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ABSTRACT

Intra-Household Allocation of Resources: Inferences from Non-Resident Fathers' Child Support Payments*

A large proportion of divorced and separated fathers form new partnerships. The new partner's preferences are not likely to put much weight on expenditures on the man's children from his previous union. Thus, his own and his partner's income would have different impacts on his child support payments if partners' relative incomes affect bargaining power in household decisions. This paper exploits within-father variation in the British Household Panel Survey (1991-2003) to estimate the impacts of intra-household income distribution on child support payments and the father's welfare. We find that a higher share of father's income in household income increases the probability of paying child support and its amount relative to household income.

JEL Classification: D12, D13

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Introduction

Traditional consumer theory has little to say about the behaviour of members of a household if there is more than one adult in the household. It is usually assumed that the household can be treated "as if" it were a single agent, allowing an application of the tools of consumer theory at the household level. This approach has been called the "unitary model". While conceptually weak because preferences attach to individuals, not households, whether or not it is an acceptable simplification for analytical and policy purposes is an empirical question. One important implication of the unitary model is that the source of household income should not affect the way in which a household's resources are allocated—the so called "income pooling" property. We test this property and make inferences about how the intra-household distribution of income affects the distribution of welfare between partners in a new way. We use households containing formerly married fathers who have a new partner, whose preferences are likely to give little weight to expenditures on the man's children from his previous union. This approach to examining intra-household allocation follows a suggestion by Pollak (1985; p.603) that does not appear to have been followed up.

Previous tests of the unitary model and inferences about the distribution of welfare in the household have typically focussed on private goods that are *assignable*, in the sense that we can observe *individual* consumption of the good.[1] The basic idea is the following. We would like to find a good that is only valued and consumed by one of the partners. If the consumption of that good changes when the distribution of income between the two partners changes, holding joint income constant, then we

[1] Using price variation, Browning and Chiappori (1998) test the "collective model" (i.e. each person has his or her own preferences and the couple's decisions are efficient) against the "unitary model"

could infer that one person's welfare went up and the other's went down, because of the budget constraint. For instance, suppose only the woman drinks wine; if wine consumption in the household increases when her proportion of household income is larger, then we can infer that her welfare increases with the share of income that she brings to the household, perhaps because it influences her relative bargaining power in household decisions. A person's leisure-time is a prime candidate for an assignable good, because it can only be consumed by that person. While this exclusivity of leisure is true in a literal sense, it is not true in a broader sense if a person's utility depends *directly* on his/her partner's leisure. In this case, the variation of a person's leisure consumption in relation to his/her share of joint full income does not reveal how the distribution of welfare in the household varies with the intra-household distribution of income. An assumption of weak separability in the couple's preferences (so called "selfish" or "caring" preferences) rules out this case and allows inferences about individual welfare variation. Because of its link to leisure, labour supply has been an important area in which the unitary model has been tested, and usually rejected (e.g. Chiappori, Fortin and Lacroix. 2002; Fortin and Lacroix 1997, Lundberg 1988 and Rangel 2006). A possible shortcoming of these studies is that it is impossible to distinguish leisure from other non-market time (e.g. in home production) in the data available, making it necessary to assume that a person's utility is increasing in all non-market time.

Other studies have taken men's and women's clothing to be assignable goods (e.g. Browning *et al* 1994; Lundberg, Pollak and Wales 1997) and rejected income pooling. These studies suggest that women do better when they control more of the

(one household utility function) without assuming that any goods are assignable or restricting individual preferences, and reject the unitary model.

couple's resources. Like leisure, interdependency in preferences (e.g. people care about how their spouses' dress) may affect the interpretation of these results.

In the present paper, we use information about child support payments by formerly married fathers who have dependent children living elsewhere and who have formed new partnerships. In Britain, such payments are in large part voluntary. In a recent national survey (Blackwell and Dawe 2003), 56% of child support arrangements were informally set between the parents. While 30% were made through the Child Support Agency and 13% through a lawyer or a court, enforcement of these arrangements was poor, making child support transfers voluntary for most fathers. Non-resident fathers may choose to pay the children's mother financial support because the father's welfare is increasing in expenditure on his children and he only can influence it by making transfers to the custodial mother (Weiss and Willis 1985). Such fathers are of increasing importance in many countries because of high rates of partnership dissolution. For instance, in Great Britain, 65% of children born into a cohabiting union and 30% of children born within a marriage will experience a dissolution of their parent's union before they are 16 (Ermisch and Francesconi 2000).

