for all the time spent caring for a child, they make a clear distinction between physical aspects of care and developmental care, placing a higher premium on the latter, by using the wages of a kindergarten teacher. In this sense they are employing an extended specialist replacement cost method. It might be expected that valuing such a large portion of time would result in a higher value of the childcare produced in households, relative to other estimates. Their work is at an early stage, but in terms of method, it is closest to the input method employed in this study.

3.2 Extending the Expenditure Account: The Output Method

The output method seeks to identify the outputs from household production process, and assign prices of similar outputs produced in the market. The price of a meal in a restaurant for example, would be assigned to meals produced within the home. Early examples include Goldschmidt-Clermont (1983), Sanik and Stafford (1983) and Bivens and Volker (1986).

3.2.1 Recent examples of valuing childcare using the output approach
Dalenberg, Fitzgerald & Wicks (2004) carry out an output based valuation of the childcare produced by households. For each child in a surveyed household, they ask for what proportion of their day they received care, as the primary function, from parents, other household members, school, babysitter, childcare facility, other friends and relatives and finally self care. They assume that no child under 5 does any self-care i.e. they are never left unsupervised. They value the portion of the day where the household provided care, using prices from local day-care facilities. They find that the value of care derived using the output method is less than the value, if measured using an input method. They argue that economies of scale in day-care facilities are the main reason for this, leading to much lower prices being assigned in the output method compared to the input method.

Holloway & Tamplin (2001) carry out an output based valuation of all informal childcare, and not just that which is provided by parents, for the UK. They estimate the quantity of output of childcare provided by households, as the remainder of 24

hours, after subtracting time spent in school, and in formal care. This has been criticised as being 'a largely administratively determined "child-care hour required" estimate' (Landefeld, Fraumeni & Vojtech 2005). In other words the output of care is all the care children need. However the valuation relies heavily on assumptions made concerning unsupervised time. The output is valued using the wage of a live in nanny, which is divided by the average number of children, yielding what is termed a child-adjusted wage.[13] They find that informal childcare ranges from 19% to 25% of GDP in the year 2000. If the estimate is restricted to informal care when the child is awake, it ranges from 9% - 13% of GDP.

3.3 Which method?

As stated above, the core national accounts include both an income and an expenditure account. However, the literature examining the valuation of household production has debated whether the input or the output approach is preferred. Placing a value on the outputs of household production (the output method) is considered superior to the input method (Goldschmidt-Clermont 1993). SNA93 states that market prices for goods and services are the 'basic reference for valuation in the system.' (Para: 2.68). Schettkat (1985) argues that "without doubt, the best way to account for household production would be to measure the output itself directly." (p310). The essence of the debate can be expressed thus: the input approach is flawed but relatively feasible, whereas the output approach is better (in that it overcomes the flaws with the input approach), but argued to be somewhat less feasible.

The first flaw with the input approach is that labour is only one input into the production process. Other inputs like intermediate goods, capital and other factors like electricity use, are ignored. Ignoring the contribution of these other inputs in the production process is of course an issue, but the magnitude of these inputs relative to the labour input is likely to be small, not least for childcare. A second issue relates to what are called process benefits (Juster 1990; Juster & Stafford 1991). Put simply, individuals may derive direct utility from engaging in an activity. Washing the dishes may not provide much in the way of process benefits, but childcare would be the

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[13] A live in nanny will be paid less compared to other childcare workers, as they will be receiving accommodation and food in kind from their employer.

source of much direct utility for the parent providing it. With respect to these process benefits, people often derive direct utility from paid work, and this is not considered a problem in core national accounting. A third flaw stems from the fact that an individual may be engaged in producing two (or even more) goods at once. This is often referred to as joint production.[14]

Much of the time that is being valued for its childcare component, will include activities associated with the production of other goods and services. Using a specialist replacement cost method raises the issue of what wage to use. If a mother is minding children, whilst cooking a dinner, is the wage of a childminder or a cook most appropriate? Or do we double count the time and use both? This is arguably more of an issue if attempting to place a value on total household production. As this is a valuation of childcare alone, the issue of joint production, whilst important, is not fatal. It is important to note that some of the value being imputed for childcare would also apply to the production of other goods and services. The output method is especially appealing with respect to the latter problem as all outputs are counted and valued.

Both methods are affected by issues relating to the degree to which the home and market are substitutes. Assigning a wage for labour input or a price for goods and services produced, implicitly assumes that the home and market are perfect substitutes. This issue has mostly focused on the input method, with researchers pointing out that the productivity of labour in the market may be different to that in the home (Goldschmidt 1993a, 1993b). The major problem with this is that any variations in the value will reflect changes in the productivity of labour in the market, and not in the home. It has been suggested when using an input method, that some adjustment is made to account for the difference in productivity (Quah 1993; National Research Council, 2005). From the perspective of the output, the care received by children from their parents is superior to that which the market can provide. Using prices charged in the market for this care is likely to understate its value.

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[14] An analogous phenomenon in the market, are economies of scope. These arise where an input can be used in the production of two or more outputs (Sharkey 1982). In the household, it is the labour input, which can evidently be utilised in the production of two or more products or services simultaneously. By spreading the time cost over the production of more than one good or service, cost efficiencies are achieved.

A recent study argues that both the inputs to and outputs from household production should be quantified and valued independently (National Research Council, 2005). They argue that whilst there is a conceptual need for core national accounts to balance, no such need arises in the household context. The cost element of the price of a market good is determined to a large extent by the scale and nature of the enterprise. Firms will benefit from the use of capital and technology and any scale economies that result, all of which is reflected in the price and which is not replicated to the same extent within households. The valuation of childcare set here estimates a value for the labour inputs and the gross value of the output of childcare, using time budget data to quantify both.

4. Data

The data set is at the level of the household. For a household to be selected diary information needed to be available for all parents and all children aged 8 – 13. Households with a child aged 14 are excluded. The reason for this is that the categories for co-presence in the parents' diaries used to measure the total input range from 0 – 14 years. But 14 year olds completed an adult diary and therefore did not record if they were with their parents, therefore excluding them from the measure of the output of care. The households may contain children aged 15+ but these do not affect the co-presence variables used. Furthermore only households that completed diaries for both a weekday and a weekend day are included. This is because the annual value is a multiple of the weekly value, which is in turn a sum of weekday and weekend totals. The resulting sample contains 905 households.[15] Approximately one quarter of the households are headed by a lone mother and the remaining households contain two resident parents.

