Modelling the capability to be free of time and income poverty

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Abstract
Conventional measures of income poverty focus on whether disposable income is below a poverty threshold. In this paper, an alternative model of poverty is developed which differs in two ways: firstly, alongside income poverty it assesses time poverty - that is, whether the individual's disposable time is below a given threshold, and secondly, it considers not only the individual's achieved functionings but also their capability to avoid time and income poverty. By taking account of the resources the household can command, their conversion factors and the caring responsibilities they must meet, the model is able to distinguish between individuals who are choosing to incur time poverty in order to maximise income (for example, dual earner professional couples), and those who must incur time poverty if they are to avoid income poverty, or vice versa (for example, lone parents working long hours at the minimum wage). It is argued that the approach is potentially a useful way to conceptualise and operationalise capability poverty. Preliminary results for the UK, based on the nationally representative Time Use Survey 2000, are provided.

Keywords: capability approach, time poverty, income poverty, time use survey, UK.

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1. Introduction

Conventional measures of income poverty tell us whether an individual's share of a household's disposable financial resources are above a certain threshold, with the threshold often defined as a percentage of the population average. For example, I might be said to be poor if my net equivalised household income is below 60 per cent of median income. Aside from the arbitrariness of the threshold, the uncertain basis for assumptions about intra-household sharing of resources, and measurement error, a significant conceptual limitation of these conventional measures of poverty as indicators of well-being is their failure to take into account the availability of free time.

The relationship between time and income is complex. On the one hand, time and income are complementary goods: we need free time in which to spend our money and to enjoy the goods and services it purchases. On the other hand, time and income are substitutes: if I have sufficient income to pay someone else to carry out some of my responsibilities (for example, to look after my children), that can give me more free time. Any measure which focuses exclusively on either income or time will provide at best a partial picture of an individual's well-being.

This observation is relevant for a number of different perspectives on the nature of well-being. A utilitarian, for example, must be interested in the relationship between time and income because they enter independently and interactively into an individual's utility function. Becker (1965) is a prime example of this approach. Similarly, a resourcist should have regard to both time and income as resources, although the subject receives little attention in Rawls' work, for example.[1]

For a capability theorist, the situation is a little more complex. Functionings are usually conceived to be activities and states of being which have intrinsic value (such as participating in an election or being well-loved). Having sufficient free time arguably qualifies as a functioning on these grounds and indeed 'time autonomy' appears in a number of proposed lists of basic functionings (Robeyns, 2003). Having sufficient disposable income, however, is valuable as a means to an end rather than as an end in itself and hence avoiding income poverty is not usually conceived of as a functioning.

Income is however a resource which, in combination with other private and public resources, and depending on the individual's rate of conversion of resources into well-being, facilitates a large number of valuable functionings. Significant among the other resources on which the usefulness of income depends is of course time, so by taking account of the availability of free time as well as income, we can gain a fuller picture of the opportunity an individual has to achieve well-being functionings or to pursue

[1] Wealth is listed as one of Rawls' primary goods, but disposable time is not (Rawls, 1971). Yet, having sufficient disposable time is undoubtedly a universal pre-condition for being able to pursue one's conception of the good life. Bojer (2006) points out that Rawls may have intended a conception of income and wealth closer to Becker's concept of full income.

his or her own goals in life. From this point of view, time and income can be considered to be constraints on (or facilitators of) the individual's capability set.

But these constraints - the amounts of income and time at an individual's disposal - are themselves not fixed. For example, two individuals Anita and Bhimla might both be time-poor but above the income poverty line. There is nothing to distinguish them in terms of time and income 'functioning'. But if Anita is part of a dual-earner professional couple, who could stop work without her household's income falling below the poverty line, whereas Bhimla is a lone parent whose earnings are the family's only source of income, their capability sets are clearly very different. Bhimla can avoid income poverty only at the price of time poverty, while Anita has the capability to be free of both time and income poverty (though at present she is choosing to be time poor in order to maximise income). Ideally, a capability-based measure of time and income poverty would reflect not only the functionings an individual can achieve given his or her current time/income bundle but also the range of functionings which could be achieved with any of the time/income bundles available to him or her.

This paper seeks to develop a measure of time and income poverty consistent with the capability approach, while retaining some of the tractability of conventional income poverty measures. It does not claim to offer a comprehensive measure of a capability set since there are many constraints on freedom other than time and income. Rather it illustrates the way in which two significant determinants of individuals' capability sets can be conceptualised and quantified, and the results compared across individuals. It is argued in the conclusion that this may provide a step in the direction of a more general operationalisation of the capability approach.

2. **Previous approaches to time and income poverty**

Interest among economists in the question of time use was stimulated by Becker (1965), who drew attention to the allocation of time by households between production-oriented activities (for example, paid work) and consumption-oriented activities (for example, leisure). He proposed that resources should be measured by 'full income': the income that could be generated by a household devoting all its time to the objective of earning income. This time would include activities necessary to sustaining paid employment, such as sleeping and eating, as well as the paid work itself. In practice of course, "Households in richer countries ... forfeit money income in order to obtain additional utility" (p.498) by choosing to allocate more time to leisure. The assumption, in accordance with conventional economic theory, is that households are utility-maximising and that the time allocation chosen necessarily represents the best allocation for that household, given the wage rates its members can command.

Becker's framework has been both used and criticised by those who have followed. For example, Folbre (2004) argues that Becker does not take sufficient account of the role institutions have in shaping the context in which households' time allocation decisions are made. These institutions include the structure of the labour market (availability of different kinds of work and different packages of hours), the availability of social services including childcare, and cultural and social norms. The broader context in which individuals' decisions about allocation of time are made is

incorporated in the framework for analysis developed in the following section of this paper.

Folbre also critiques, as others have done, Becker's treatment of the household as a unit. In practice the dynamics of household decision making are complex, often involving a mix of altruism, reciprocity, cooperation, conflict, bargaining and exploitation (see Folbre, 1986). This draws attention to the importance of carrying out analysis as far as possible at the individual level, taking into account household resources, rather than starting with the household as the unit of analysis.

Bojer (2006) argues that Becker's framework can be used as a basis for developing a measure of full income *capability*, in accordance with Sen's capability approach. Full income capability is the income an individual could generate if he or she spent all available time in paid work, adjusted for variations in 'special needs' (such as disability) and for unavoidable costs (such as children's consumption and childcare). Bojer argues that the time available for paid work is constrained not just by the number of hours in the day, but also by inflexibility of employers and social norms (for example, mother's may be expected to look after their children rather than undertake long hours of paid work). This approach has much in common with the model outlined in the following section, although here time and income poverty are considered jointly, rather than being combined into a single concept of 'full income'.

The closest equivalent to the approach pursued in this paper is a study by Goodin, Rice, Bittman and Saunders (2005), which distinguishes between free time and discretionary time. Free time is the actual time left over after carrying out 'obligatory' activities such as paid work, unpaid work and personal care, but "people may nevertheless spend more time than strictly necessary doing [these tasks], or achieve more in those realms than strictly necessary" (p.44). Discretionary time is therefore defined as the residual after the *minimum necessary* time has been expended on paid and unpaid work and personal care.

Goodin and colleagues define minimum necessary paid work as the amount of time necessary to earn a poverty-level income, given the wage rate an individual can command (and taking into account the lower wage rates of part-time workers). Poverty is defined in line with (Australian) convention as 50 per cent of median income. For unpaid work and personal care, there are no similar conventions to draw on for what constitutes a 'poverty line', so Goodin and colleagues propose the mean time spent in these activities minus one standard deviation.[2] They justify this definition on the grounds that a poverty line should be set relative to the distribution as whole and somewhere in the bottom half. Obviously this leaves open a wide range of possible thresholds; sensitivity analysis with respect to different definitions of the poverty line would be useful.

Goodin and colleagues operationalise their idea using data from the 1992 Australian Time Use Survey. Mean personal care time is 69.60 hours per week with a standard deviation of 11.73, so the 'poverty line' is set at 57.87 hours per week. For a two-person household, mean unpaid work time is 41.70 hours per week, with a standard

[2] For unpaid work, the mean and standard deviation are calculated separately for different household types.

deviation of 23.94, producing a poverty line of 17.76 hours. Thresholds are derived for other household types in a similar fashion. Minimum paid work time varies by earnings potential, but for a two-adult, one-earner, household with children (for example), the average minimum necessary is calculated to be 24.44 hours per week.

