Family Labour Supply, Child Care and Taxation

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October 4, 2010

Abstract

This paper explores the implications for redistributive income tax policy of taking account of household production, especially child care, as a significant form of economic activity, which strongly influences the relationship across households between inequality in incomes and inequality in wellbeing. An important purpose in modelling within-household time and consumption allocations in the presence of household production is to allow us to analyze rigorously the way in which female labour supply heterogeneity conditions the relationship between households’ labour incomes and their utility possibilities after the arrival of children. This analysis casts doubt on the idea of a simple monotonically-increasing relationship between household income and welfare. A tacit belief in this relationship however seems to underlie much of public policy, especially family tax policy, in many countries.

1 Introduction

The question of how to tax the family is of central importance in designing a country’s tax system, yet it remains largely unresolved in the public economics literature. The answer to the question depends crucially on how we assess the utility possibilities of the household, and of its individual members, when household production, especially child care, is an empirically important alternative to market labour supply and bought-in child care. Optimal tax theory has been slow to develop models that address this issue because they typically assume a single-person household. Many of the contributions to the literature on tax reform and to the more recent work on estimating intra-household sharing rules, while recognizing the presence of two adults in the household, are seriously limited because they continue effectively to assume that the adults have only two uses of their time, market labour supply and leisure, and so ignore the existence of household production and intra-family exchange of domestic for market output. This cannot be excused on the grounds of data availability, since a large
body of data on intra-household time use now exists, and a large and growing literature is concerned with analysing it.¹

Time use data reveal two important facts. First, they show that the allocation of time to household production, especially by the female partner, is a very significant form of time use, above all when children are present in the household, and that there is a high degree of substitution between market work and work at home, especially child care. It is this substitution which drives the observed much higher labour supply elasticities of women relative to men.²

Secondly, the data for many OECD countries reveal a high degree of (as yet largely unexplained) heterogeneity in time use allocations of the female partner, as the second earner, across households with similar demographic profiles and wage rates. In a household model which ignores domestic production, this can only be explained by differences in preferences for leisure, with high leisure consumption of one partner being financed by transfers from the earned income of the other (as well as possibly from the state). In the absence of such preference heterogeneity, household income in this model is a perfect indicator of household utility possibilities, so that household welfare rankings defined on household income, deflated by an equivalence scale, appears to be quite appropriate. But then it provides no explanation of female labour supply heterogeneity.

The recognition of the significance of household production as a form of time use upsets this approach to the household profoundly, and implies a limitation of the conventional approach to constructing a household welfare ranking that is, in our view, of greater concern than that arising out of the recognition of the potential for intra-family inequality. It implies that household labour income is no longer an unambiguous measure of household utility possibilities. This therefore has deep implications for welfare comparisons based on household income, and for the use of household income as the tax base. In this paper we develop this point at some length, both theoretically and empirically, and go on to discuss its tax policy implications.

The paper is organised as follows. In the next section we analyse a formal model from which we draw our conclusions on the significant implications of the existence of household production for defining a welfare ranking, both within and across households. In Sections 3 and 4 we present empirical evidence to substantiate our modelling approach and go on to apply it to the discussion of tax/transfer policy. Section 5 concludes.

2 Household production and inequality

2.1 The Model

A good way of thinking about a multi-person household with household production is as a small economy. It trades labour for market goods at exogenously given prices, and uses labour and capital to produce non-traded goods consumed

¹See for example Gronau and Hammermesh (2006).
²See below for evidence on this.
within the household. Individuals specialise at least to some extent, for example in working at home vs. in the market, and exchange domestic and market goods. From this point of view, identifying household utility possibilities with labour market income is analogous to comparing welfare across countries on the basis of the values of their exports.

Obviously, in the absence of production of non-traded goods the household’s utility possibilities are entirely determined by its budget constraint, which, with the price of the composite market consumption good normalized at unity, depends entirely on its wage rates and nonwage income. Introducing "leisure" as a consumption good does not change this, as long as it is assumed that across all households, preferences are identical, one unit of time "produces" one unit of leisure, and the opportunity cost of an individual’s time in each household is equal to her market wage. In this case, a ranking of households according to labour income and a ranking according to full income\(^4\) (plus nonwage income in each case) would be identical and would be a perfect indicator of the height of a household’s utility possibility frontier. It would be correct then only to worry about the problem of the within-household income distribution. This breaks down if preferences differ, since then a household whose members have a high preference for leisure could have a higher full income but a lower labour income than another. In modern analyses of public policy however, especially optimal taxation and tax reform, individuals are assumed to have identical preferences so that this problem does not arise.

If we introduce household production, this picture may change in two important respects. First, productivities in household production may vary across households, for example because of differences in human and physical capital. Secondly, market goods are used as inputs into household production and their prices may well vary across households.\(^5\) In the absence of specific assumptions about the relationship between the relevant productivities or prices and wage rates, as well as on household preferences, it is then not possible to determine the direction and strength of the relationship between a household’s labour income and its utility possibilities. This has important implications for public policy. We now make these points more precise in a formal model. Because of its importance as a form of time use (see Table 1), we take child care as our prototypical household good.

Assume that there are two household types, indexed \(h = 1, 2\), each consisting

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\(^3\)For an analysis of income taxation as a tax on trade between households, with intra-household exchange excluded from the tax base, see Apps and Rees (1999).

\(^4\)The sum of the values of the products of market wage rates and total time endowments.

\(^5\)In a model without household production, the idea that households may face different prices for the composite consumption commodity can be handled simply by defining their real wage rates as the ratio of the nominal wage rate to the consumption good price they face, so that varying wage rates can capture also variations in the price of consumption. In empirical studies it is usually, unrealistically, assumed that consumers always face the same market prices. In the present context, however, non-parental child care is a good example of a good whose cost varies, ranging from the opportunity cost of a grandmother’s time, through the fees for a pre-school playgroup or creche, to the wage of a highly trained nanny. These differences may not reflect simply differences in quality, but also differences in supply conditions.
of two adults, a primary and a second earner, and a child, labelled \( i = 1, 2, k \) respectively. They each consume a market good \( x \) and the child consumes child care \( y \), which is produced by combining parental time inputs \( t_i, i = 1, 2 \) with a bought in market child care input \( z \). We can think of the child care variable as a real number measuring the quality of child outcomes. The production function, assumed linear homogenous and strictly quasiconcave, is

\[
y_h = \phi^h(t_{1h}, t_{2h}, z_h) \quad h = 1, 2
\]

where \( \phi^h(.) \) may differ across households, reflecting differences in productivities. Minimizing the cost \( \sum_{i=1,2} w_{ih} t_{ih} + q_h z_h \) of producing one unit of \( y_h \) yields the implicit price of child care

\[
p_h = \gamma^h(w_{1h}, w_{2h}, q_h) = \sum_{i=1,2} w_{ih} t_{ih}^0 + q_h z_h^0
\]

where \( w \) denotes a wage rate, \( q_h \) the price of the market child care good, which may vary with \( h \), \( \gamma^h(.) \) is a unit cost function independent of the output of child care, strictly increasing in its arguments, and \( t_{ih}^0, z_{ih}^0 \) are the quantities of the respective inputs that minimize the cost of producing one unit of \( y_h \) at \( w_{ih}, q_h, i = 1, 2 \).