These are very restrictive selection criteria and the potential for serious selection bias cannot be ignored. Weights are supplied with the data to correct for this in data set as a whole, but it is appropriate to further augment these, to take into consideration the

[15] 924 households meet the selection criteria detailed but I drop 19 lone father households. As a distinct group they are too small for meaningful analysis, and combining them with lone mothers to create a 'lone parent' group would be misleading given that the vast majority of this group would in fact be lone mothers.

added selection criteria. It is apparent from the results of a logistic regression that small families (fewer parents and fewer children) have a higher than expected probability of being included in the sample. Another way of looking at this is to note that lone mother households, with a single child, have a higher than expected probability of being included in the sample. This is not surprising. To correct for this a new weight is constructed, given here as:

$$W = [(w_i / \theta_i) * (P / (\sum_{i=1}^{n} (w_i / \theta_i)))] \qquad [i = 1, 2, 3,..., n] \qquad (1)$$

Where w_i = weight supplied with data; θ_i = predicted probability of being included in the sample; P = population of households with a child aged 0 – 13 years. The weight available in the data for grossing up to the UK population is multiplied by the inverse of the predicted probability of being included in sample, which is derived from a logistic regression.[16] This in turn is adjusted, so that the new weight correctly grosses to the population of households with a child aged 0 – 13 years.

5. Method I: Input

5.1 Total Time Input

The basis of the measure of the input of childcare is the time that parents record being co-present with a child aged 0 – 14 years. This time is differentiated depending on the activities recorded by parents. Mullan (2007) sets out an approach for quantifying different types and intensities of parental childcare. There are two stages to this. The first involves recognising that parents perform different types of care activities, which are organised into three key groups. These are:

1. Physical care and supervision
2. Developmental care
3. Accompanying a child

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[16] These regressions initially included gross household income, housing tenure and the availability of a car. None of these were significant and were dropped from the regression. The final specification included number of parents, number of children and the age of the youngest child in the household.

The second stage focuses on the fact that care activities can be carried out in combination with some other activity, or done as the sole activity. The inclusion of secondary activity diary information in UKTUS enabled this distinction to be developed. This applied to the first two care groups, as accompanying a child was almost always carried out as the sole activity.[17] Therefore physical care and supervision and developmental care, are further defined depending on whether they were carried out as the sole primary activity (undivided care), or combined with some other activity (combined care). Finally, there is the time that a parent record being with a child but does not record a specific childcare activity. This is referred to as non-specific care.

Taking these together, six distinct care jobs are identified. These are:

1. Undivided Physical Care and Supervision
2. Undivided Developmental Care
3. Accompanying a Child
4. Combined Physical Care and Supervision
5. Combined Developmental Care
6. Non-Specific Care

The parental input is measured in two ways. The first measure includes only childcare activities (jobs 1 – 5 above) and will be referred to throughout as Input 1. This measure is the most comparable to other input based valuations. The second measure of parental childcare includes all these childcare activities plus non-specific care (jobs 1 – 6 above), and will be referred to throughout as Input 2. For the moment it is decided not to include time spent in other household production which could be construed to feed into the ultimate provision of childcare. Using Folbre & Yoon's (2006) terminology this is a valuation of 'supervisory' and 'direct childcare', omitting 'indirect childcare'. The total daily input by each parent, is the sum of the time spent doing these six categories of care. In two parent households the household daily total is the sum of both parents' input.

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[17] Accompanying a child was almost always associated with travelling which is invariably coded as a primary activity.

5.1.1 Assigning a Wage

Having identified and quantified the time spent doing various type of childcare the next step is to assign a shadow wage, using wages available in the market for comparable work. Data on earnings are taken from the 2005 Annual Survey of Hours and Earnings (ASHE). This data provides gross hourly wages for childcare workers in the UK at the four digit SOC classification level. The data provide wage information for four occupations in the childcare sector:

1. Nursery Nurses (6121)

2. Childminders and Related Occupations (6122)

3. Playgroup Leaders/Assistants (6123)

4. Educational Assistants (6124)

Average gross hourly wages and wages across the distribution are presented in Table 1.[18]

Table 1: Market Values for Replacement Cost Wage

| | Mean | Percentiles | | | | | | | | | | |
		10	20	25	30	40	50	60	70	75	80	90
Nursery nurses	7.12	4.85	5.13	5.25	5.46	5.86	6.43	7.46	8.51	8.75	9.13	9.76
Childminders and related occupations	7.43	4.87	5.50	5.54	5.84	6.26	6.98	7.47	8.19	8.50	8.73	x
Playgroup leaders/assistants	6.85	4.85	5.00	5.04	5.27	5.60	6	6.50	7.26	7.54	7.93	x
Educational assistants	7.38	5.43	5.85	5.99	6.12	6.43	6.78	7.31	7.89	8.19	8.61	9.68
Primary and nursery education teaching professionals	19.3	12.34	15.09	16.15	16.65	18.12	19.33	20.54	22.26	23.14	24.09	27.41

Source: ASHE 2005

There are many possible reasons for the variation including location, local supply and demand factors, and the level of experience and qualifications of the childcare workers. It is tempting to choose the highest wage available, given the discussion earlier concerning the substitution between home and market, but it seems appropriate to choose the average wage, given that the factors determining the variation are not clear. One interesting observation is that there is not much difference in the wage offered for differing jobs. Wages range from £6.85 for playgroup leaders/assistants to £7.43 for childminders and nannies. The average wage for educational assistants is £7.38, which is very low compared to a teacher.

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[18] Light shading indicates a coefficient of variation (CV) > 5% & < 10%. Dark shading represents CV > 10% & < 20%. No shading CV < 5%. X = unreliable.

It was noted above that Folbre & Yoon (2006) suggest a more refined replacement cost approach arguing that specific aspects of childcare need to be identified and valued appropriately. In their work, physical care and developmental care are assigned average wages for a child care worker and a kindergarten teacher respectively. With respect to the latter, a comparable occupation in the ASHE would be a nursery teaching professional. Average gross hourly wages for this occupation in the ASHE are £19.30 (Table 1: fifth row). The tenth percentile is £12.34 and the ninetieth percentile is £27.41. These are considerably higher than the wage for the educational assistant in the childcare sector.