People falling below these thresholds can then be compared to those who are 'time poor' based on actual time use. They find that lone mothers are particularly short of discretionary time, followed by mothers in one-earner and two-earner two-adult households. The biggest discrepancy between (actual) free time and (potential) discretionary time is found for two-adult two-earner households – the household type who are often reported as being under the most time pressure.

The authors conclude that there is a systematic "time-pressure illusion" (p.60) and in one sense this is of course correct. On the other hand, it is worth noting that subjective time pressure is real enough to those enduring it, and people do not necessarily perceive themselves to have as much discretion as Goodin and colleagues attribute to them.[3] It may be important to consider both subjective and objective measures of time poverty to get the full picture (Robinson and Godbey, 1997).

A number of alternative specifications of 'objective' time poverty have been proposed. Bittman (2004) restricts his attention to actual free time available, and defines time poverty relative to the overall distribution of leisure time, setting a threshold at 50 per cent of the median (19 hours and 15 minutes per week for Australia in 1998). By contrast, Vickery's (1977) approach can be seen as an attempt to define *absolute* time poverty, comparable to the US definition of *absolute* income poverty. Vickery observes that the official US poverty line, based on the price of food for a diet that is minimally nutritionally adequate, implicitly assumes that there are substantial time inputs, since the raw ingredients need to be purchased at the cheapest available outlet (potentially requiring time for searching and travel), and prepared or cooked before they can provide nutrition. She calculates the substitutability of time and money near the income poverty line and derives a range of two-dimensional poverty thresholds using an early US time budget study. For example, for a household with one adult and two or three children the poverty threshold is $78 income and 61 hours of non-market work, or $172 income and 14 hours of non-market work (in prices contemporary to the year of the paper: 1977). To this she adds 81 hours per week (as a constant) for the minimum necessary personal care and sleep.

European studies of income poverty more often adopt a relative definition of poverty, and that is reflected in the definitions of both time and income poverty used in the current paper.

Although Ås (1978) does not propose a definition of time poverty, his distinction between four kinds of time is useful:

[3] Reisch (2001) argues that it is not only the lack of time available which contributes to a sense of being pressurised, but also the time of day at which 'free time' occurs, the extent of control the individual has over when it occurs, and the degree to which it is synchronised with the free time of others with whom one wishes to spend leisure time.

(i) necessary time: time needed to satisfy basic physiological needs, for example, sleep, eating, personal hygiene.[4]
(ii) contracted time: regular paid work. Although there may be a degree of freedom of choice in hours of paid work taking a long perspective, in the course of a single day or week, hours of work are usually fixed.
(iii) committed time: "we are often committed to do certain activities simply because earlier we chose to do certain things, e.g. get married, buy a house, have children" (p.134).
(iv) free time: the residual.

Ås acknowledges that the boundaries between these four categories are often blurred – is tending the garden free time or committed time, for example? – but his classification is useful in drawing attention to the longer term dynamics of time use. Earlier decisions about investment in human capital (education and health), about having children, about where to live, and so on, have major consequences for the current range of possible time allocations open to an individual.

Equally, earlier decisions about time use have significant consequences for the different forms of capital now accumulated and available as a resource for individuals to use in combination with current time inputs (Gershuny, 2003). But capital may also need time input in order to be maintained: for example, Gray (2003) focuses on social capital, and shows how its creation and maintenance requires significant time expenditure through providing reciprocal services and investing emotionally in relationships.

In the framework proposed below, past decisions which influence both the stock of capital available to individuals and the responsibilities they have acquired (for example, children to look after), are regarded as fixed: the analysis is of the current circumstances of the individual, not of the extent to which they may be held responsible for their circumstances. Again, this is consistent with the usual approach to income poverty. We do not generally ask whether someone *could have* earned more money if they had worked harder at school, we analyse the income they actually have. Current levels of capital, and the time necessary to maintain it, are important elements of the framework.

Efforts to measure trends in free time over the latter half of the twentieth century have used a range of definitions but produced broadly similar findings. Gershuny (2000) concludes, on the basis of an analysis of 20 countries, that there was a slight increase in free time for both men and women in the period 1960 – 1990,[5] although not through the mechanisms that might have been expected. For example, between 1930 and 1970 in the USA and the UK, average hours of domestic work did not fall, despite major changes in technology.

More important perhaps than trends in average free time, is changes in its *distribution*. Paid work has increased for high paid men and decreased for the low paid, contrary to the prediction of Veblen's classic, *Theory of the Leisure Class* (1925), leading

[4] Ås (1978, p.134) comments: "Sex most definitely belongs here, but this is seldom encountered in time diaries".
[5] Extending this analysis into the 1990s, Fisher (2003) finds that free time receded again, returning to the level of the early 1970s.

Gershuny (2005) to argue that 'being busy' – in particular working long hours – is now a signifier of dominant social status. At the same time, there has been a convergence between men and women in terms of the balance of paid work, unpaid work and leisure. The importance of taking into account both gender and differences in social status is highlighted by Warren (2003) in her analysis of British Household Panel Survey data. She finds evidence that women in higher income households are able to increase time available for leisure or paid work by purchasing help with domestic tasks: 13 per cent of "middle class" women said cleaning was mainly provided by someone outside the family, and over one-third used non-family childcare when they were at work. Interactions between gender and class are an important component of the analysis presented below.

3. **Model of time and income capability poverty**

3.1. Context, resources and responsibilities

Figure 1 illustrates the model proposed in this paper. Two simplifying assumptions are made at the outset. The first is that the model is represented for an individual rather than a household (and for ease of exposition the individual is referred to as female). Individuals are the appropriate unit of analysis for the outcomes - time and income poverty - since these are experienced by individuals, but for many people, the process of arriving at those outcomes includes decisions about the allocation of time to paid and unpaid work made jointly by two or more members of the household. Moreover, by focusing on individual experience of time poverty, the model sets aside the problems which can be generated for families by members' disposable time failing to overlap, so that leisure cannot be enjoyed together (Jacobs and Gerson, 2001; Warren, 2003). The model could be adapted for a couple or other household unit by adding interactions between the decisions of the two (or more) individuals and interactions between their poverty outcomes.

The second simplification is holding constant the wider context in which decisions are made. This includes the following:

- the physical environment, such as the transport infrastructure, which influences the feasible travel-to-work area (and travel-to-childcare area) of the individual;
- the economy, including prices (which determine what goods and services can be purchased with a given income), the returns to different forms of capital (for example, the wage differential between low and high-skilled workers), the availability of part-time and flexible work, and the overall level demand for labour;
- the cultural context, including gender and other social norms which determine who and what is deemed to be an individual's responsibility;
- public policy, which sets out the entitlements an individual has to state support and on what conditions.

Within this context, an individual must decide how to allocate her time between four categories of activity: paid work, unpaid work, personal care and free time. The decision is constrained in two ways: firstly by the resources available to the individual, and secondly by the responsibilities for looking after herself and others which she must meet. Together these constraints define a set of feasible time

allocations, within a given context. Of course, some individuals choose to, or are obliged to, adopt a time allocation which does not enable them to meet their responsibilities but, for the purposes of the model, to be deemed feasible a time allocation must enable an individual's responsibilities to be met.

Let us now look at each of the principal components of the model. Resources are defined to include time (24 hours per day), since the individual can use her time either directly to meet her responsibilities (for example by looking after her own children) or indirectly to earn income to pay for goods and services which in turn meet her responsibilities (for example, a childminder). Income is not treated as a basic resource since it is derived through the application of time and one or more forms of capital. Financial capital is the most obvious – savings generate income with only a minimal investment of time. (Conversely, debt absorbs income). Physical capital, such as a house or piece of equipment, can be used to generate income by renting it out or employing it in the course of paid work. Human capital includes educational qualifications, skills, experience and health status, and is a key determinant of the wages an individual can command. Finally, social capital, such as having a network of friends and family nearby, may enable the individual to access goods and services without monetary payment.