Adult utility functions are \( u^i(x_{ih}, l_{ih}) \) \( i = 1, 2 \), where \( l_{ih} \) is leisure, and that of the child\(^6\) is \( u^k(x_{kh}, y_h) \), where we assume identical preferences across households. Using (1) and the household budget and individual time constraints, which require that time spent in leisure, child care and market work must sum to total time available, normalized at 1, we derive the household full income constraint:

\[
\sum_{i=1,2} (x_{ih} + w_{ih} l_{ih}) + p_h y_h \leq \sum_{i=f,m} w_{ih} \equiv W_h
\]

where \( W_h \) is the household’s full income and for simplicity we have assumed no nonwage income.

The household is assumed to choose its resource allocation, values of the variables \( x_{ih}, y_h, l_{ih} \) and \( t_{ih} \), by solving the problem:

\[
\max_{x_{ih}, l_{ih}, y_h} H = H(u^f(\cdot), u^m(\cdot), u^k(\cdot); w_{1h}, w_{2h}) \quad \text{s.t.} \quad (3)
\]

where \( H \) is a household welfare function (HWF) which embodies the household’s ordering of utility profiles of its members\(^7\). This is assumed to be quasiconcave and strictly increasing in utilities and an identical function across households. The inclusion of the wage rates, which are exogenous to the household, expresses the idea that the household’s ordering over utility profiles depends on individual

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\(^6\) We assume that all of the child’s time is spent as leisure. This utility function could be that imputed to the child by its parents.

\(^7\) This, rather than the individual utility functions defined only on own consumptions, expresses the love, care and concern that household members may have for each other.
wage rates. For example, if $H(\cdot)$ were a standard Nash bargaining function, inclusion of the wage rates expresses the dependence of the outcome on the individual threat points.

The value function of the problem in (4) is $V^h = V(p_h, w_{1h}, w_{2h}, W_h)$, which, because of the assumption of identical preferences and HWF’s, is also identical across households. This can be called the household’s indirect welfare function (IWF) and is a complete representation of the aggregate utility possibilities of the household. At a given set of wage and price vectors $\{(p_h, w_{1h}, w_{2h})\}$, household 1 can be said to be "better off" than household 2, regardless of the precise distribution of utilities and choices of resource allocation, if and only if $V^1 > V^2$. It is in this sense that we say that household 1 has higher utility possibilities than household 2: The set of utility profiles available to household 1 (through lump sum redistribution) lies everywhere above that available to 2, at the given wages and prices. We should however not lose sight of the fact that wage rates affect household resource allocations through four channels: the value of full income; the prices of individual leisure consumptions; the price of child care; and the distribution of utilities.

Thus a household’s utility possibilities depend on its wage rates and the price of nonparental child care. If wage rates are observable, then so are full income and the prices of leisure. However, $p_h$ depends not only on wage rates and the price of the market child care good but also on the household’s productivity in producing child care, as summarized in the function $\phi^h(\cdot)$, which would therefore have to be known in order to be able to construct a ranking of the household types in terms of their utility possibilities. We now consider how this ranking can be expected to relate to a ranking of the households on the basis of labour market income.

### 2.2 Household income and utility possibilities

We assume in this subsection that households face identical wage rates, and so we write these now as $w_i$, $i = 1, 2$. Moreover, since variations in productivity have qualitatively strictly opposite effects on $p_h$ as do variations in $q_h$, we focus on the latter and assume that the functions $\phi^h(\cdot)$ and therefore $\gamma^h(\cdot)$ are identical. Thus we can write household welfare as a function of $q_h$, $V(q_h)$, and clearly $V'(q_h) < 0$, so that, on the assumptions we have made up to now, the household facing the lower price of market child care is unambiguously better off. Let $q_1 < q_2$, so that household 1 is this household. Then a ranking on household income will correspond to this welfare ranking if and only if

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8 For further discussion of this function see Apps and Rees (2009), Chapter 3. We could also include additional exogenous variables, or "exogenous environmental parameter" in the terminology of McElroy (1990).

9 To see this, give 1 and 2 the same utility values in each household, and note that $u^h$ can be higher in $h = 1$ if and only if $V^1 > V^2$.

10 See Apps and Rees (2009), Chapter 3 for an explicit analysis of the effects of productivity variations across households.

11 Note also that we assume for simplicity that $q_h$ has no distributional effects within the household.
\[ \sum_{i=1,2} w_i L_{i1} > \sum_{i=1,2} w_i L_{i2}, \] where \( L_{ih} = 1 - t_{ih} - t_{ih} \) is market labour supply of individual \( i \) in household \( h \). A sufficient condition for this is that both labour supplies are decreasing in \( q_h \), i.e.

\[ \frac{\partial L_{ih}}{\partial q_h} = -y_h \frac{\partial l_{ih}^0}{\partial p_h} - t_{ih} \frac{\partial y_h}{\partial p_h} \frac{\partial p_h}{\partial q_h} - \frac{\partial l_{ih}}{\partial q_h} < 0 \quad i = 1, 2 \] (5)

where\(^{12}\) we have used the fact that \( t_{ih} = t_{ih}^0 y_h \).

The first implication of this result is that it cannot be concluded that the household with the lower price of child care will have higher market labour supplies. The first term on the right hand side is indeed negative, since a change in the price of market child care will cause a change in the parental time-intensity of child care in the same direction. This follows simply from cost minimization and the technology of child care production. The second term however is positive: a change in the price of market child care changes the overall price of child care in the same direction (at the rate \( z_{ih}^0 \)), but this will in turn change the demand for child care in the opposite direction, assuming, as seems reasonable, that child care is a normal good.\(^{13}\) The strength of the first effect depends on the elasticity of substitution between market and parental child care, that of the second on the price elasticity of the household’s demand for child care and the values of \( t_{ih}^0 \) and \( z_{ih}^0 \). Finally, the effect of a change in \( q_h \) on leisure is not determined a priori.

The value of \( t_{ih}^0 \) determines how strongly a given change in child care affects the demand for the time of a particular parent. That of \( z_{ih}^0 \) determines how large is the impact of a change in the price of market child care on the unit cost of child care overall. To assume that market income provides an accurate ranking of household utility possibilities when households face differing prices of market child care is effectively to assume that (5) holds.

We now look at the relationship between household income and utility possibilities from a different perspective, relaxing as we do so the simplifying assumptions we have made up to now. Suppose we observe that the two household types have incomes satisfying

\[ \sum_{i=1,2} w_{i1} L_{i1} = \sum_{i=1,2} w_{i2} L_{i2}; \quad w_{i1} L_{i1} > w_{i2} L_{i2} \] (6)

In words: the households have equal total market incomes, with the primary earner in the first household earning more than the primary earner in the second. Since the empirical evidence suggests that primary earners work very similar hours (see the next section), we can assume equivalently that \( w_{11} > w_{12} \), while then assortative matching would suggest that \( w_{21} > w_{22} \) and so \( L_{21} < L_{22} \).