The father's new partner's preferences are likely to put a much lower weight (if any) on expenditures on the man's children from his previous union. Indeed, the organisation of groups representing "second wives" and their lobbying efforts suggest that many new partners resent payments to first wives. For instance, the British Second Wives Club, founded in 2005, propose that "financial maintenance be paid only as a temporary measure until the ex-wife can find a job and get back on her feet..." (Duguid 2006).[2] In the technical terminology of Browning et al (1994), child support transfers approximate an *exclusive* good for the father in his new partnership.

[2] Second wives organised earlier in the USA. In the mid-1990s they supported a bill in California designed to cut child support payments by as much as 25 percent (Auther 1996).

As a consequence, changes in such transfers would be indicative of changes in the intra-household distribution of welfare, and the father's and his partner's income would have different impacts on child support transfers if their relative incomes affect bargaining power in household decisions. The paper tests for these differences.

A difficulty in studying how child support payments vary with the income and other characteristics of the father and his new partner in most nationally representative surveys is that we do not know which men have dependent children living elsewhere. In terms of direct information, the British Household Panel Survey (BHPS) is no different (other than in the 2002 wave). But the BHPS collected marital, cohabiting union and childbearing histories, and from the annual waves of the panel there is information on birth and marriage dates and cohabiting union status at each annual wave. From these data we identify men who reported the birth of a child within marriage and for whom that marriage subsequently dissolved. From annual observations of these men after the couple separated we construct a sample of years in which they have a dependent child (aged under 16) not living with them and have a new partner. Multiple annual observations on most re-partnered fathers in our sample allow us to use within-father variation in partners' incomes to identify the impact of individual partners' incomes on child support payments. In other words, we can allow for unobserved persistent influences on child support payments, including the father's ex-partner's preferences, his preferences and durable public household goods, to be correlated with father's income and his current partner's income (and other included variables).

The next section presents the theoretical foundation for our econometric analysis. We then present the data, followed by our results and conclusions. Our estimates indicate that a higher share of father's income in household income (a lower

share of partner's income) increases the probability that he pays some child support and child support transfers relative to household income. There is not income pooling in the father's household, and partners' relative incomes appear to affect their bargaining power in household decisions and the intra-household distribution of welfare.

Decisions of Mothers, Fathers and Partners

To sharpen our focus and make our main points clearer, we abstract from labour supply decisions throughout.[3] The mother's preferences are represented by the utility function $U=U(C, x_m)$, where C is expenditure on children and x_m is her private consumption. She is assumed to choose C to maximize U subject to $y_m + s = x_m+C$, where s is a lump-sum transfer from the father and y_m is her income. This behaviour implies a child expenditure function, $C = f(y_m+s)$.

Expenditures on children are assumed to be a public good for the parents, even after divorce, as in Weiss and Willis (1985). A general representation of preferences for the father is given by the utility function $V=V(C, x_f, x_p, G)$, where x_f is his private consumption, x_p is his new partner's private consumption and G is vector of household public goods. When the father acquires a new partner, she is unlikely to have the same preferences as him regarding expenditures on children from his previous union. Her preferences are represented by the utility function $W=W(x_p, x_f, G)$; that is, she receives no utility from expenditures on his children from the previous union. But with such general preferences it is hard to interpret what any difference in impacts of individual partners' incomes on child support transfers means in terms of the welfare for each partner because, in effect, all goods other than C are public goods in the father's new partnership. This is a particular example of the general proposition that individual preferences and the family decision process (e.g. a "sharing rule") are

not uniquely identified under such general preferences (e.g. Chiappori, Fortin and LaCroix 2002).

A clearer interpretation can be obtained for more restrictive preferences, so called "caring preferences", of the form $F^f[V(x_f,C,G), W(x_p,G)]$ for the father, and $F^p[V(x_f,C,G), W(x_p,G)]$ for the father's new partner. Caring preferences assume that she does not care how (in terms of x_f, C and G) he attains a given level of utility (and similarly for him). For simplicity, the particular caring preferences assumed in the theoretical exposition ignore household public goods. But we can think of all of our analysis as being conditional on such public goods, and if these change little from year to year, say because of their durability, this conditioning will be picked up in the "fixed effects" of our empirical model.[4] Note that "selfish preferences" are a special case of caring preferences.