The difference between an educational assistant in the childcare sector and a nursery/primary teaching professional in the education sector raises questions about the choice of replacement. Some have criticised the efforts to value housework, arguing that it is not appropriate to use depressed wages in the market for work mostly done by women, as a replacement for the unpaid work within the home, again mostly done by women (MacDonald 1995). MacDonald asks if childcare should 'be calculated using the wages of day-care workers or child psychiatrists?' (P.164-165). When valuing developmental care, should we use the wage of an educational assistant or that of a teacher? By way of compromise, the wage for a nursery school teacher at the tenth percentile (£12.34) is chosen for developmental care. The average wage of £7.43 for childminders and related occupations is chosen for undivided physical care and supervision, and time spent accompanying a child.

There remain two further questions. The first concerns the valuation of undivided care and combined care. Mullan (2007) argues that if combined with another activity, physical care and supervision is most likely to be supervision. It seems reasonable to argue that a nanny may in some instances combine many of the childcare activities they do with other activities such as domestic work. So as to make a distinction with undivided care, combined physical care and supervision is valued at the wage for the twentieth percentile of a childminder or similar occupation, which is £5.50 per hour. This is slightly above the current minimum wage, which is £5.05 for workers aged 22 years and over. When developmental care is combined with another activity it is much less like the specialised task that is performed in the education sector and perhaps more like that which would be provided by a childminder or nanny. The wage for

these (£7.43) is therefore used for this care time. The second concerns how to value non-specific care. This time is also valued at the wage for the twentieth percentile of a childminder or similar occupation, which is £5.50 per hour.

In addition to assigning market wages as set out above, it is proposed that a lower and upper bound is placed on the value of the time parents spend doing childcare, by valuing all the time a parent is caring for a child (jobs 1 – 6 above), using a wage drawn from the lower and upper bounds of the distribution reported in Table 1. A wage of £5 is chosen for the lower bound and a wage of £9.68 is chosen for the upper bound.

5.2. Method II: Output

The measure of the output of childcare is based on data available for children aged 8 – 13 years. Using this data, matched to diary data from parents, it is possible compute the total time each child is with their parents. The output of childcare therefore, like the input, is measured in units of time, but it is measured from a child's perspective not a parents. Recalling that the total time a mother is co-present with a child is added to the total time a father is co-present with a child, yielding a measure of total household input. Care time measured from a child's perspective, needs to consider any care overlap between mothers and fathers. This is time when both the mother and father can be said to be caring for a child together. Therefore, to attain a measure of the output of childcare, three co-presence variables are created for child aged 8 – 13 years. These are:

1. The time a child is with a mother alone
2. The time a child is with a father alone
3. The time a child is with both together

These variables need to be imputed for children aged 0 – 7 years. To understand the method of imputation it is necessary to recognise that the time a child recorded being with their parents is some fraction of the total time a parent recorded being with a child. For example, the time any individual child aged 8 – 13 years recorded being alone with their mother is some fraction of the total time a mother recorded being

alone with a child, and so on. These fractions can be referred to as output/input ratios. It is reasonable to suppose that the relationship between the output/input ratio and the age of the child can be stylised as a downward sloping S-shaped curve, as shown in Diagram 1. The basic premise is that as children grow older they spend less time with their parents, but that the decline is not necessarily strictly linear. This ratio is observed for children to the left of the dashed line in Diagram 2 (8 – 13 years). Using this information, the ratio is imputed for children to the right of the dashed line (0 – 7 years).

Diagram 1: Stylised Relationship between the Output/Input Ratio and Age of Child
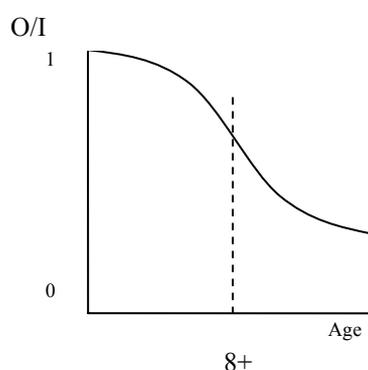
5.2.1. Imputing Output/Input ratios for children aged 0 – 7 years
Figure 1 shows imputed output/input ratios averaged across time alone with a mother, a father and both together, for children aged 0 -7 years alongside observed ratios for children aged 8 -13 years. Table 2 reports the actual ratios imputed. It was highlighted above that studies which have valued the output of childcare, have made assumptions concerning the age at which a child was never left unsupervised. This is akin to assuming that the output/input ratio is equal to 1. This assumption is made here only for very young children (aged 0 or 1), although looking at time with a mother alone, this assumption is extended to children up to three years, and for fathers alone up to age two. Output/input ratios then decline as children age, generally following the hypothesised relationship set out in Diagram 1 above.

The imputed ratios are identical for children aged 0 -5 years on a weekday and a weekend day. On a weekend the imputed ratios are greater for children aged 6 – 7

compared to those imputed on a weekday. Imputed ratios are larger for time alone with a mother, which is observed in the data for children aged 8 – 13 years.

Figures 1: Output/Input Ratios 0 – 13 Years
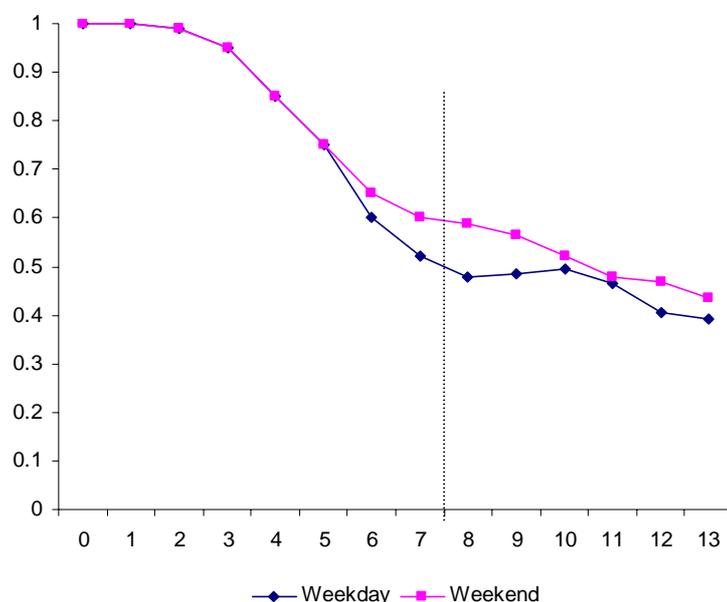