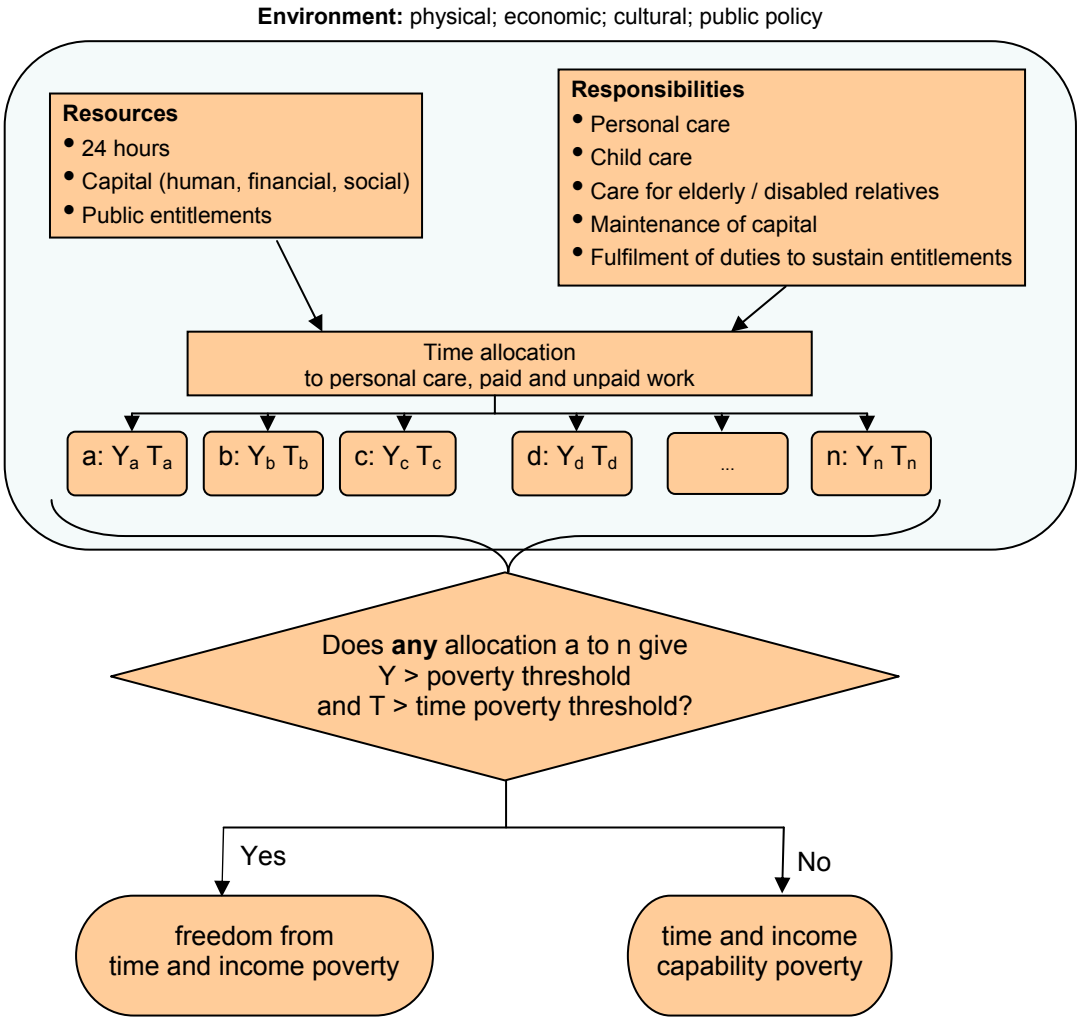
The stock of each of these forms of capital which the individual holds, and especially human capital, is crucial in determining the 'exchange rate' between her own labour and that of others. For example, one hour's labour for a professional can purchase several hours' childcare, because her earnings are several times that of a childminder, while for a manual worker, an hour's labour might only just be sufficient to pay for an hour's childcare, making paid work uneconomic unless other forms of capital (for example, social capital in the form of unpaid care provided by grandparents) can be brought into play. This implies that for a given set of responsibilities (and holding other forms of capital constant), the range of allocations between paid and unpaid work available to a professional is greater than that available to a manual worker.

In addition to these private resources, the individual may also have a number of social entitlements, for example to unemployment benefit if out of work, or to a disability benefit if unable to work through incapacity.

Turning to responsibilities, the first in the list is personal care, which includes sleeping, eating, washing and so on. These are not counted as 'unpaid work', since in most cases it is not possible to pay someone else to do them for you and still get the same benefit from them.[6] Time taken for personal care is included in 'non-disposable' time. Clearly, some people choose to spend more time on these tasks than others – a 5-minute shower may achieve the same degree of cleanliness as a long soak in the tub – so that the boundary between disposable and non-disposable time becomes somewhat fuzzy. The question of the minimum required to meet one's responsibilities is an issue to which we return below.

[6] Reid (1934) calls this the 'third person criterion'.

Figure 1: Time and income capability poverty



Key

a - n are alternatives Y is disposable income T is disposable time

There are also non-discretionary variations in the time required for personal care. For example, some physical impairments mean it takes longer to eat or to wash; children need more sleep than adults, and so on. These variations affect the amount of disposable time available to individuals with different characteristics.

Childcare and care for elderly or disabled relatives may be provided directly, by performing the care oneself, or indirectly, by paying someone else to do so. The extent to which it is acceptable to replace direct by indirect care, the minimum quality of care which must be provided, and the extent of responsibilities for relatives other than one's own children, are all subject to strong social norms. The interpretation of these norms, and the degree of congruence with personal values, varies considerably.

Caring activities are often simultaneous with other activities, for example, minding the children while cooking the dinner, or keeping granny company while studying for college (Craig, 2005). This creates additional complexity in operationalising the model but conceptually it is clear that time spent fulfilling caring responsibilities, even if something else can be done at the same time, is non-disposable: the carer is not free to do exactly as she pleases during that time.

Also included in the list of responsibilities is maintenance of capital. This is to ensure that the model represents a sustainable scenario: if individuals were running down their capital, that would imply that a narrower range of time allocations would be available in future. Maintenance of capital involves quite a wide range of activities. Physical capital, such as a house, requires investment of time and/or resources in order to maintain its condition and value. Maintaining human capital means keeping healthy (exercise, diet, adequate rest and so on), as well as keeping skills up to date through continuing education and training. Social capital is in many cases based on reciprocity, and this too requires investment – usually of time – to maintain, although not necessarily in exactly the same time period as the period in which the benefits are received.

The stipulation that maintenance of different forms of capital is part of the 'responsibilities' side of the equation can be interpreted relatively straightforwardly for single people, and for couples provided one treats the couple as a unit. But if one considers the possibility that a couple may split into two households at some point in the future, the question of maintenance of capital becomes more complex. Commonly, a couple's human capital is maintained by one partner remaining in the labour market (often the man), and their social capital is maintained by the other partner participating in informal networks of shared care. This may be an entirely satisfactory time allocation for as long as they remain a unit – each benefiting from the capital being maintained by the other – but following a split, the lack of specific forms of capital may be acutely felt. Human capital is not readily translated into social capital or vice versa.

A more sophisticated version of the model presented here would therefore need to incorporate the lifetime dynamics of time allocation. As it is, the future is assumed to be like the present. Equally, the past is taken as given. Previous constraints and decisions the individual has made about allocating her time between different activities, including the accumulation of different forms of capital (for example

investing in human capital through studying), are regarded as fixed constraints on the present situation (Gershuny, 2003).

Given their current stocks of capital and level of responsibilities, some people may be in a position to accumulate additional capital, for example by studying in their spare time. Any such activities are treated in the model as discretionary (i.e. included in disposable time). Others may find themselves in a 'time poverty trap': needing to work long hours in order to meet their responsibilities (directly or indirectly) and therefore unable to devote time to increasing their human capital, which would in due course increase their disposable time.

Finally, entitlement to public support such as social security, usually comes with strings attached, such as the requirement to seek work. Fulfilment of these conditions is also included in the model in the category of responsibilities which an individual must meet.

3.2. Time allocations

The resources an individual commands and the responsibilities which she must meet defines a range of feasible time allocations for her, with activities grouped broadly into personal care, paid work and unpaid work. The residual is disposable time. Each allocation, labelled as 'a' to 'n' in Figure 1, implies a different combination of disposable time, T, and disposable income, Y. These terms must now be defined more precisely.