\(^{12}\)In the light of the analysis in the next subsection, it is clear that here we have assumed that the distributional term \((\partial l_{ih}/\partial s_{ih})/(\partial s_{ih}/\partial q_h)\) is small enough to be ignored. Note that the derivatives \( \partial s_{ih}/\partial q_h \) \( i = 1, 2, k \) must sum to zero, since full income is unaffected by a change in \( q_h \).

\(^{13}\)We can, in the usual way, use a Slutsky equation to decompose this into income and substitution effects.
Thus we have two households with the same total income, one having higher wage rates, the primary earners working much the same hours and the secondary earner in the higher wage household working fewer hours than her counterpart in the low wage household. Given our model, what assumptions would we have to make to be able to conclude that they have the same utility possibilities?

Recalling the IWF $V^h = V(p_h, w_{1h}, w_{2h}, W^h)$, note first that although the household with the higher wage rates will also have the higher costs of leisure and, other things equal, child care, nevertheless the net effect of higher wages on its utility possibilities must be positive as long as it has a positive market labour supply.\(^{14}\) Thus, if $V^1 = V^2$ this can only be because $p_1$ is higher than would be suggested from a comparison of wage rates alone. In other words, either the first household has sufficiently lower productivity in child care, or the price of its bought-in market child care must be sufficiently higher, or both. In each case, the implicit assumption must be that second earner market labour supply decreases with the overall price of child care, and, if productivities are the same across households, that the derivative in (5) is negative for $i = 2$ - a higher price of bought-in child care leads to a lower second earner labour supply.

To illustrate: Suppose each household has a market income of $100,000, but in household 1 this is earned by the primary earner alone, with his partner working only at providing child care, whereas in household 2 both earners work full time, with the primary earner contributing $60,000 and the secondary earner $40,000. For these households to be equally well off, it would have to be the case that the value of child care produced by "full time work" in the first household is less than that produced in the second household with a much lower parental time input, which requires implausibly large differences in productivity and/or a much lower price of bought-in child care.

The purpose of this discussion is to clarify what assumptions have to be made to support the claim that household utility possibilities increase with household market income in the presence of household production, since this claim implicitly underlies the structure of tax/transfer systems in many countries. We now consider the implications of the model for the within-household distribution of utility.

### 2.3 Within-household distribution

In this subsection we explore the relationship between the household allocations to individuals and the exogenous variables - wage rates and price of the market child care input - implied by the model presented in Subsection 2.1. We do this using the sharing rule approach introduced by Samuelson (1956). Thus consider the individual choice problems:\(^{15}\)

$$\max_{x_i, l_i} u^i(x_i, l_i) \quad \text{s.t.} \quad x_i + w_i l_i \leq s_i \quad i = 1, 2$$

\(^{14}\)Just as an oil exporting country gains from a higher price of oil even though it may be a major oil consumer also.

\(^{15}\)Since we are concerned with a single household we drop the subscript $h$. 

7
\[
\max_{x_k,y} u^k(x_k, y) \quad \text{s.t.} \quad x_k + py \leq s_k
\]

where \(s\) denotes a share in full income assigned to an individual in the household. Solving these problems results in the indirect utility functions \(v^i(w_i, s_i)\), \(v^k(p, s_k)\) with the usual properties. We could then think of the household as choosing these income shares optimally by solving

\[
\max_{s_1, s_2, s_k} H(v^1(.), v^2(.), v^k(.); w_1, w_2) \quad \text{s.t.} \quad \sum_{i=1,2,k} s_i \leq \sum_{i=1,2} w_i
\]

to produce the sharing rule functions \(s^i(w_1, w_2, p), i = 1, 2, k\). Samuelson then showed that inserting these functions in the problems in (7) and (8) and solving yields precisely the same set of allocations as is obtained by solving the problem (4) in Subsection 2.1. This is essentially an application of two-stage budgeting: the household can be modelled as if it first distributes its full income among its members and then leaves them to maximize their individual utilities. Thus we can derive the individual leisure demands16 \(l_i(w_i, s^i(w_1, w_2, p)), i = 1, 2\), consumption demands \(x_i(w_i, s^i(w_1, w_2, p)), i = 1, 2, k\) and the demand for child care \(y(p, s^k(w_1, w_2, p))\).

The "distribution of income" within the household is described by the set of functions \(\{s^i(.)\}, i = 1, 2, k\). The function \(s^k(.)\) could be thought of as yielding "child costs". Note that the market consumption quantities \(x_i\) give only a partial value of \(\dot{i}\) s full income share. Also required for an adult member of the household is the value, at the individual’s wage rate, of her leisure consumption.17 The existence of household production implies that this requires time use data, since leisure consumption cannot be calculated simply by subtracting hours of market work from the total time endowment. For a child, we also require the value of child care, which, under constant returns to scale, is the value of the parental time inputs plus bought in child care inputs. Again therefore time use data, as well as more conventional expenditure data, will be required.

Assuming functional forms for \(H(.)\) and the indirect utility functions \(v^i(.)\), \(i = 1, 2, k\) allows the \(s^i(.)\) to be derived from the problem in (9). These could then be taken to the data and estimated.18 The main problem here is that the price of child care is not observable as data, but rather has to be estimated from a household production model. The lack of data on which to do this is the main obstacle to empirical estimation of this model. Approaches to estimating household sharing rules which "solve" this problem by ignoring household production, as for example in Browning and Gortz (2006) and Lise and Seitz (2010), suffer therefore from a serious omitted variable problem.

16These explain the point made in footnote () above.

17In a more comprehensive and realistic model, in which there would also be domestically produced consumption goods, the values of individual shares in these would also be part of the sharing rule. See Apps and Rees (2001).

18See Apps and Rees (2001) for an approach to this. Note that the functional form of the sharing rule is implied by the forms assumed for the HWF and the individual indirect utility functions. More generally, choice of functional form for any two of these determines that of the third.
3 Family time use, income and saving

3.1 From theory to data

In the preceding section we emphasized that the data do not (yet) exist to enable complete estimation of even the relatively simple model of the multi-person household with household production presented there. Nevertheless, we believe that this model provides a useful framework for discussion of both theoretical and empirical aspects of the household, and is indispensable in the analysis of many important aspects of policy involving households, for example tax and child support payments. In particular, it suggests a new approach to analyzing the decisions on time allocation and consumption over the life cycle, and the way in which policy influences these.