Table 2: Imputed Output/Input Ratios

	Mothers	Both	Fathers	Mean
0	1	1	1	1.00
1	1	1	1	1.00
2	1	0.98	1	0.99
3	1	0.9	0.95	0.95
4	0.9	0.8	0.85	0.85
5	0.8	0.7	0.75	0.75
6	0.7	0.6	0.65	0.65
7	0.65	0.6	0.55	0.60
6 (Weekend)	0.65	0.6	0.55	0.60
7 (Weekend)	0.55	0.5	0.5	0.52

5.2.2 Adjusting for varying levels of parental involvement

Prices for the output of childcare are discussed more fully in the following section. Prior to that, it is important to acknowledge that the substance of the output of care varies. When looking at the input of care, a range of intensity of care was highlighted - from undivided direct care activities to non-specific supervisory care - and different shadow wages were assigned to different types and intensities of care. With this in mind it is perhaps inconsistent to value all the output at the same rate, allowing for the

fact that it varies. Mullan (2007b) sets out a detailed description of the total time children aged 8 – 13 years are co-present, or at least at the same location as their parents. Four distinct levels of involvement between parents and children were identified based on contextual information, combined with information from the activity diaries. These points were defined as follows:

1. Time when both parent and child record being co-present and a parent records a primary childcare activity. It also includes time when a parent records 'reading, playing or talking to a child' as a secondary activity. This was called **Engaged 1**.

When the child and both parents record being co-present and all three are at the same location, it is the mothers' activity diary that is used.

2. Time when both parent and child record being co-present and they both record doing the same primary activity. This includes time when parents record 'physical care and supervision' as a secondary activity. This was called **Engaged 2**.

Again when the child and both parents record being co-present and all three are at the same location, it is the mothers' activity diary that is used. An undetermined amount of this time will be when both parents are doing the same primary activity as the child.

3. Time when parents and children are co-present but they are not doing the same primary activity. This includes time when parents record 'physical care and supervision' as a secondary activity. This was called **Accessible 1**.

4. Time when it is only possible to match parents and children by using the location data i.e. it is only possible to say they are at the same location, but nothing to suggest they are interacting. No reference is made to the activity diaries. This was called **Accessible 2**.

Accessible 1 corresponds in large part to non-specific care (time when a parent is co-present with a child, but not doing a specific childcare activity). Some unknown portion of Accessible 2 may correspond to non-specific care, as a parent may have recorded being co-present with the child, but the child did not record being co-present with a parent. Most of Accessible 2 however, is likely not to have been included in the measure of total input. The output/input ratios discussed in the previous section, are calculated with Accessible 2 excluded. Including Accessible 2 will increase these ratios, but whether it is reasonable to do so, is open to debate. In many cases the inclusion of Accessible 2 results in an output/input ratio greater than 1. This raises a question: if this time is not part of the input value, should it be part of the output value?

It is difficult to imagine a parent leaving their child with a child-minder, and the child-minder informing the parent that for a significant portion of the time, the child will be playing in the garden whilst the child-minder is indoors reading a book, for example. This is mainly because most care provided in the market, is provided for younger children, who require higher levels of supervision. Mullan (forthcoming) showed that the levels Accessible 1 and 2 become more prominent for older children. An inherent aspect of caring for older children is allowing them some space. There is therefore little ground to suggest that no care is being provided, but rather a particular type of care, appropriate for more mature children.

What is proposed is that the value of the output is computed excluding Accessible 2, including Accessible 2; and finally including Accessible 2 but deflating the price of the output, to take into consideration the differing levels of interaction between parents and children. These three measures are added to the measure of the output of childcare for children aged 0 – 7 years. There is no reference point for adducing an appropriate deflation factor. It is proposed that the price of the output of Accessible 1 is deflated by 20% and the price of the output of Accessible 2 is deflated by 50%. Again, as with the imputed output/input ratios, the valuation will be sensitive to these deflation factors. This will be discussed in tandem with the presentation of results below.

5.2.3 The price of 'per-child' childcare

Examples of childcare provided in the market on a per child basis include day-care and nursery school, after-school clubs and playgroups. Another example in the UK is that of a childminder who looks after a number of children in their own home, and charges a fee per hour per child. Information about these 'per-child' rates is not available in the ASHE. As stated above, Holloway & Tamplin (2001) construct a child adjusted hourly wage, essentially dividing the hourly wage of a live in nanny by the average number of children. In this sample the average number of children is 1.8. Recalling from above that the average wage of a childminder and related occupations was £7.43. Dividing this by the average number of children yields an output adjusted hourly wage of £4.12. The National Childminders Association (NCMA) surveys members annually to find out what childminders are charging. Results from 2004/05, report that the average across all regions was £2.84 and that the average highest quoted price across all regions was £5.03. The output adjusted hourly wage from the ASHE lies between these two prices. Results based on all three prices are reported so as to obtain a range of the value of the output of childcare.

6. Results

6.1 Annual value of household labour input and gross household output

Tables 3 & 4 present a summary of results for the valuation of inputs and outputs respectively. There are two measures of input and three measures of output. For each of these, there are three valuations derived from a range of shadow wages or prices assigned. The first input value (Input 1) relates only to specific care activities. The three estimates are relatively close together, with the Folbre & Yoon estimate offering a midpoint value. For the Input 2 estimate (care activities and supervisory care), the upper bound is much greater than the value resulting from the Folbre & Yoon method, which in turn is relatively close to the lower bound estimate. It would appear that the Folbre & Yoon method of assigning shadow wages to parental care time, results in an estimate that lies between a potential upper and lower bound, and especially with the Input 2 value, is closer to the lower bound. Most results present below focus therefore, on the estimates using the Folbre & Yoon valuation method. Towards the end of the paper, in discussing comparisons with GDP, this range is made explicit again.