Disposable time is the time left over after an individual's responsibilities are met. However, as mentioned above, what constitutes 'meeting one's responsibilities' is subject to wide variation in interpretation of social norms and personal values, and it is therefore difficult to define in absolute terms. Moreover, some people choose to use their disposable time to undertake activities which are indistinguishable from the activities required to meet their responsibilities – working longer hours in the same job, for example, or spending more time with their children. For these reasons, *all* time actually spent on paid work, personal care, caring or capital-maintenance type activities is treated as non-disposable.

However, the model requires us to examine all feasible time allocations, not just the observed (actual) allocation, and in order to determine what counts as 'feasible', we need a definition of the *minimum* required to meet a given level of responsibilities. In order to reflect the idea that the minimum is socially constructed and that some people will fall below it, the minimum is defined relative to the relevant population average (for example, half of the median time non-disabled adults spend on personal care might define the minimum for personal care in the absence of impairment). Sensitivity analysis can be performed to test the implications of defining the minimum at different levels.

Similar issues arise with respect to disposable income. Disposable income is usually taken to be income net of direct taxes, social insurance contributions and, sometimes, pension contributions and housing costs. For the purposes of this model, we also need to subtract any costs associated with meeting one's responsibilities – childcare expenses, travel to work, and so on. Again, there is a question about the point at

which such expenses cross into discretionary expenditure. The response is the same as described above for disposable time: all actual expenses of this kind are deducted from disposable income, but when evaluating the minimum expenditures necessary, levels are defined relative to population averages.

Each allocation of time generates a different combination of disposable time and income and these can be plotted on a graph as shown in Figure 2. The numbers are hypothetical and each line represents a different individual. The thresholds for time and income poverty shown on the figure as dashed lines are also hypothetical but are roughly speaking at 60 per cent of population median time and income respectively. Everyone is assumed to have an entitlement to a basic state income (£100 per week) if they do not work.

Person A (the light blue line with square symbols) has high human capital and few responsibilities – no children or other dependent adults – so as soon as she starts working, her disposable income rises rapidly. Of course her disposable time falls, but she may choose any of a wide range of time allocations without risking either time poverty or income poverty.

Person B (dark blue line with cross symbols) is similar to Person A in that she has few responsibilities for caring for others, but her human capital is lower and consequently the returns to paid work for her are lower. She has to work longer hours in order to achieve the same disposable income as Person A, and as a result, some of her feasible time allocations take her to the left of the time poverty threshold. Nevertheless she has a reasonably wide range of possible allocations free of both time and income poverty.

Life is considerably more complicated for Persons C and D, both of whom have substantial caring responsibilities (here taken to be 70 hours per week). They face not only a decision about how much paid work to undertake, but also about how much replacement care to buy in and how much to provide directly themselves. Person C (yellow line with circle symbols) has similar levels of human capital to Person A. Each hour of paid work she undertakes can pay for two hours of replacement care, because her wages are twice those of the carer. To start with, she might decide not to work but to use all her state income (£100) to purchase replacement care, gaining her a little bit of extra disposable time, but with no disposable income (i.e. moving right along the bottom axis).[7] Initially when she starts working, all her income goes on purchasing replacement care – again, gaining disposable time but not generating any surplus income. Only when she works more than 35 hours does she begin to see a net financial return from working. At this point, however, any additional paid work will begin to *reduce* her overall disposable time, though with all the care now paid for, her disposable income can rise quite rapidly. Her time and income capability set is clearly more constrained than her counterpart who has few responsibilities (Person A). With respect to Person B, who has few responsibilities but lower human capital, the dominance is less decisive. C can generate more disposable income than B if she works 70 hours a week or more, but the majority of C's feasible time allocations generate less desirable disposable time and income combinations than B's options.

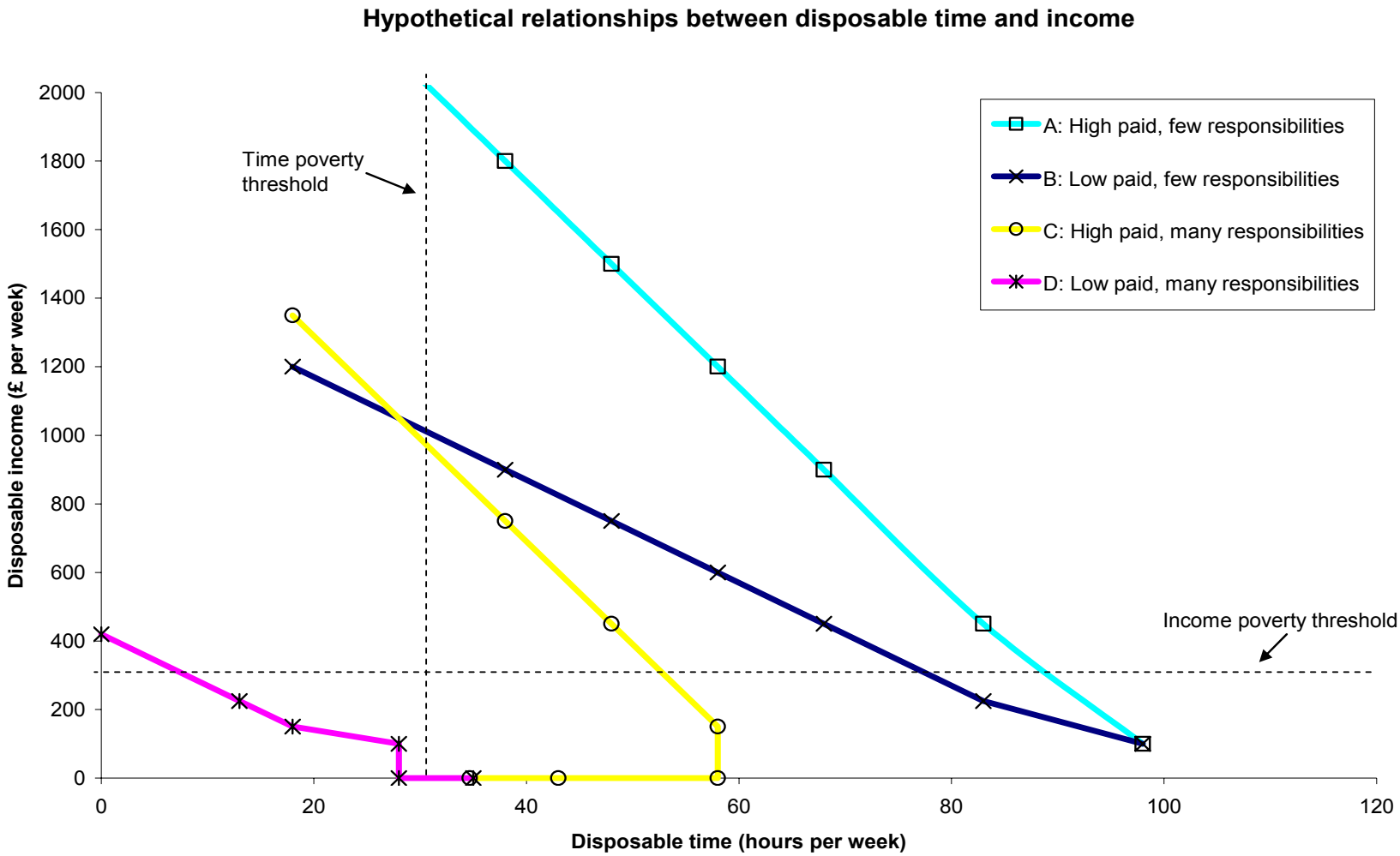
[7] In fact she is unlikely to choose this option unless she has a preference for caring work over paid work because the time-income pair generated is dominated by another point in her feasible time allocations – she can gain the same disposable time but more disposable income by working much longer hours.

Person D (pink line with star symbol), with low human capital and substantial caring responsibilities, is clearly worst off of all. Initially, like Person C, she may spend her state entitlement on purchasing replacement care, gaining her the maximum amount of disposable time she can generate but no disposable income (first point on the line at the right). If she undertakes a few hours of paid work she forfeits the state income, and as her wage rate is the same as that of a replacement carer, she gains no additional disposable income but loses disposable time (second point on the line). Instead she might choose to rely on the state entitlement and undertake the care work herself (third point along the line) – same disposable time but at least a little disposable income. Increasing disposable income from here can be achieved in one of two ways, but both of which reduce disposable time substantially: either she can continue to provide the care herself on top of her paid work hours, or she can work such long hours (over 70) that she can pay for the care and have a little income left over. The maximum disposable income she can generate in this example is £420 per week, by doing 28 hours of paid work and 70 hours of caring, leaving her with no disposable time at all. Person D can escape income poverty only by incurring severe time poverty, and can escape time poverty only by incurring severe income poverty: her capability set is severely constrained.