In the model we focussed on child care as the relevant form of household production. Over the life cycle of the household, the period when child care plays such a central role is only one in a sequence of phases, which together make up what we call the "family life cycle".19 Nevertheless, the data show that this phase is pivotal, essentially because of the effects of the time allocation decisions taken in this phase on the labour supply of the second earner, typically female, throughout the remainder of the life cycle. Following the arrival of children, and while they are still young, the household has to decide on the extent to which the second earner will allocate her time to child care as opposed to market work. There is a great deal of heterogeneity in the choices households make in this respect. This is exactly the concern of the analysis of the preceding section. The key point is that there appears to be considerable persistence of the effects of this decision over the remainder of the life cycle.20 Second earners who choose to work part time in the market, or not at all, are less likely to resume full time work when there are no longer dependent children present, and this has important policy implications. In this section we present data to support this view of the household. We model the family life cycle as consisting of five phases:

- Phase 1: the couple are of child-bearing age but do not yet have children;
- Phase 2: there is at least one child aged under 5 years in the household;
- Phase 3: the still-dependent children are all aged over 5 years;
- Phase 4: the couple are of pre-retirement age with no dependent children present;
- Phase 5: the couple are of retirement age.

These phases seem to us to characterize appropriately what we think of as a family life cycle.

19 For a comprehensive discussion of how this model relates to the existing life cycle literature see Chapter 5 of Apps and Rees (2009).
20 This is supported by panel data studies. See, for example, Shaw (1994).
3.2 Data

Our data are drawn from the Australian Bureau of Statistics (ABS) 2005-06 Time Use Survey (TUS) and the ABS 2003-04 Household Expenditure Survey (HES). The TUS provides detailed information collected by diary, for two diary days, on the allocation of time to labour market activities and nine non-market activities: personal care, education, domestic activities, child care, purchasing goods and services, voluntary work and care, social and community interaction, active recreation and passive leisure. We aggregate non-market activities into three categories: domestic work, child care and leisure. Domest work includes the activity episodes classified as "domestic activities" and "purchasing goods and services". Total time allocated to domestic work and child care is referred to as "household production" and the sum of time allocations to all other activities as "leisure". The HES contains data collected by interview on consumption expenditure, labour supply, earnings and non-labour incomes and estimates of government direct and indirect taxes and benefits. Both surveys provide data on a common set of demographic, education and occupation variables.

We select couples from each survey, excluding only those records in which a partner is a full time student or reports a negative income in the HES. Using regression models estimated on the TUS data, we merge information on time use with income and consumption data for each record in the HES sample. To ensure that the time constraint is satisfied, we predict time use ratios. We estimate as functions of observed variables the ratios of leisure to non-market time and child care to household production time. The regressors include dummy variables for age of youngest child, interaction variables that capture the effect of additional children at each age of youngest child, and the characteristics of the adults, including age and dummy variables for education and employment status.

We partition the sample into the five "family life cycle" phases based on the following criteria. In phase 1 there are no dependent children present in the household and the female partner is aged from 20 to 39 years. In phase 2 there is at least one child under 5 present, and in phase 3 there is at least one dependent child but none under 5 years. The average number of children in phase 2 is 1.96 and in phase 3, 1.92. Phase 4 includes couples in which the male partner is under 60 years and there are no dependent children present. In phase 5 the male partner is aged least 60 and there are no dependent children present. The number of records in the full sample is 3,963, and in phases 1 to 5: 389, 726, 1044, 747 and 1057, respectively.

21 For each activity episode, information is recorded for a "primary" and, if relevant, a "secondary" activity. Where primary and secondary activities are reported, the weighting used is 0.6:0.4.

22 This gives samples containing 2085 records from the TUS and 4064 records from the HES. Less than 4 per cent of records report negative incomes in the HES sample.
3.3 Life cycle time use

When we organize time use data according to the five life cycle phases, the pivotal relationship between the demand for child care and female labour supply decisions becomes evident. Table 1 reports data means for the allocation of time to market work, domestic work and child care. Figures 1a to 1c present the means, including those for annual leisure hours, across the life cycle phases.

Table 1 and Figures 1a to 1c here

In phase 1 the time allocations of partners are closely matching. On average both work above full time annual hours (calculated on the basis of 35 hours per week). They spend a minimal amount of time on household production, as we would expect since there are no children present and both partners have had similar educational opportunities and work histories, and therefore have close to the same wage rates. When the family enters phase 2 female labour supply falls by over 50 per cent. This fall is more than matched by a rise in the allocation of time to household production, around 80 per cent of which is child care. Because there are no children under 5 in the household in phase 3, child care hours fall to a small fraction of their phase 2 level. Domestic hours rise only marginally, and similarly in phase 4. Nevertheless, average female labour supply remains well below its phase 1 level for the remainder of the life cycle. There is very little change in average male hours during the working age phases. The decline in phase 4, of around 200 hours pa, in no way matches the drop in female hours in the younger phase 2 age category. The result is a large gender gap in hours across the entire life cycle. Overall, female market hours are only 53 per cent of male hours.

Life cycle studies that organise the data by age of head diffuse the dramatic fall in female labour supply in phase 2 by combining couples in phase 1 with those in phase 2 in the younger age of “head” categories. The result is a female profile that tends to replicate the male profile at a lower level of hours. This may in part account for the perception of the single-person model as a harmless simplification. However, the model can lead to a misinterpretation of the data. For example, Erosa and Gervais (2002) using a life cycle model based on a within-period single-person work-leisure choice decision, base their conclusions for tax policy on the assumption that "consumption and leisure [measured as non-market time] generally move together over time". The data in fact show that the rise in female non-market time in phase 2 strongly dominates any increase in both partners’ non-market time allocations in the pre-retirement phase.23

3.4 Life cycle income, consumption and saving

Defining the life cycle on family phases also gives a very different picture of family consumption and saving decisions. Much of the standard literature generates “hump” shape profiles of both income and consumption, but this is a misreading

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23he Erosa and Gervais analysis has had a strong influence on the discussion of tax reform. See for example, Banks and Diamond (2008).
of the data due to averaging across young couples in phases 1 and 2.\textsuperscript{24} Table 2 shows that the usual single "hump" shaped profile of median household private income is missing.\textsuperscript{25} Instead, household income strongly tracks female earnings, and therefore female labour supply which is at its lowest level in phase 2. The usual single "hump" shaped profile of median net income is also missing,\textsuperscript{26} despite the moderating effect of direct taxes and benefits. The table also reports the family life cycle profile of median saving, calculated as the difference between net income and consumption expenditure. Saving is at its highest level phase 1, then falls to its lowest level in phase 2 and thereafter rises until the retirement phase, but does not return to its phase 1 level. Thus we see that saving, as well as household income, tracks female labour supply during the working age phases.