Table 3: Annual Value of the Childcare Labour Input and the Gross Output of Childcare for Two Parent and Lone Mother Households

		Input 1	Input 2
Couple	Low (£5)	£7,722	£25,743
	Folbre & Yoon	£11,599	£31,422
	High (£9.68)	£14,949	£49,839
Lone Mother	Low (£5)	£5,007	£15,211
	Folbre & Yoon	£7,481	£18,788
	High (£9.68)	£9,693	£29,449

In addition there are nine estimated values of the output of childcare. The first excludes Accessible 2, the second includes Accessible 2 but deflates the assigned price, and the third includes Accessible 2 without deflating the price. For brevity these will be referred to throughout the text as Output 1, Output 2 and Output 3 respectively.

Table 4: Annual Value of the Gross Output of Childcare for Two Parent and Lone Mother Households

		Excl. Accessible 2	Incl. Accessible 2 (deflated price)	Incl. Accessible 2
Couple	£2.84	£14,014	£15,014	£16,582
	£4.12	£20,330	£21,781	£24,056
	£5.02	£24,820	£26,592	£29,369
Lone Mother	£2.84	£10,439	£11,562	£12,038
	£4.12	£15,143	£16,772	£17,463
	£5.02	£18,488	£20,477	£21,320

It is clear that using an input measure, but only including specific childcare activities, produces the smallest estimate. Even if valuing the output at £.2.84 per hour, and excluding Accessible 2, the value of output exceeds Input 1 by £2000 - £3000, in couple and lone mother households respectively. Where Input 1 is the smallest estimate, Input 2 is clearly the largest. All measures of output vary between these extremes. They come closest in couple households when the price assigned to the output is £5.02 and Accessible 2 is included, and in lone mother households, again when the price assigned is £5.02, but Accessible 2 is excluded.

Looking at the values for each of the output measures, for any given price, excluding Accessible 2 results in the lowest value, including Accessible 2 results in the greatest

value and, whilst including Accessible 2 but deflating the price lies between these two points. Obviously, higher prices produce higher annual values of output. The differences between lone mother households and those with two resident parents, decline considerably when any output measure is used to value the childcare. Therefore, based on these results, an input measure is likely to understate the value of the childcare produced in lone mother households, relative to that which is produced in two parent households. For example, the value of Input 1 is 35% greater in two parent households, and the value of Input 2 is 40% greater in two parent households. Whilst the differences in the value of output is 26%, 27% and 28%, for Output 1, Output 2 and Output3 respectively. It is important to note that the value of the input in two parent households is not twice as large as that which is produced in lone mother households.

6.2 The different contributions of Mothers and Fathers to Household Labour Input
Table 5 reports the average gross yearly value of Input 1 & 2 for mothers and fathers in two parent households, and the values in lone mother households. The average hourly shadow wages are also reported. Mothers account for approximately two thirds of the total input value produced in two parent households. The majority of the extra value evident in two parent households comes as a result of adding a father's contribution. The values produced by lone mothers are very similar to those for mothers who reside with the father. Perhaps surprisingly, fathers' mean shadow wage is greater than mothers' mean shadow wage, in two parent households for the Input 1 value. Mullan (2006) and others, have shown that fathers tend to engage in more developmental type care, which has been assigned a much higher shadow wage. This is likely to explain this difference. Taking into consideration all time with children, this difference disappears with mothers' average shadow wage being £6.16 and fathers' average shadow wage being £6.04. Lone mothers' average shadow wage is slightly higher for both measures of input, compared to those mothers who reside with the father.

Table 5: Mothers' and Fathers' Contribution to Total Household Input and the Respective Mean Shadow Wages

		Mothers	Fathers
Couple	**Input 1**	£8,173	£3,426
	Mean Shadow Wage	£7.59	£8.05
	Input 2	£19,532	£11,890
	Mean Shadow Wage	£6.16	£6.04
Lone Mother	**Input 1**	£7,481	-
	Mean Shadow Wage	£7.71	-
	Input 2	£18,788	-
	Mean Shadow Wage	£6.20	-

6.3 Care overlaps in the Gross Value of Output

Measuring a quantity of childcare from the child's perspective requires that the time when both parents are caring for a child is not double counted. This is not the case for an input measure, where the total time input by mothers and fathers, is summed to give the household total. To understand the impact of the care overlap on the total value of output in two parent families, the value of output is decomposed to show the respective contribution made by mothers and fathers alone, and both together. Results are reported in Table 6.

Table 6: Care overlaps in two parent households

		Mothers	Fathers	Both
Output 1	£2.84	£7,248	£1,966	£4,799
	£4.12	£10,515	£2,852	£6,963
	£5.02	£12,837	£3,482	£8,500
Output 2	£2.84	£7,518	£2,117	£5,339
	£4.12	£10,907	£3,072	£7,745
	£5.02	£13,316	£3,750	£9,456
Output 3	£2.84	£8,105	£2,375	£6,102
	£4.12	£11,758	£3,445	£8,852
	£5.02	£14,355	£4,206	£10,808

Whilst mothers in two parent families are contributing much more to the value of the output, a large proportion of the total is produced jointly with fathers. For fathers, the influence of joint care on their total contribution is even more substantial. We see that a mother alone provides the most care, followed by mothers and fathers together, and finally providing the least amount of care: fathers alone. One might value the care a child receives from two parents together, as greater than that provided by one. It is interesting to note however, the differential impact of the deflation factor. Table 7

shows the percentage change in the value of the gross output of childcare with the addition of Accessible 2 (row 1), and the addition of Accessible 2 but deflating the price (row 2).

Table 7: Impact of the Weight on the Value of Output for Different Carers

	Mothers	Fathers	Both	Lone mother
Adding Accessible 2 (%)	13	20	27	15
Deflated Price (%)	-7	-14	-12	-9

Mothers' care is affected least by adding Accessible 2, revealing that the care provided by mothers is likely to involve more amounts of closer contact. This is the case for both lone mothers and those living with the father. The value of output in two parent households, when both parents are jointly caring for a child, is affected most by the addition of Accessible 2. What this implies is that relative to being with one parent (especially a mother), time around both parents is more likely to involve lower levels of interaction. Care provided by fathers, is about twice as sensitive compared with mothers, to the addition of Accessible 2 and the subsequent price deflation.

6.4 Number of children

Figure 3 shows how the annual values of Input 2 and Outputs 1 – 3 (for the price equal to £4.12) vary between households containing different numbers of children. As the number of children increases, the value of each output increases by a larger amount than the increase in the value of Input 2, such that in households with three or more children the value of each output, is greater than the value of Input 2. This pattern is more pronounced in lone mother households. For example, the value of each output is approximately equal to the value of Input 2 in lone mother households, which contain two children. It follows that an input measure is likely to overstate the value of childcare in households with fewer numbers of children. The extent of this appears to be greater in two parent households.