One can see that having heavier responsibilities (Persons C and D) shifts the 'capability frontier' to the left, towards time poverty: this is because even in the absence of paid work, these individuals have less disposable time than those with fewer responsibilities (Persons A and B). Having more responsibilities also shifts the line downwards, towards income poverty: the costs of replacement care must be deducted from earnings before any disposable income can be generated. In addition, the graph shows that having lower human capital (for example, being a lower-skilled worker – Persons B and D) makes the gradient flatter, since converting one hour of disposable time into income through paid work generates less additional income than for a higher-waged individual. This means it is harder for the lower-skilled to move into the top right quadrant of the graph, where she would be free from both time and income poverty.

In the example shown, no part of Person D's line crosses into the top right quadrant, in other words, no feasible time allocation for this individual enables her to be free of both time and income poverty. All of the other hypothetical individuals represented in the graph have some chance of locating themselves in the top right quadrant, although a wider range of time allocations produces that result for Person A than for the others. This corresponds to an approximate ranking of capability sets, at least as far as the capabilities for time and income are concerned.

Figure 2


Hypothetical relationships between disposable time and income
Disposable income (£ per week)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
20
40
60
80
100
120
Disposable time (hours per week)
Time poverty threshold
Income poverty threshold
A: High paid, few responsibilities
B: Low paid, few responsibilities
C: High paid, many responsibilities
D: Low paid, many responsibilities

4. **Time and income poverty in the UK**

4.1. Data and definitions

Implementing the model outlined in the previous section is demanding in terms of data, since it requires information not only on the actual allocation of time individuals make between different activities and the income thereby generated, but also on their resources and responsibilities, such that the effects of a range of alternative feasible time allocations on their disposable time and income can be considered. Time use surveys, such as the UK 2000 Time Use Survey (TUS) run by the Office for National Statistics, provide a useful starting point, covering actual time allocations in considerable detail, some measures of income, and some information on individuals' caring responsibilities. This is sufficient to analyse actual time and income poverty ('functioning'), as illustrated below. However, information on different forms of capital and public entitlements is more limited, which means that generating the alternative feasible time allocations necessary to evaluate time and income capability requires more complex imputation and estimation, not attempted in this paper.

The TUS was designed to be representative of the household population in the UK. The achieved sample size was 6,414 households, representing a response rate of 61 per cent. All individuals aged 8 or over were asked to complete an individual questionnaire (N=11,664) and to complete diaries detailing their activities in 10-minute slots for two days (one weekday and one weekend day), (N=19,898). This represents a response rate of 73 per cent of eligible individuals in sample households for the diaries, which is good in comparison to other time use surveys, but nevertheless means the overall response rate for diaries from the target sample is just under half, at 45 per cent. For this reason ONS have calculated weights to counter potential bias arising from differential non-response (Elliot, 2002), and these are applied in the results shown below.[8]

Results are presented below based on the working-age population (ages 16-64), since different norms for time poverty apply to both children and the retired population. Time spent on three broad categories of activity is counted as non-disposable time: personal care, paid work, and unpaid work. Travel in pursuit of these activities is also included. Personal care includes sleep. Paid work includes employment and self-employment, working in a family business without pay, and job-seeking activities. It does not include education or unpaid training. Unpaid work uses the 'third person criterion', that is, whether the task could in principle be performed by someone else without loosing its purpose. For example, the purpose of washing up is to get the dishes clean and this can be done by someone else, whereas the purpose of watching a film is (usually!) to enjoy it, so getting someone else to watch the film on your behalf would miss the point. Broadly speaking, unpaid work includes domestic tasks, childcare and unpaid care for others. Voluntary work for organisations is not included, as this is regarded as leisure. More detail of the relevant codes is given in Appendix 1.

[8] Using the variable wtdt_ug, which is for individuals who have completed diaries of an adequate standard.

For each time slot, respondents were asked to record their main activity and any secondary activity in which they were engaged.[9] If either the main or the secondary activity falls into the category corresponding to 'non-disposable' time, that time is counted as non-disposable. Disposable time is simply 24 hours minus non-disposable time for the diary day in question. A weekly figure is calculated by multiplying the weekday diary total by 5 and adding the weekend diary day total multiplied by 2.[10]

As discussed in relation to the model, disposable time is measured at an individual level. This is appropriate for a 'functionings' measure. An individual may be time poor despite the fact that her household overall is not, due to an unequal distribution of disposable time within the household, and this can be detected only by analysing poverty at an individual level. It is often thought that women's increased participation in the paid labour force has not been matched by a decrease in their domestic labour, such that they are now at greater risk of bearing a 'double burden', although analysis of trends over time do not necessarily bear this out (Gershuny, 2000). More detailed exploration of the causes of individual time poverty, whether they lie within the household or outside it, are beyond the scope of this preliminary analysis.

The empirical definition of disposable time is thus reasonably close to that outlined in the model. The main difference is failure to include time allocated to maintenance of different forms of capital. The definition of income is more problematic. Ideally, we would want a measure of individual command over resources – not the same as individual income receipts, since there is usually some sharing within households, but not the same as equivalised household income either, since sharing is often unequal (Pahl, 1989). In the absence of detailed information on intra-household distribution, and in common with most other income poverty research, we use equivalised household income as the least-bad approximation.

Information on household income in TUS comes in various forms. A general question about asks respondents to indicate into which of 11 consecutive ranges their gross household income falls. This has three limitations for the present analysis: (i) it provides gross incomes rather than disposable income; (ii) it is in bands rather than exact amounts, which makes it difficult to manipulate, for example, to adjust for differences in household size; and (iii) the responses are of doubtful accuracy (see Burchardt, 2006).

More detailed information on net earnings is available, and on other sources (but not amounts) of income. Total household net incomes can be imputed by combining this information with estimates from another survey (the Family Resources Survey) – see Burchardt (2006) for details of the methodology. The resulting distribution of net income gives a reasonable match to the government's official income statistics, and it is this definition of income which is used in the results shown below, equivalised for

[9] Unless the main activity was sleep or paid work, in which case secondary activities are not recorded. Childcare is one of the activities which often occurs as a secondary activity – eg making dinner and supervising children's homework. Some passive childcare is nevertheless likely to have gone unrecorded, for example if both the parent and the children are in the house but they are not engaging with one another.

[10] Only individuals who completed two diary days at a standard judged acceptable by ONS are included. This means dropping 1082 below-standard diaries and 166 diaries where no 'pair' exists.

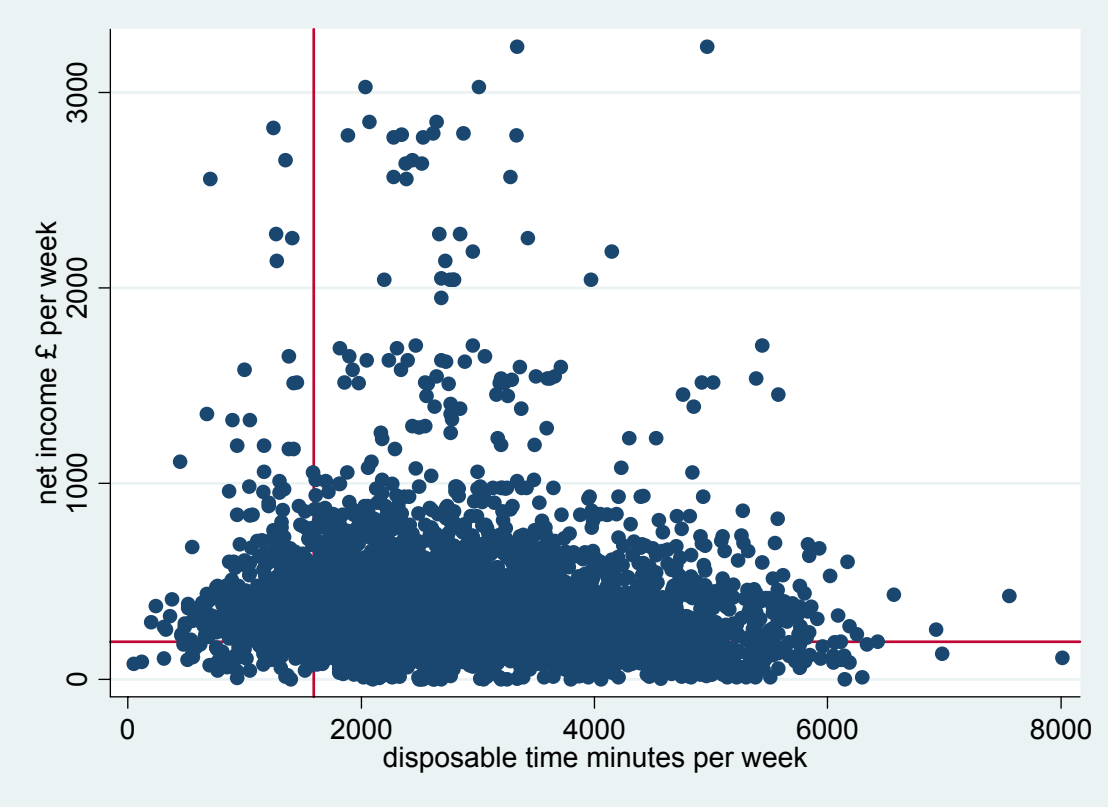
differences in household composition using the 'Modified OECD' equivalisation scale (DWP, 2006).