**Table 2 here**

Net income is obtained by subtracting government direct taxes and cash benefits from household private income.\textsuperscript{27} Overall, the tax-transfer system redistributes income from phases in which household income is high to those in which it is significantly lower. On average, direct taxes are at their highest level in phase 1, at $21,170, the phase which has the highest average household income because both partners in the vast majority of couples work full time in taxed market work, and with no dependents they receive little in cash benefits (an average of $418). In contrast, the average family in phase 2 pays only $16,207 in income taxes and receives $5031 under a joint income-tested family payment system. In phase 3, female labour supply rises and so income taxes rise and family payments fall.\textsuperscript{28}

Table 2 reports an estimate of implicit expenditure on household production ("hhp") based on valuing non-market time at the net wage.\textsuperscript{29} Phase 2 has by far the highest implicit expenditure on home production, followed by phase 3, during the working age phases. However, much of the additional expenditure represents the cost of parental child care time.

An important advantage of time use data is the information they provide on two assigned consumptions - child care and leisure. From the data on parental child care it is clear that we cannot sensibly deflate expenditure on household production by an equivalence scale of the kind typically applied to market income and consumption variables because almost all of the increase in non-market

\textsuperscript{24}This is referred to as the “excess sensitivity puzzle” and has generated a vast literature offering a range of explanations, one of the most widely accepted being the “buffer stock” model. See, for example, Carroll (1997) and Gourinchas and Parker (2002).

\textsuperscript{25}Private income is defined by the ABS as all income from wages, investments, etc. Government benefits are not included.

\textsuperscript{26}As for example in Attanasio and Browning (1995), Blundell, Browning and Meghir (1994), Deaton (1991) and Gourinchas and Parker (2002).

\textsuperscript{27}The data means for direct taxes net of cash transfers across phases 1 to 5 are: $20,752; $11,176; $16,723; $16,404; and -$6,814, respectively.

\textsuperscript{28}The government age pension accounts for the negative figure in the retirement phase.

\textsuperscript{29}Gross wage rates are computed from hours and earnings data, and the predicted values are based on regression models estimated on data for workers, with the Heckman correction for selectivity applied in the estimation of the female wage equation.
time in phase 2 is child care.\textsuperscript{30} Expenditure on household production by the average couple in phase 1 is $23,315. Since there are no children present, this is the opportunity cost of time allocated entirely to domestic work. In phase 2 the implicit opportunity cost of domestic work rises to only $30,577. The remainder, $44,429, is the opportunity cost of child care, an assigned consumption.\textsuperscript{31} The household’s implicit expenditure on domestic work is unassigned. We compute the costs of children reported in Table 2 by applying an equivalence scale to the unassigned components of market consumption and home production that sets a child’s share to 0.4 of that of the adults.\textsuperscript{32}

When we sum the family’s implicit expenditure on household production and their spending on market consumption, and subtract the full costs of children, we obtain the U-shaped profile of adult consumption across the life cycle, reported in Table 2 under “Adult mkt+hhp”. This finding is consistent with the U-shaped leisure profiles in Figure 1c. We conclude from this that the average family is not using the capital market to smooth consumption.\textsuperscript{33}

3.5 Heterogeneity

The preceding life cycle time use profiles based on data means conceal the high degree of heterogeneity in female labour supply, which is evident from employment status data as well as time use data. Table 3 reports the distribution of female employment status within phases 1 to 4. “FT” refers to full-time employment and "PT" to part-time employment. "NE/SE" denotes not in employment or single-earner household.\textsuperscript{34}

Table 3 and Figure 2 here

The histograms in Figure 2 show graphically the high degree of heterogeneity in female employment that emerges in phase 2, and continues until the retirement phase. Full time female employment then falls from 72.7 per cent in phase 1 to 21.9 per cent in phase 2, and stays below 40 per cent in subsequent phases. Over 20 per cent remain out of employment. In contrast, male employment remains above 90 per cent until the pre-retirement phase, where it drops to 82.2 per cent.

Time use data show that married women employed full time within each of phases 2 to 3 allocate considerably less time to domestic work and child care

\textsuperscript{30}The same argument can be applied to the market income of the female partner (as second earner) in phase 2 because much of her net income will be spent on buying in child care.

\textsuperscript{31}Apps and Rees (2001) show that when parental time cost of child care is included in the analysis of intrahousehold shares, the "cost" of a child is close to that of an adult.

\textsuperscript{32}These child costs are consistent with the results in Apps and Rees (2001). When indirect government benefits are included, the cost of a school aged child is closer to that of a child under 5 due to the much higher level government investment in the education of the school child.

\textsuperscript{33}In Apps and Rees (2010) we calibrate a model to show that the life cycle profiles of parents’ consumptions and leisures are consistent with a capital market in which the borrowing rate is significantly above the lending rate for the average family.

\textsuperscript{34}Since the sample excludes households in which both partners are out of employment in the working age phases, the presence of an NE partner defines a single-earner household in these phases. We therefore also apply the label "SE" to these households.
than those employed part time or not in employment. To illustrate, Table 4 reports phase 2 data means for hours of market work, domestic work and child care, by female employment status. In the FT household, the female partner works a total of 5227 hours in the market and at home and in the PT household she works a total of 5094 hours per annum. In the SE household total female hours of work are only fractionally lower, at 4786 hour per annum, even though market hours are zero.

Table 4 here

These diverse time use choices cannot be explained adequately by demographics because the average number of dependent children, as well as the number aged under five, changes very little with employment status, as indicated in Table 5. There is also little variation in predicted gross wage rates in the early phases. More significant differences emerge later in the life cycle, as we would expect, given the evidence in the literature on the loss of human capital associated with an extended period of withdrawal from the labour market. We therefore infer from these data that many families with the same demographic characteristics and earnings possibilities are making very different time use decisions during the earlier phases of the life cycle.

Table 5 here

3.6 Household income and ranking errors

We now investigate in further detail the potential for errors in a welfare ranking defined on household income, using the data for phase 2. Focusing on this specific phase, in which the demand for child care is at its highest, allows us to identify the effects of changes in female labour supply on earnings and, in turn, on household income, holding demographics approximately constant. Since the female partner has the higher earnings or higher private income in a non-trivial proportion of households, the analysis to follow is based on the income status of partners, primary or secondary, rather than on gender, as in the preceding sections. In phase 2, for example, the female partner has the higher income in around 15 per cent of families. This typically has the effect of increasing the degree of within-household inequality. From a policy perspective, a gender division of time use or income shares within households is especially questionable because selectivity in tax and welfare policies is normally defined on primary and second income status, and not gender.35

The potential for ranking errors in an ordering defined on household income can be illustrated by comparing the ordering of single- and two-earner families defined on primary and household income. Table 6 presents this comparison for families in phase 2. Under the primary income ranking the position of a family does not change when it switches type from SE to PT or FT. Overall, 40 per cent of families have a single earner, 22 per cent have a full time second earner and the remaining 38 per cent have a second earner in part time employment. The three types are distributed relatively evenly across primary income quintiles.

35In some countries, e.g. the US, it is argued that this could be unconstitutional.
However, when we use household income as the welfare indicator, there is a very high degree of re-ranking. Two-earner families are much more strongly represented in the upper quintiles. In fact, a SE family in quintile 1 can be shifted to quintile 4 with the decision to switch to FT. To illustrate: the upper limit of quintile 1 is $39,364 and the lower limit of quintile 4 is $70,668. A single-earner family with an income of, say, $39,000 will be located in quintile 1. If the second earner decides to work full time for an income of $32,000, it will be re-ranked from quintile 1 to quintile 4.