The two principal reasons for this are that each of the output measures do not double count the care provided by both parents together. Table 5 highlighted the magnitude of this joint care. The second major reason for the difference lies in the prices

assigned to the time. The price per hour, on average, assigned to the labour input is greater than the price per hour assigned to the output.

Figure 3: Total Labour Input, Gross Output (£4.12) and the Number of Children in Couple and Lone Mother Households
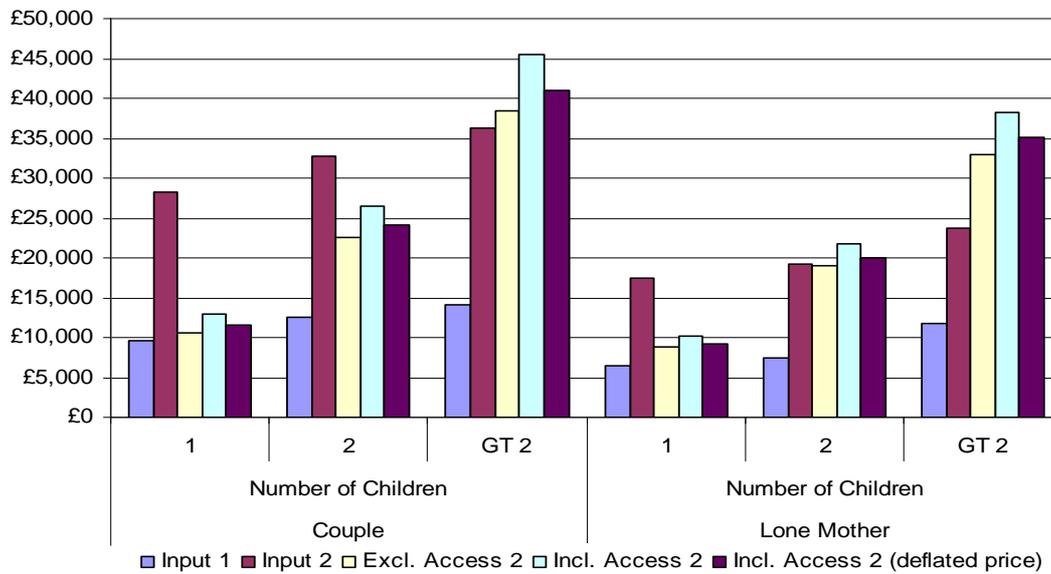

Figure 3 also includes the value of Input 1, which is most similar to the output value in households with a single child, although the value of the output in lone mother households exceeds Input 1. The measure of the output contains a higher amount of time than the measure of Input 1, and where they to be priced identically, the output values would exceed the Input 1 value. The main point to highlight is that an input based value of childcare is very likely to be an underestimate, for households with more than one child, when only the time spent doing specific care activities is included in the valuation. This suggests a strong case for using a more extended definition of care, if employing an input based valuation, especially in households with more than one child.

6.5 Age of youngest child

Figure 4 shows that, as might be expected the value of childcare is smaller in the household where the age of the youngest child is older. In two parent households the value of Input 2 is always greater than each of the values of the output and this difference becomes greater as the age of the youngest child increases. In lone mother

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households, the values of each of the outputs is greater than Input 2 in households where the age of the youngest child is 0 – 2 years, and approximates the value of Input 2 in households where the age of the youngest child is 3 – 4 years.

Figure 4: Total Input, Gross Output (£4.12) and the Age of the Youngest Child
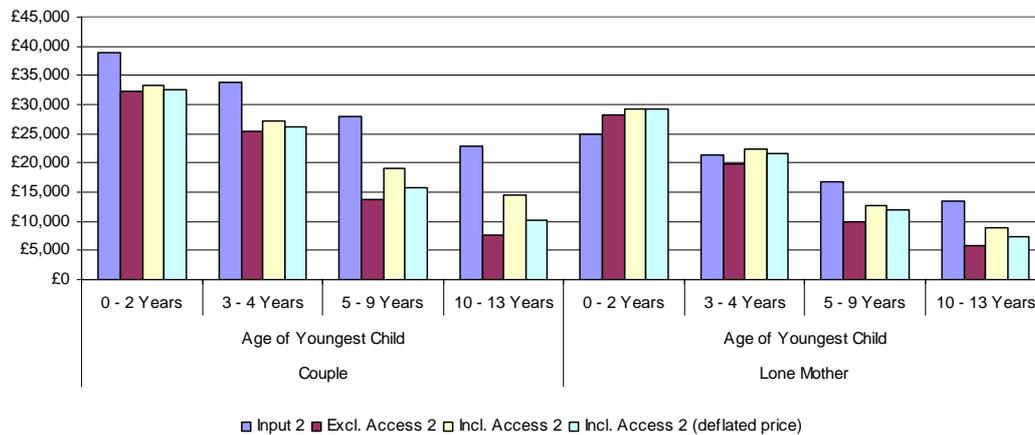

What this suggests it that the input measure is likely to overstate the value of care in households where the age profile of the children is older. This pattern appears to be greater in two parent households. One final thing to note relates to adding Accessible 2. In households where the youngest child is aged 5 – 9 years or 10 – 13 years, adding Accessible 2 increases the value of output quite significantly. In the latter group the value almost doubles increasing from £7,651 to £14,483 in two parent households. In lone mother households the value increases from £5,765 to £8,888. The difference resulting from including Accessible 2 is therefore greater in two parent households. The main reason for this is that much a large proportion of Accessible 2 is when a child is around both parents. Mullan (forthcoming) showed that children in two parent household spent significantly more time in time in these lower levels of involvement, compared to children in lone mother households. Lastly, it is apparent that deflating the price of the output results in a value that lies between the values of output excluding and including Accessible 2. Increasing or decreasing the deflation factor will shift this value up or down respectively.

6.6 Age and the number of children

To assess the impact of the number of children of differing ages on the value of the three outputs, 'descriptive regressions'[19] were run including variables for the number of children in four age categories, controlling only for household type. The regressions are run through the origin, imposing the restriction that zero children results in no care. Figure 5 plots the coefficients from the regressions of the number of children of different ages on Input 2 and each of the three measures of the gross output of care for the price equal to £4.12.