Information is collected in TUS on childcare used and other goods and services purchased in order to meet responsibilities, but not on the expenditure on these items. According to the model described in the previous section, expenditure of this kind should be deducted from net incomes to provide a measure of disposable income. It is hoped to include estimated care costs in future versions of this paper. For now, the income definition is better described as 'net income' than 'disposable income'.

4.2. Preliminary results

Figure 3 shows the net income and disposable time generated for each individual in the sample by the actual time allocations they have chosen (or been obliged to adopt). The lines superimposed on the graph represent poverty thresholds set at 60 per cent of the relevant population median.

Figure 3: Net income and disposable time, people of working age, UK 2000



Note: each spot represents an individual. The vertical and horizontal red lines indicate poverty thresholds, set at 60 per cent of median disposable time and net income respectively.

Those in the bottom left-hand corner are both time and income-poor. Although the figure represents functionings rather than capabilities, we can already infer that these individuals have severely constrained time and income capabilities: they cannot trade time for income or vice versa, since they are already below the poverty lines on both dimensions.

Individuals on the left of the figure but higher up are time poor but income rich – those with fewer responsibilities or higher human capital who are trading disposable time for higher net income. The outliers may be dual-earner professional couples about whom so much is written in the time poverty literature. Conversely, those at the bottom of the figure but to the right are time rich but income poor. These are likely to include the unemployed without significant caring responsibilities.

Fortunately a large majority of the working age population are free of both time and income poverty. Table 1 shows the corresponding proportions in each sector of the figure.

Table 1: Time and income poverty among people of working age, UK 2000
Using poverty thresholds of 60% of median net income and 60% median disposable time (cell percentages)

60% median	Time poor	Not time poor
Not income poor	10.2	68.4
Income poor	1.6	19.9

Median disposable time for people of working age in this sample is 44 hours and 15 minutes per week, so a threshold set at 60 per cent of the median is 26 hours and 54 minutes. For net income, the median is £327 per week, so the 60 per cent threshold is £196. Naturally, the proportions classified as poor depend on the position of these thresholds. Table 2 illustrates sensitivity analysis using lower (50 per cent of median) and higher (70 per cent of median) poverty thresholds for each dimension. The estimate of the percentage of the population who are both time and income poor ranges around the central estimate of 1.6 per cent to 0.8 per cent using the lowest threshold, and 4.3 per cent using the highest threshold. This indicates that the joint distribution of disposable time and income is denser just above the central poverty threshold than it is just below the central threshold, since more people are brought into the classification 'poor' by moving the threshold up by 10 percentage points of the median than are excluded by bringing the classification down the same distance.

Table 2: Time and income poverty using lower and higher thresholds
(cell percentages)

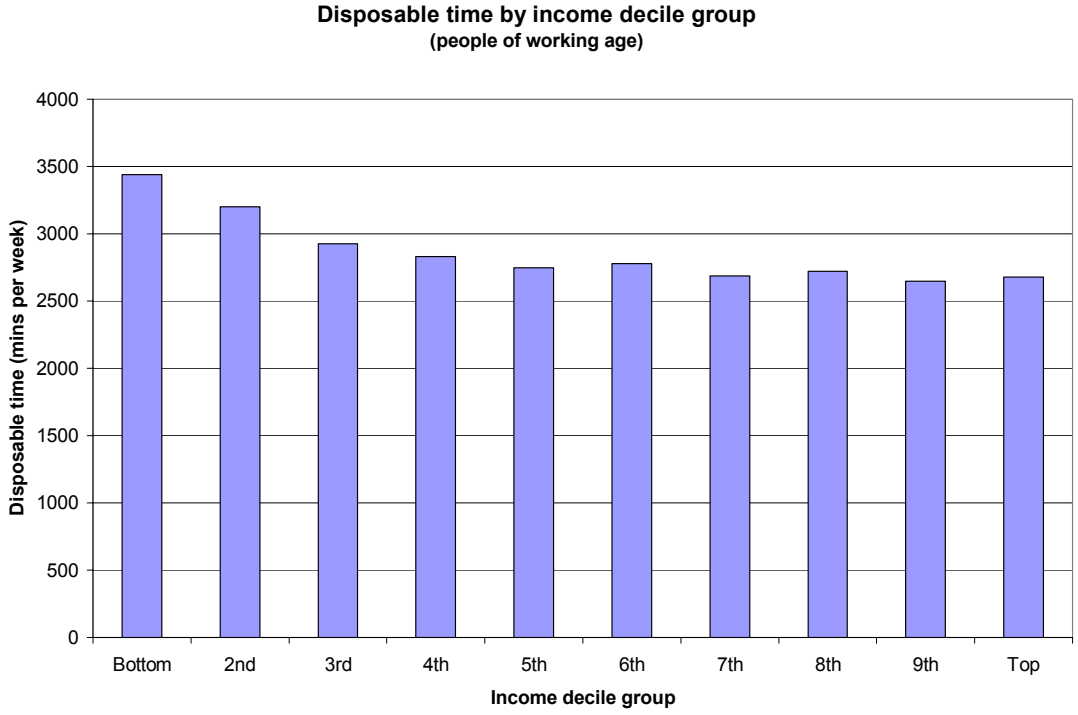
50% median	Time poor	Not time poor
Not income poor	5.6	78.5
Income poor	0.8	15.1

70% median	Time poor	Not time poor
Not income poor	15.2	56.2
Income poor	4.3	24.3

The remainder of the analysis uses the 60 per cent of median thresholds for each of time and income. The choice is inevitably arbitrary; this threshold has the advantage of being commonly used in income poverty studies.

Overall, there is a weak, but significant, negative correlation between net income and disposable time (coefficient -0.12) among people of working age. Dividing the population into ten equal groups by income (decile groups), the relationship with disposable time is shown in Figure 4.[11]