The degree of re-ranking is due not only to heterogeneity in second earners’ labour supplies, but also to the shape of the distribution of the incomes of primary earners. To show this most clearly, we reclassify the households in each primary income quintile into two types, so as to obtain within each quintile equal numbers of households of each type:

**Type H1**: The second earner is working at or below the median second earner hours;

**Type H2**: The second earner is working above median second earner hours.

Table 7 and Figure 3 present profiles of hours and incomes by quintiles of primary income for these two household types. The most important feature of the results is the relatively flat profile of primary income up to the 5th quintile, at which point it almost doubles. The increase is due almost entirely to an increase in the primary earner’s wage, since average hours increase by less than 6 per cent. In a distribution of primary income of this shape, the position of a family in a ranking defined on household income will be very sensitive to the labour supply of the second earner, because it will take only a small increase in her income to shift the family to a significantly higher point in the distribution, as illustrated by the numerical example given earlier.

**Table 7 and figure 3 here**

In Table 8, the quintile data means for time use now show that the second earner’s shift to market work tracks a large fall in the allocation of time to household production, and especially to child care, within each quintile of primary incomes. The table also reports the average number of children under 5 in each quintile, to show that there is little variation in this across household types, especially in the lower quintiles. Thus, to justify the omission of household production from measures of household welfare it is necessary to argue either that bought-in child care is costless to the H2 household or that home child care makes little to no contribution to the welfare of the H1 household.

**Table 8 here**

Table 9 presents a ranking by household income. The two household types are strongly polarized towards opposite ends of the distribution. The percentage of H2 households in quintile 1 falls to 21 per cent and rises to 75 per cent and 68 per cent in phases 4 and 5, respectively. The average number of children under 5 years tends to be higher in the H1 household, apart from the first quintile. However the differences are obviously not sufficient to drive the wide variation in time use choices.

**Table 9 here**
The data means for primary incomes give an indication of the extent to which a household income ranking systematically places two-earner households with lower wage rates in the same percentile as a single-earner family on a significantly higher wage. The re-ranking could be justified on the basis of the assumption that the single earner has married a low wage partner, but this assumption is not supported by the evidence on assortative matching.

3.7 Labour supply and saving

Studies that model the household as a single person with a life cycle defined on age do not provide the appropriate insights into the relationship between household labour supply and saving. While it is recognised that the absolute amount of saving rises with the labour market participation of the female partner as second earner, the saving rate, measured as the ratio of saving to household income, is typically found to fall with an increase in female labour supply. Consequently, the overall saving rates of economies that have experienced significant increases in female participation since the 1960s have been observed to fall (see, for example, Attanasio and Banks, 1998). There is also the mistaken perception that it is very predominantly “the rich” who save.

The problem is that household income omits home production. As the preceding time use profiles show, an increase in female market hours is closely matched by a fall in home production hours. To give a truer picture, the saving rate needs be calculated with respect to a measure of household income that includes implicit income from household production, since then the effects of the switch from domestic to market work would be more accurately picked up.

As shown in the preceding section, a ranking by household income places two-earner households with primary earners on relatively low-to-average wages in the upper quintiles of the distribution. The result is that the saving behaviour of two-earner households is misrepresented. Much of the saving in the economy is that of average-wage two-earner families in the middle of the distribution of primary earnings. We show this by comparing the distribution of savings with respect to primary income (Table 10a) and household income (Tables 10b) based on regression estimates that control for the number and age of children and for the income ranking variable, primary and household income respectively. The data sample includes all records in phases 2 to 4.

Table 10a and b here

The first row of Table 10a gives the predicted levels of household saving that would result if second earners withdrew from the workforce, that is, if all households became type SE. The following panels give the predicted levels of saving by household types, H1 and H2 (defined according to median hours of work of the second earner as above) and the earnings associated with the second earner’s hours of market work.

When households are ranked by primary income we see that the level of saving depends very heavily on the contribution made by the second earner across the middle quintiles of the distribution. The results indicate that if all second earners were to withdraw from the workforce after the arrival of
children, their annual earnings up to retirement would fall by over 25 per cent (sample data means for primary and second earnings are $53,338 and $18202, respectively). Household saving would fall by over 75 per cent, from an average of $6,104 pa to $1,313.

The ranking by household income in Table 10b gives a different picture. The first row reports the level of saving by quintiles of household income, and shows that saving rises quite steeply with household incomes. The second two rows report the saving levels of the H1 and H2 household types. We observe that within each quintile, saving (and therefore the saving rate) falls. The very large addition to saving across the middle of the distribution of primary earnings due to the second earner is not immediately obvious, even though it is clear that the overall level of saving in the economy rises.

3.8 Family tax/transfer policy

The preceding empirical analysis provides the foundation for the argument that it is essential to construct household welfare rankings and to evaluate tax reforms within the framework of a model that recognises the multi-person household as a small economy engaged, to varying degrees, in production, particularly of child care, and intra-household exchange. This approach makes clear the importance of basing taxes on indicators of family welfare that take account of heterogeneity in the choice between home and market work following the arrival of children.

Tax and family payment systems based on household income fail to do this. Under a system of individual taxation, at any given level of primary income the two-earner family pays more tax than the single-earner household, because the second earner has chosen to work in the taxed market sector rather than in untaxed home production. A system of joint taxation with marginal rates increasing with household income imposes an additional penalty on the two-earner family by raising, at each given level of primary income, the marginal tax rate on both partners’ incomes above the rate applying to the income of the single earner. The more progressive the marginal rate scale, the greater this effect. This can only be justified on equity grounds if the single-earner household is worse off than the two-earner household. In the preceding sections of this paper we have suggested reasons for questioning whether this is the case.

Many OECD countries still have systems of joint taxation, notably the US and Germany. The UK moved to individual taxation in 1990 and Australia’s income tax was always based on individual incomes. However, these two countries have recently moved to systems of partial joint taxation by introducing child payments that are withdrawn as a function of joint income. The US has reinforced its system of joint taxation by introducing an Earned Income Tax Credit (EITC) program under which the credit is withdrawn on joint income. Such systems raise marginal tax rates on joint income over the withdrawal range.

Under the tax systems of these countries, the second earner faces higher marginal and therefore higher average tax rates than the primary earner in the single-earner household, at a given level of primary income. If second earners have higher compensated labour supply elasticities than primary earners, this
means that deadweight losses will be higher than under a system of individual taxation with the same total revenue requirement.

If we take the primary earner’s labour supply to be fixed, the effect of such systems is to widen the average net of tax gender wage gap, given that the large majority of second earners are female. To the extent that outside opportunities determine within-family allocations, this can be expected to increase intra-family inequality. The systems also contribute to inequality across households, by imposing higher taxes on two-earner families than on single-earner households facing the same wage rates.