Figure 5: Total Input, Gross Output (£4.12), and Age and the Number of Children
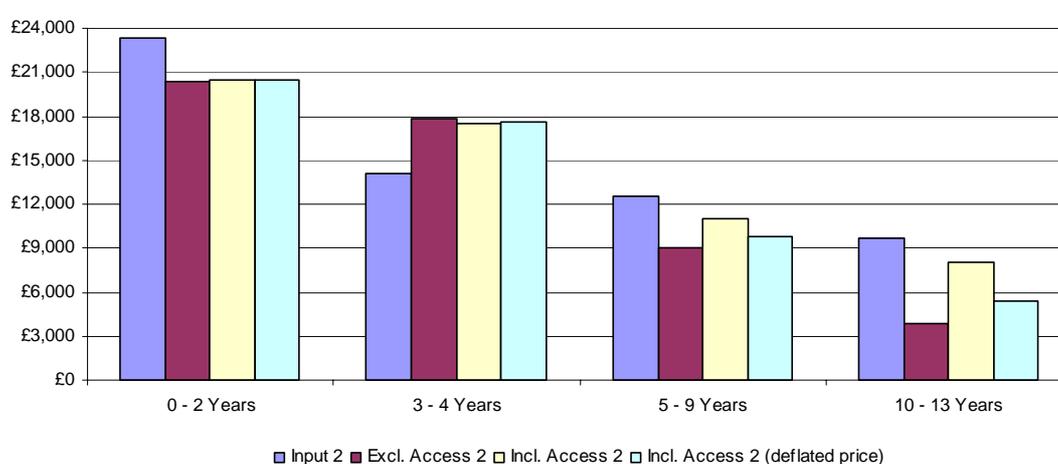
What Figure 5 shows, other things equal, is the increase in the value of childcare resulting from an extra child at differing ages. The effect on the value of the output of including Accessible 2 is again strongest for children aged 10 – 13 years. The deflated measure (Output 3) offers a compromise between excluding Accessible 2 altogether, or including it but not deflating the price. Focusing on the output measure including Accessible 2 but deflating the price, a child aged 10 – 13 will add just under £6,000 to the value of the output a household produces. A younger child aged between 3 – 4 years will add about £18,000 per year to the value of output. There is a significant dip in output as children reach school age (5 + years). It is possible to speculate here about the impact of imputing different values of the output/input ratios. Imputing higher ratios for children aged 5 – 7 years will result in a higher value for children in the 5 – 9 years group. Imputing a ratio equal 1 for children aged 3 – 4 years will

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[19] Ginther and Pollack (2004) use this phrase.

increase the value of output for children in this group. The decline in the Input 2 value is very steep when moving from a child aged 0 -2 years to a child aged 3 – 4 years. In this latter group, the output measures exceed the input measure.

6.7 Childcare and GDP

It is often customary to report the value of household production in aggregate terms, so as to compare with the level of GDP. Figure 6 shows the value of household production of childcare in the UK as a proportion of GDP in 2005 for all eleven estimates.

Figure 6: Parental Childcare and GDP
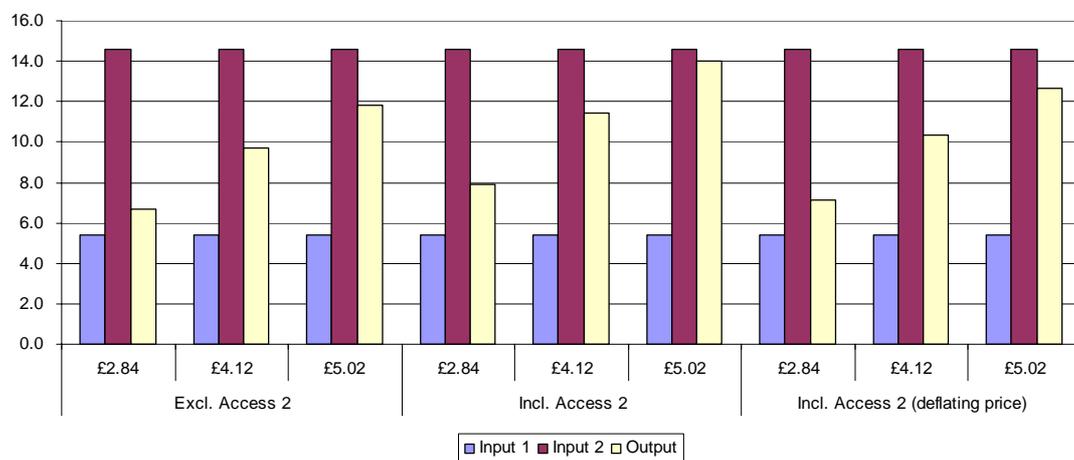
The pattern of results observed when looking at household annual totals in Table 4, is reflected here when looking at the proportion of GDP. All output measures lie between Input 1 and Input 2. Input 1 is the most comparable to other measures of the value of childcare using the input approach. Recalling from above Sousa-Poza et al (2001) found values that ranged from 5% - 8% of GDP. I find values that range from 3.6% - 7% of GDP (2005). Using the Folbre & Yoon method I find a value 5.4% of GDP (2005). Most of this range lies above the Finnish figure of 4% also quoted above, probably because I use a specialist replacement cost method, and because I include secondary activity childcare. Perhaps more importantly though, state support in the provision of childcare is very high in Finland as is female labour force participation. The broader measure of childcare (Input 2) ranges from 12% - 23.2% of GDP. With the Folbre & Yoon method of valuation the value is 14.6% of GDP.

Holloway & Tamplin (2001) report a value of childcare that ranged from 9% - 13% of GDP, excluding time the child was sleeping. Taking the output priced at £2.84, which is closest to the price they assign, the estimate ranges from 6.7% - 7.9% of GDP. Deflating this price having included Accessible 2, results in a value of output of 7.1% of GDP. This suggests that the upper ranges of the ONS estimate, where the assumed amount of unsupervised time is lowest, are overestimates. It should also be noted that the Holloway & Tamplin estimate includes all carers and not only parents. Furthermore they valued care provided for children aged 0 – 15 years.