It is assumed that child support transfers by the father (s) are *voluntary*. As argued further below, this approach is justified in the British context, and perhaps also in other jurisdictions, because the majority of child support arrangements are made informally (Blackwell and Dawe 2003), and while courts and the Child Support Agency (CSA) can set and order payments, they do not enforce the orders very well. With either the lack of institutional sanctions, or weak enforcement (a small or zero cost of non-compliance), child support payments are essentially voluntary for most fathers, and so a voluntary payment model remains relevant despite the operation of

[3] In the empirical analysis below, we allow for incomes to be endogenous.

[4] If "private preferences", $V(\cdot)$ and $W(\cdot)$, are separable in private and public goods, then efficiency in family resource allocation is equivalent to the existence of a "sharing rule" (Browning et al 1994). It is *as if* allocations within the family are made in two stages. First, joint income is allocated among public good expenditure and each of the partners for private expenditure. At the second stage, each partner chooses his or her bundle of private goods with the money allocated to them. In the absence of separability of public goods, a sharing rule exists, but it and the demand functions for private goods are conditional on expenditures on public goods.

the courts and the CSA.[5] Note that this model does not imply that all fathers with arrangements covered by courts or the CSA pay below an amount set by them, but those that pay at least that amount do so voluntarily, because they care for their children.

Assume that the couple achieves an efficient outcome. Any outcome that is efficient in the context of caring preferences would also be efficient if the parents were selfish (Chiappori 1992). This is equivalent to choosing s, x_f and x_p to maximise $V(C, x_f,)+ \mu W(x_p)$ subject to $y_f + y_p = s + x_f + x_p$ and $C= f(y_m+s)$, where y_f is the father's income, y_p is his partner's income and μ is a Lagrange multiplier that reflects the weight put on the father's partner's utility in household decisions.[6]

The efficiency assumption implies $V_C f_s \leq V_x$ and $V_x=\mu W_x$, where $V_x=\partial V/\partial x_f$, $V_C=\partial V/\partial C$ and $W_x=\partial W/\partial x_p$. Child support transfers are zero if $V_C f_s < V_x$ at $s=0$. Assuming an interior solution ($s>0$), the conditions for a maximum imply a child support function in terms of μ, partners' joint income and the mother's (i.e. the father's ex-partner's) income:

(1) $s=g(y_m, y_f+y_p, \mu)$

Equation (A1) in the Appendix gives an example of this function for particular preferences. The implicit utility weighting factor μ indicates the location chosen on the utility possibility frontier. In general, μ may be a function of individual incomes (i.e. $\mu=\mu(y_f, y_p)$) and perhaps also other "distribution factors" (Browning and

[5] In the model of Del Boca and Flinn (1995), fathers are assumed to have varying costs of non-compliance with the order. Here we are saying that they are low for most fathers.

[6] Basu (2006) provides a definition of a household equilibrium when μ depends on endogenous partners' incomes like earnings and sufficient conditions for its existence. In addition, he sets up a dynamic household game and defines a subgame perfect equilibrium for it. In this context, he shows that it is possible that the household can get stuck in an *inefficient* subgame perfect equilibrium. For instance, partners may work *too much* to improve their bargaining power in future household decisions. For simplicity we take a static approach and ignore labour supply decisions in the theoretical exposition, but allow for endogenous incomes in the empirical analysis.

Chiappori 1998; Chiappori at al 2002; Rangel 2006).[7] These are variables that affect the intra-family decision process without affecting individual preferences or joint consumption possibilities. These may include marriage market attributes and divorce and child support laws that, in some circumstances, affect bargaining between spouses within marriage.[8]

Income effects on child support payments are given by

$$(2) \qquad \partial s/\partial y_j = (V_{xx} - f_s V_{Cx})[\mu W_{xx} + W_x(\partial \mu/\partial y_j)]/D, \qquad j = f,p$$

where V_{ij} and W_{ij} are second partial derivatives and $D>0$ by the second order conditions. There is "income pooling" ($\partial s/\partial y_f = \partial s/\partial y_p$) if μ is not affected by individual partners' incomes. For example, income pooling may arise because the father's and his partner's incomes are sufficiently different and the couple has caring preferences. Suppose that the father's share of joint income, $y_f/(y_f+y_p)$, is sufficiently large. Then, because he cares for his partner, he makes transfers to her to ensure that her welfare is not too low. Using Becker's (1981) terminology, he is an *effective altruist*, and consumption outcomes only depend on joint income (i.e. $\partial \mu/\partial y_j = 0$, $j=f,p$). Income pooling can also arise if both partners would make contributions to a household public good in a non-cooperative Nash equilibrium, and individual welfare in this equilibrium provides the threat points for Nash bargaining.