We illustrate the effects of joint taxation with the Australian family tax system, comprising the Personal Income Tax, Low Income Tax Offset and the system of joint income-tested family payments (Family Tax Benefits Part A (FTB-A) and Part B (FTB-B)). As in the preceding section, we focus on households in phase 2 of the life cycle. Table 11a presents for these households the quintile distribution of taxes and cash benefits by quintiles of primary income and reports the average tax rate (ATR) on the primary income of the single-earner household and the effective rate on the additional income of the two-earner household.

Table 11a and b here

The average income of the H1 household in quintile 1 is $26,437 (see Table 7). This income attracts a negative tax of $6,864. If the household decides to switch type and earn additional income of $13,730 to raise its joint income to that of the H2 household, the family would pay $7,835 more in tax. The additional income is effectively taxed at an average rate of 57 per cent. This very high rate is due primarily to the withdrawal of FTB-A on joint income and FTB-B on the income of the second earner. Both household types have very close to the same number of dependent children in total and under 5 years, yet the H2 household loses $5,405 pa in cash benefits - over 50 per cent of the child payments received by the H1 household. The remainder of the additional tax, $2,432, is the tax on the second earner’s income – the result of switching from untaxed home production to taxed market work.

By the 5th quintile, the ATR on the income of the H2 household is less than that on the H1 household because at around the 4th quintile the family payments are almost fully withdrawn, and the distributional impact of the progressive individual based income tax cuts in, with the result that at any given level of household income, a household with a higher primary income pays more tax. Thus a progressive individual income tax has the effect of taxing home production indirectly, with the size of the tax rising with the degree of progressivity.

The introduction of a system of family payments withdrawn on joint income, which began in the 1980’s and has been gradually expanded since then, can thus be seen as a reform that has replaced the progressive individual income tax and universal family payment system of the 1980’s with a joint tax system with very high marginal rates on low and average second incomes at the lower end of the primary income ranking.

Under a system of full joint taxation the average tax rate on household
incomes is the same across single- and two-earner households, since the rate scale is independent of the distribution of income between partners. The use of policy instruments, such as Australia’s FTB system or the UK’s Child Tax Credit and Working Tax Credit systems, tend to achieve close to joint taxation at the lower end and middle of the distribution of household income, but lose effect over the higher income ranges where the credits or payments have been fully withdrawn.

This is illustrated for the Australian case by the distribution of taxes by household income in Table 11b. Both household types in the middle quintile have almost the same average tax rates, and so full joint taxation applies in this quintile. In the lower quintiles, the ATR on the income of the H2 types exceeds that of the H1 type. This is due to the withdrawal of FTB-B on the second income – at a given level of household income the two-earner family working longer hours and having to buy-in more child care pays more tax than the single-earner household. At higher income levels the difference between average tax rates reverses because family payments are almost fully withdrawn and the progressive income tax takes effect. Thus, this type of tax system widens the net of tax wage gap between primary and second earners and increases inequality as between households with a single earner and those with two earners on lower wages.

4 Conclusions

In this paper we have explored the implications for redistributive income tax policy of taking account of household production, especially child care, as a significant form of economic activity. In relation to within-household inequality, this is important not only because the allocation of household output as well as the allocation of market consumption must be taken into account, but also because it cannot be assumed that an individual’s leisure consumption is given by subtracting time spent in market work from the total time endowment - we also need to subtract time spent in household production. The true intra-household distribution of full income,\textsuperscript{36} which is the relevant concept for welfare analysis, may differ sharply from the distribution of consumption of market goods, just as in the overall economy, the distribution of national income will differ from the distribution of consumption of imports. However, in the context of income tax design, the analysis in this paper suggests that within-household inequality is, at least partly, a "second-order" effect of the broader policy setting.

Much more important are the implications of household production for the relationship across households between inequality in incomes and inequality in wellbeing. An important purpose in modelling within-household time and consumption allocations in the presence of household production is to allow us to analyze rigorously the way in which female labour supply heterogeneity conditions the relationship between households’ labour incomes and their utility.

\textsuperscript{36}Equal to the sum of consumptions of market goods, household goods and leisures.
possibilities. This analysis casts doubt on the idea of a simple monotonically-increasing relationship between household income and welfare. A tacit belief in this relationship however seems to underlie much of public policy, especially tax and family benefit policy, in many countries. Basing marginal tax rates on household income, either explicitly in the formal tax system, or implicitly, by withdrawing benefits as a function of household income, has the effect of shifting tax burdens on to low to middle income households and in particular on to second earners, in a way which is both inequitable and inefficient. In widening the gap between the net of tax wage rates of primary and second earners, and therefore between their "outside opportunities", it can also be expected to have regressive effects on the within-household allocation of full income.

References


Table 1  Life cycle time use, hours per annum

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<th>Female hours</th>
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<td>1265</td>
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Figure 1  Life cycle time use by gender

(a) Labour supplies

(b) Household production

(c) Leisures

Table 2  Life cycle incomes, saving and household production

<table>
<thead>
<tr>
<th>Phase</th>
<th>H’hold income*</th>
<th>Female earnings*</th>
<th>Net income*</th>
<th>Saving*</th>
<th>Adult mkt+hhp</th>
<th>Costs of children</th>
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*Medians
Table 3  Employment status by gender

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<th>Males</th>
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Table 4  Phase 2: Time use by female employment status

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<th>Total</th>
<th>Female hours pa</th>
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Table 5  Phase 2: Incomes, taxes, wage rates and demographics

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<th>Female employment</th>
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<th>Female wage</th>
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Table 6  Rankings by second earner employment status

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<td>SE %</td>
<td>48.3</td>
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<td>34.2</td>
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<td>NE %</td>
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<td>42.1</td>
<td>21.9</td>
</tr>
</tbody>
</table>

Table 7  Labour supplies and incomes by household type

<table>
<thead>
<tr>
<th>Primary income quintiles</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1: Primary market hours pa</td>
<td>2071</td>
<td>2303</td>
<td>2348</td>
<td>2409</td>
<td>2551</td>
<td>2334</td>
</tr>
<tr>
<td>Second market hours pa</td>
<td>24</td>
<td>36</td>
<td>81</td>
<td>144</td>
<td>142</td>
<td>85</td>
</tr>
<tr>
<td>H2: Primary market hours pa</td>
<td>2014</td>
<td>2125</td>
<td>2121</td>
<td>2306</td>
<td>2408</td>
<td>2190</td>
</tr>
<tr>
<td>Second market hours pa</td>
<td>1470</td>
<td>1467</td>
<td>1677</td>
<td>1566</td>
<td>1803</td>
<td>1607</td>
</tr>
<tr>
<td>H1: Primary income $pa</td>
<td>26437</td>
<td>38179</td>
<td>46985</td>
<td>58603</td>
<td>111337</td>
<td>56298</td>
</tr>
<tr>
<td>Second income $pa</td>
<td>1193</td>
<td>1981</td>
<td>1631</td>
<td>3420</td>
<td>9267</td>
<td>3535</td>
</tr>
<tr>
<td>H2: Primary income $pa</td>
<td>23247</td>
<td>38377</td>
<td>48026</td>
<td>59450</td>
<td>102114</td>
<td>55061</td>
</tr>
<tr>
<td>Second income $pa</td>
<td>18114</td>
<td>23863</td>
<td>28759</td>
<td>32253</td>
<td>38678</td>
<td>28513</td>
</tr>
</tbody>
</table>