Figure 4

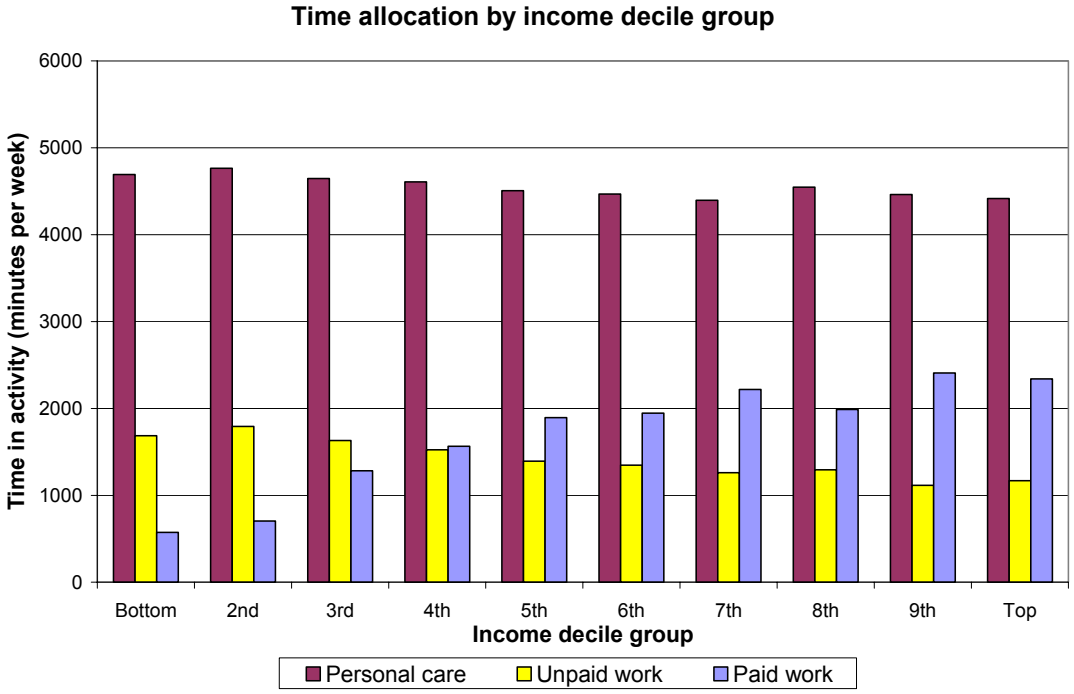


Disposable time among the bottom income decile groups is substantially higher than further up the income distribution. (To translate into more familiar terms, the bottom income decile group have 57 hours and 17 minutes, while the top income decile group have 44 hours and 37 minutes). This is to be expected, since those with the lowest income are also least likely to be in paid work – a major component of 'non-disposable' time as defined here. This is shown in Figure 5, along with the other components, personal care (including sleep), and unpaid work (including caring for children, caring for others and domestic work).[12]

[11] Conversely, dividing the working age population into ten equal groups by disposable time, the average net income in the bottom time decile group is £433 per week in 2000 prices, and £296 per week for the top time decile group.

[12] These 3 components do not sum exactly to the total 'non-disposable time', because a principal activity in one component (eg cooking) may be simultaneous with a secondary activity in another component (eg childcare). This time is counted only once in total non-disposable time, but occurs in each of the relevant component totals.

Figure 5



There is a slight, but statistically significant, fall in minutes spent on personal care with increasing income. The bottom two income decile groups spend an average of 5 hours per week more on personal care than the top two income decile groups. Explanations for this difference must await further analysis but one possibility is that those with long paid working hours have less sleep. (Sleep is a major component of what is defined here as personal care). Certainly there is a strong negative correlation between paid work hours and personal care hours (correlation coefficient -0.44).

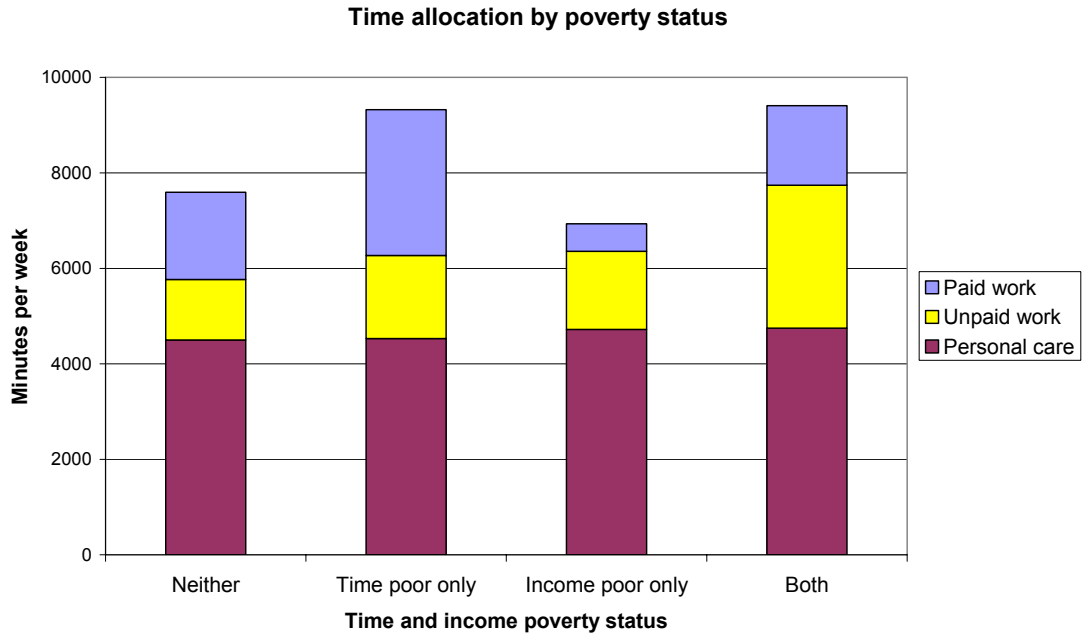
Unpaid work falls from just over 28 hours in the bottom income decile group to 19½ hours in the top income decile group. This is consistent with the higher income groups using some of their income to purchase services to meet their domestic and caring responsibilities, rather than providing the labour directly themselves, although it may also reflect compositional differences (for example, differences in household type).

The combined reductions in time spent in personal care and in unpaid work at the top of the income distribution are not enough, however, to offset the greater amount of time spent in paid work: up from an average of 9½ hours in the bottom income decile group to 39 hours in the top income decile group. This explains the pattern observed in Figure 4, with the lower income groups having more disposable time overall than the higher income groups. The steepness of the down-sloping gradient in disposable time for the bottom four income groups in Figure 4 is a reflection of the steep up-gradient in the hours of paid work for these groups shown in Figure 5.

Figure 6 examines the same components of non-disposable time, but using a breakdown by time and income poverty status (using 60 per cent of median as the poverty threshold for both dimensions). This shows that not only are there significant differences between the groups in terms of overall non-disposable time (and therefore in disposable time), but there are also significant differences in the types of activities

which make up their non-disposable time. The time and income poor, and those who are time poor only, have similar amounts of non-disposable time overall, at 149 hours and 147 hours respectively, but the former spend a much higher proportion of their time in unpaid work (caring for others), while the latter spend more time in paid work (possibly indicating a greater degree of choice). Those who are neither time nor income poor do more paid work than those who are income poor only, but they do the least unpaid work of all the groups. There is very little variation between poverty status groups in the amount of time spent on personal care.

Figure 6



Focusing on those who are income poor (i.e. those who are income poor only and those who are both income and time poor), we find that they spend on average nearly 29 hours per week in unpaid work (compared to just over 22 hours for the non-poor). One quarter of income poor spend over 42½ hours per week in this kind of activity. This group is likely to include those with substantial caring responsibilities, for example for elderly or disabled relatives, who may have very limited opportunities for increasing their income through paid work.

While 70 per cent of the income poor report no paid work at all, among the 30 per cent who do, mean working hours are 37½ hours per week. One quarter of the income poor who are in employment report working over 51½ hours per week. This is a group of considerable concern from both from a policy perspective and in terms of their potentially very limited capability set.

These figures of course represent the actual chosen allocation of time (time-functioning) rather than the range of allocations available to the different groups (time-capability). Analysing the resources individuals have at their disposal and the level of responsibilities they must meet begins to indicate the constraints which they are operating under. While a full analysis of the implications of these constraints must wait for another paper, Figure 7 shows the relationship between one indicator of resources – educational qualifications as a proxy for human capital – and the risk of

time and income poverty, while Figure 8 shows the relationship between an index of caring responsibilities and the risk of poverty.