The output value produced where Accessible 2 has been included, the price assigned to the output is £5.02, and not deflated, roughly approximates the input value produced using the Folbre & Yoon method, and including supervisory care, at 14% of GDP. Alternatively (not shown in Figure 6), the lowest value of Input 2 (12%) approximates the output measure priced at £5.02 and excluding Accessible 2, or including it but deflating the price.

6.8 Childcare and Annual Net Personal Income from Employment
Having looked at the aggregate value of childcare and compared it to GDP, the imputed income from childcare (Input 1 & 2) is now compared to the net annual income from employment for men and women. Figure 7 shows the effect of adding Input 1 and Figure 8 shows the effect of adding Input 2.

In both cases, but more so with respect to Input 2, the 'income' gap between men and women falls with the addition of imputed income for childcare. Total 'income' for men is £29,396 and for women it is £28,315 after adding Input 2. This emphasises the importance of placing a value on household production. If it were possible to find some common denominator (other than money), so as to compare activities carried out in the market and in the home, we would reach a very similar conclusion. Considering both, in the same terms, results in a more balanced picture of what is actually being produced in society.

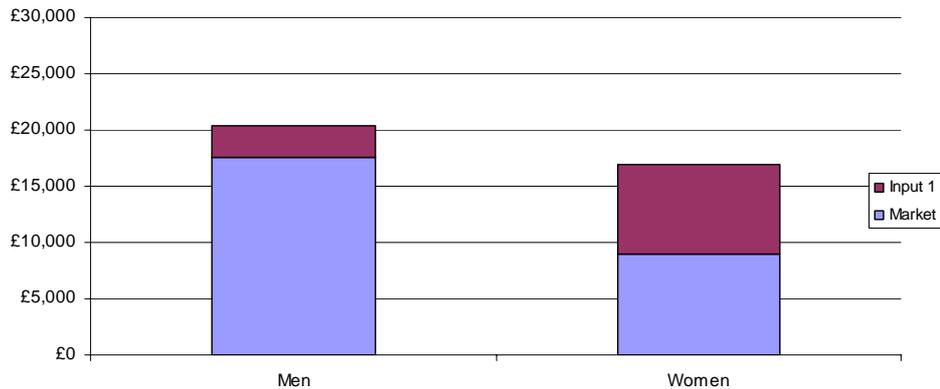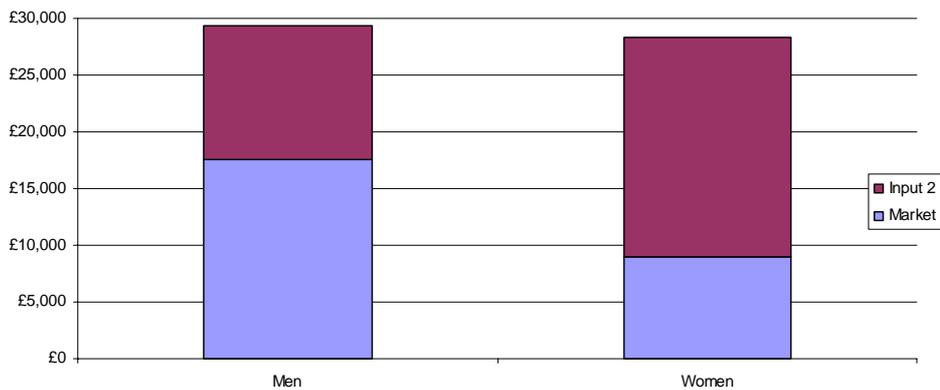Figure 7: Childcare Activities (Input 1) and Annual Net Personal Income

Figure 8: Childcare Activities plus Supervision (Input 2), and Monthly Net Personal Income

7. Conclusion

Valuing household production is an exercise fraught with difficult questions: theoretical, philosophical and empirical. This can be used as an excuse not to do it. There are few who would argue that the quality of care provided in the market is superior to that which is provided within the home. The absolute advantage that parents possess in the provision of the care of their children is something the market could, and should, never compete with. The market however provides some benchmark from which to gauge the economic worth of the care provided by parents.

Recall the critique at the outset of this paper, which argued that a failure to place a value on home produced childcare led to an impression that it was valueless (0),

rather than priceless (∞). Whilst it is possible to conclude with single a point estimate, it seems more reasonable to start from a position which states that the potential value of the household production of childcare, lies somewhere between 0 and ∞, and then basically attempt to narrow the range. Given the large number of assumptions associated with an exercise such as this, it seems reasonable to present a range within which the value can be said to lie.

The prices assigned to household production are not generated 'naturally' as part of an economic process. There is therefore no theoretical basis for the income and expenditure accounts to balance. The number of parents and the number of children appear to be strong factors in mediating the relationship between inputs and outputs. The number of resident parents is going to affect any measure of the parental input into childcare within any individual household. Two resident parents will produce a higher value of childcare, if using an input method, compared to a household with a lone mother. This disparity is not as pronounced when the output method is used. The output measure however, will not fully reflect the total time input into the process in smaller families, as fewer children results in less output. These patterns are going to be more or less pronounced if a higher or lower price is assigned to the output.

The difference in the wages paid to carers, or prices charged per-child, also clearly have a bearing on the outcome of the two methods. However, allowing for the prices to differ, there are times when the input and output measure are roughly similar. In lone mother households, when the ratio of children to carers is 2:1 the input and output methods are similar, and in two parent households when the ratio of children to carers is 3:2/4:2, the input and output methods produce similar values. This occurs when the price of output per child per hour is £4.12, which could be argued to be very high, although not unheard of in the market.

The principal purpose of this paper has been to detail a method for valuing the inputs to, and outputs from childcare provided by the household. Many important issues and questions have been mentioned only in passing. It is important to take some time to reflect on some of these here. This measure of childcare has excluded the time children spend sleeping. Clearly children are still being cared for, and obviously adding this time, even at a very low price, would increase the resulting value of

childcare quite significantly. A second very important issue relates to joint production. This is much more an issue if attempting to place a value on all household production, using an input method. Perhaps, some of the time included in the Input 2 measure would also be included in measures of the value of other activities like cooking and cleaning for example.

From the discussion at the outset of the paper it was concluded that it was preferable to measure the inputs and outputs of household production independently. This paper has sought to show, that whilst valuing childcare using both an input and an output measure is something that requires considerable data, it is nonetheless feasible. In particular it has shown that with diary information completed by children, an output method is possible, as well as the usual input method. The more information that children provide independently of their parents the better this measure becomes.

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