Figure 3  Labour supplies and incomes by household type
Table 8  Second earner time use by primary income

<table>
<thead>
<tr>
<th>Primary income quintiles</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>H1</strong> Child care hours</td>
<td>2797</td>
<td>2902</td>
<td>2812</td>
<td>2950</td>
<td>2941</td>
<td>2878</td>
</tr>
<tr>
<td>Domestic hours</td>
<td>1823</td>
<td>1866</td>
<td>1879</td>
<td>1845</td>
<td>1867</td>
<td>1855</td>
</tr>
<tr>
<td># Children under 5</td>
<td>1.28</td>
<td>1.37</td>
<td>1.28</td>
<td>1.49</td>
<td>1.46</td>
<td>1.38</td>
</tr>
<tr>
<td><strong>H2</strong> Child care hours</td>
<td>2209</td>
<td>2225</td>
<td>2030</td>
<td>2195</td>
<td>2095</td>
<td>2143</td>
</tr>
<tr>
<td>Domestic hours</td>
<td>1410</td>
<td>1440</td>
<td>1403</td>
<td>1454</td>
<td>1400</td>
<td>1419</td>
</tr>
<tr>
<td># Children under 5</td>
<td>1.26</td>
<td>1.25</td>
<td>1.06</td>
<td>1.26</td>
<td>1.18</td>
<td>1.19</td>
</tr>
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</table>

Table 9  Household type by household income

<table>
<thead>
<tr>
<th>Household income quintiles</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>H1</strong> %</td>
<td>79.1</td>
<td>73.5</td>
<td>46.3</td>
<td>24.8</td>
<td>31.8</td>
<td>50.0</td>
</tr>
<tr>
<td>Primary income $pa</td>
<td>29313</td>
<td>45736</td>
<td>57631</td>
<td>74341</td>
<td>131345</td>
<td>56298</td>
</tr>
<tr>
<td># Dependent children under 5</td>
<td>1.33</td>
<td>1.33</td>
<td>1.45</td>
<td>1.54</td>
<td>1.40</td>
<td>1.38</td>
</tr>
<tr>
<td><strong>H2</strong> %</td>
<td>20.9</td>
<td>26.5</td>
<td>53.7</td>
<td>75.2</td>
<td>68.2</td>
<td>50.0</td>
</tr>
<tr>
<td>Primary income $pa</td>
<td>21744</td>
<td>33172</td>
<td>40977</td>
<td>51752</td>
<td>89660</td>
<td>55061</td>
</tr>
<tr>
<td># Dependent children under 5</td>
<td>1.34</td>
<td>1.11</td>
<td>1.19</td>
<td>1.17</td>
<td>1.20</td>
<td>1.19</td>
</tr>
</tbody>
</table>

Table 10  Saving - phases 2 to 4

<table>
<thead>
<tr>
<th>Quintiles</th>
<th>1</th>
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<th>3</th>
<th>4</th>
<th>5</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(a) Primary income</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SE: Saving if zero 2nd earnings</td>
<td>-1055</td>
<td>-5422</td>
<td>-1262</td>
<td>2662</td>
<td>22092</td>
<td>1313</td>
</tr>
<tr>
<td>H1: Saving $pa 2nd earnings $pa</td>
<td>-9919</td>
<td>-3874</td>
<td>298</td>
<td>4934</td>
<td>24454</td>
<td>2853</td>
</tr>
<tr>
<td>2nd earnings $pa</td>
<td>1671</td>
<td>6519</td>
<td>7769</td>
<td>10679</td>
<td>10760</td>
<td>9356</td>
</tr>
<tr>
<td>H2: Saving $pa 2nd earnings $pa</td>
<td>-6836</td>
<td>1341</td>
<td>6671</td>
<td>12398</td>
<td>33390</td>
<td>8068</td>
</tr>
<tr>
<td>All: Saving $pa</td>
<td>-10186</td>
<td>-3222</td>
<td>2735</td>
<td>9591</td>
<td>31542</td>
<td>6104</td>
</tr>
<tr>
<td><strong>(b) Household income</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H1: Saving $pa</td>
<td>-10174</td>
<td>-3185</td>
<td>2817</td>
<td>9720</td>
<td>31753</td>
<td>2853</td>
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<tr>
<td>H2: Saving $pa</td>
<td>-10223</td>
<td>-3284</td>
<td>2658</td>
<td>9524</td>
<td>31445</td>
<td>8068</td>
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</table>

Table 11  Taxes – phase 2

<table>
<thead>
<tr>
<th>Quintiles</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(a) Primary income</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H1 Tax $pa</td>
<td>-6864</td>
<td>-1856</td>
<td>2636</td>
<td>8340</td>
<td>33780</td>
<td>7363</td>
</tr>
<tr>
<td>Cash benefits $pa</td>
<td>10621</td>
<td>8579</td>
<td>7098</td>
<td>5169</td>
<td>2758</td>
<td>6850</td>
</tr>
<tr>
<td>H2 Tax $pa</td>
<td>971</td>
<td>9492</td>
<td>13630</td>
<td>18439</td>
<td>38563</td>
<td>16029</td>
</tr>
<tr>
<td>Cash benefits $pa</td>
<td>5218</td>
<td>3874</td>
<td>2156</td>
<td>1644</td>
<td>941</td>
<td>2710</td>
</tr>
<tr>
<td><strong>(b) Household income</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H1 Household income</td>
<td>30215</td>
<td>46694</td>
<td>61497</td>
<td>79268</td>
<td>147370</td>
<td>59832</td>
</tr>
<tr>
<td>Tax $pa</td>
<td>-5706</td>
<td>1386</td>
<td>7907</td>
<td>18532</td>
<td>44128</td>
<td>7363</td>
</tr>
<tr>
<td>ATR</td>
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<td>3.0</td>
<td>12.9</td>
<td>23.4</td>
<td>29.9</td>
<td>12.3</td>
</tr>
<tr>
<td>H2 Household income</td>
<td>30035</td>
<td>47853</td>
<td>62759</td>
<td>81080</td>
<td>133190</td>
<td>83574</td>
</tr>
<tr>
<td>Tax $pa</td>
<td>-2575</td>
<td>3218</td>
<td>8046</td>
<td>14140</td>
<td>35435</td>
<td>16029</td>
</tr>
<tr>
<td>ATR</td>
<td>-8.6</td>
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<td>12.8</td>
<td>17.4</td>
<td>26.6</td>
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