Figure 7

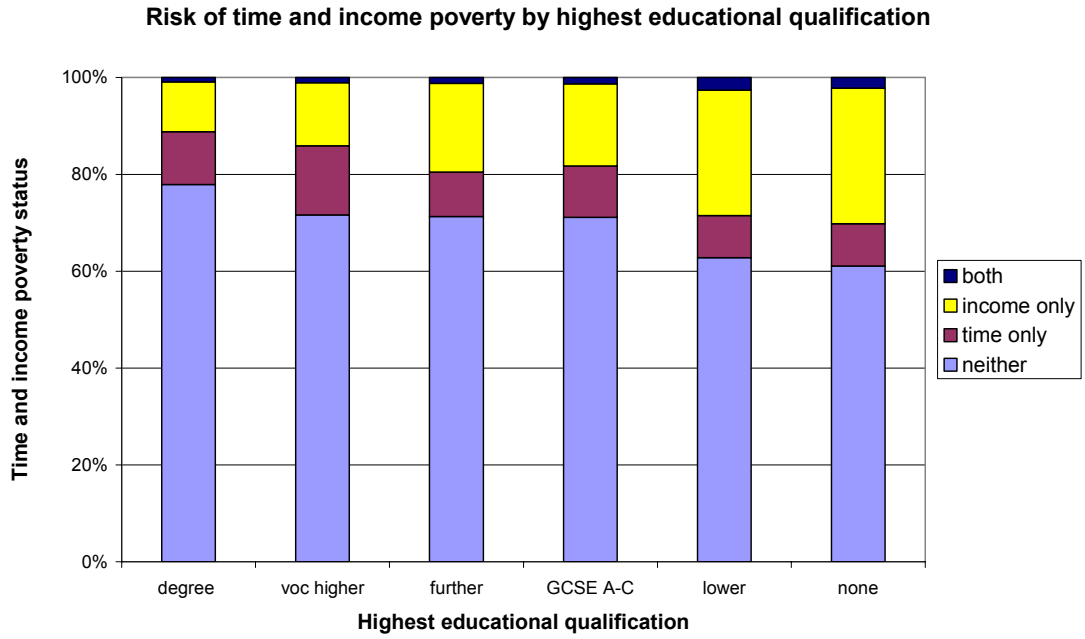
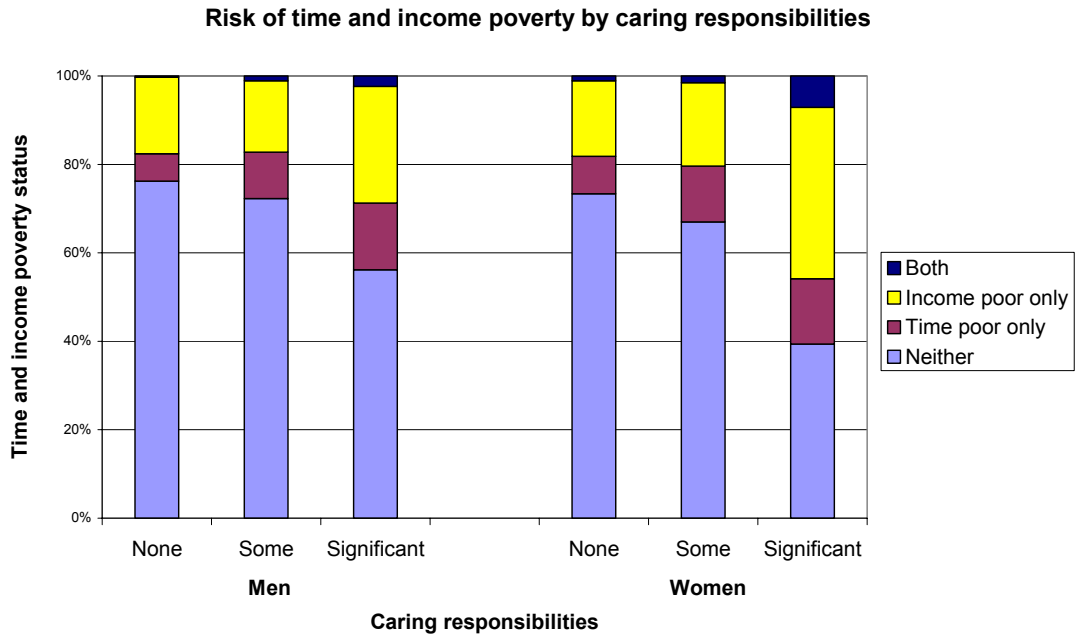


Figure 7 confirms that higher levels of human capital protect against time and income poverty. Although as we have seen the numbers experiencing time and income poverty simultaneously are small, there is a clear gradient from 0.9 per cent of those with a degree to 2.2 per cent of those with no formal qualifications. There is also a strong increase in risk of income-only poverty as qualifications fall, as expected, and an uneven slight decrease in risk of time-only poverty (possibly as a consequence of higher rates of unemployment among the low-skilled). The combined effect is a very strong gradient in the chance of freedom from both time and income poverty: from four-fifths of those with a degree to one half of those with no educational qualifications.

A rough index of caring responsibilities can be created by counting the number of children in the household, giving additional weight to younger children, adding information about any other caring responsibilities (such as for elderly relatives), and adjusting to take account of whether there are one or more adults in the household to potentially share the caring responsibilities. Figure 8 is based on such an index, with the category "significant" responsibilities referring to a household in which there is, for example, a pre-school child in a single-parent household, or a baby and an elderly parent in a couple household.

As predicted by the theoretical model, those with more substantial caring responsibilities are at greater risk of time and of income poverty, and particularly at greater risk of experiencing both simultaneously. The effect is apparent for both men and women but is especially pronounced for women. Only two-fifths of women with significant caring responsibilities are free from both time and income poverty compared to over half of men in that situation (39 per cent compared to 56 per cent).

Figure 8



Taking men and women together, 5 per cent of those with significant caring responsibilities are both time and income poor, 15 per cent are time poor only and one-third are income poor only: 54 per cent in total are constrained by either time or income poverty. This compares to just 25 per cent of those with no caring responsibilities, confirming that differing burdens of responsibility are an important contributor to differences in capabilities for time and income.

5. Conclusions

This paper has developed a framework for thinking about time and income poverty, and the relationship between them. It began by arguing that income-based measures of well-being, such as conventional poverty indicators, are incomplete since they do not take into account the possibility that income poverty may be avoided only at the price of time poverty. The model proposed differentiates between the actual time allocation chosen by individuals (and the income it generates) and the range of possible time allocations (and incomes) available to them, given their resources and responsibilities. This framework draws on the theoretical apparatus provided by the capability approach.

Preliminary analysis presented in section 4 of the paper focuses on actual time allocations, and further work will be necessary to implement the estimation of the range of time allocations available to individuals (their 'time and income capability sets'). Nevertheless, this preliminary analysis sheds some interesting light on the groups most likely to be suffering from severely constrained opportunities for avoiding both time and income poverty. It shows that while there is a negative relationship between disposable time and disposable income overall (more money means less time), there is wide variation around the averages, with for example 1 in 3 of the income poor appearing the bottom half of the distribution of disposable time. Breakdowns by time allocation and individual characteristics supported the hypothesis that both heavy caring responsibilities and limited resources (in the form of low

human capital) contributed to being at higher risk of the 'double bind' of time and income poverty.

Understanding the joint operation of time and income constraints is important not only for a better appreciation of individual well-being and disadvantage but also for formulating effective policy responses. Where long paid work hours are required to maintain an income above the poverty line, interventions to make each hour of paid work more financially rewarding may be relevant: for example, through raising the minimum wage; increasing take-up, scope or generosity of tax credits; or providing opportunities for individuals to increase their human capital without losing essential income in the short-term. Where the risk of time and income poverty is due not so much to limited resources but to onerous responsibilities, as for example in the case of carers, support of a different kind may be indicated: regulation or provision of more flexible working arrangements including career breaks; increased out-of-work benefit income; and public financing of care services.

Appendix 1: UK Time Use Survey 2000 diary codes

Respondents were invited to record their activities using their own words and these were subsequently coded by trained clerks. Single digit codes indicate broad categories of activity, under which 2, 3 and 4 digit codes give progressively greater detail (in so far as this is possible given the information provided by the respondent). The following diary codes were selected to indicate activities contributing to non-disposable time:

Personal care
0 including sleep, sick in bed, eating, wash and dress
901 travel related to personal business

Employment
1 including main job, second job, lunch breaks, job seeking
911 travel in the course of work
913 travel to/from work
914 travel to work from a place other than home

Care for others
300 unspecified household and family care
31 food management
32 household upkeep
33 making and care for textiles [laundry, ironing, etc]
36 shopping and services, *except*
3614 shopping or browsing at car boot sales or antique fairs
3615 window shopping or other shopping as leisure
37 household management
38 childcare of own household members
39 help to an adult household member
42 informal help to other households
931 travel related to household care
936 travel related to shopping
937 travel related to services
938 travel escorting a child (other than education)
939 travel escorting an adult (other than education)
942 travel related to informal help to other households

Note: for a future version of this paper, information provided by respondents about paid employment on the week-long worksheets will be compared with the information provided on individual diary days (see Williams, 2004). In this version, information is drawn solely from the diaries.

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