If, however, bargaining power in the couple's decisions is related to the resources that they bring to the partnership, then we would expect $\partial \mu/\partial y_f \leq 0$ and

[7] With $\mu = \mu(y_f, y_p)$, equation (1) could also be interpreted as a *conditional* child support function, analogous to conditional demand functions (Pollak 1971), when labour supply is endogenous and the preferences of the father and his partner are separable in non-market time. In principle, "separable non-market time" is testable (see Browning and Meghir 1991 and Hussain 2006).

[8] Note that when labour supply is endogenous and μ depends on each partner's earnings, the recursive structure between the determination of μ and the determination of the endogenous variables like *s* and labour supply disappears—it becomes simultaneous, possibly with multiple equilibria; see Basu (2006).

$\partial\mu/\partial y_p \geq 0$. We expect that $V_{xx} - f_s V_{Cx} < 0$,[9] and so $\partial s/\partial y_f \geq \partial s/\partial y_p$. If we define $\partial s/\partial y_j\big|_{d(yf+yp)=0}$ as the impact on s of individual income holding the couple's joint income constant (i.e. the impact of an individual's income share), then (2) implies

(3) $\partial s/\partial y_j\big|_{d(yf+yp)=0} = (V_{xx} - f_s V_{Cx}) W_x (\partial\mu/\partial y_j)/D.$

Equation (3) shows the effect on s of movement along the utility possibility frontier. If μ declines with the father's share of the couple's income, more will be transferred in child support if the father's share is larger. As the fathers, but not new partners, value C, higher s (and C) raises the father's utility index V and lowers his partner's index W and, in the context of caring preferences, as long as a person's own utility index affects their own welfare more than their partner's, we can interpret a positive impact of the father's share of income on s as increasing his welfare and reducing his partner's.

The impact of the mother's income on child support transfers is

(4) $\partial s/\partial y_m = [-(\mu W_{xx} + V_{xx})(f_s V_{CC} + V_C f_{ss}) + \mu W_{xx} V_{Cx} f_s + (f_s V_{Cx})^2]/D$

Diminishing marginal utility ($V_{CC}<0$), additive separability in the father's preferences ($V_{Cx}=0$) and $f_{ss} \leq 0$ are sufficient for $\partial s/\partial y_m < 0$, but not necessary. By raising the mother's expenditure on children, higher mother's income reduces the father's transfers to her.

So far we have ignored the state benefit system, which can interact in important ways with mothers' incentives to work and fathers' incentives to pay child support. In the UK, lone mothers who receive the main out-of-work benefit for families, Income Support (IS), receive benefits related to the number and ages of their children and have their rent fully paid if they are tenants. Their IS-benefits are

[9] Note that, if $\partial\mu/\partial y_j=0$, $j=f,p$, then $\partial s/\partial y_j = (V_{xx} - f_s V_{Cx})\mu W_{xx}/D$ should be positive, and $W_{xx}<0$ because of diminishing marginal utility.

withdrawn at a rate of 100% on all child support and other non-earned income received, and on earnings above an "earnings disregard" (e.g. of £20 per week in 2002/03 for a lone mother).[10] The 100% benefit withdrawal rate on child support payments makes the value of f_s faced by fathers equal to zero. Thus, his first order condition for lump sum transfers is $V_C f_s < V_x$, implying $s=0$. In other words, fathers whose ex-partners receive IS have no incentive to pay child support because such transfers are fully taxed away. But IS-recipients are compelled to get a child support assessment from the Child Support Agency (CSA), and so fathers with sufficient income may be forced to pay even though the only beneficiary is the UK Treasury. Panel data from the Family and Children Study (1999-2002) indicate that 30% of lone mothers who receive IS receive some child support, but fixed effect logit estimates indicate that IS-receipt significantly reduces the odds that they receive child support.

For a minority of fathers, courts and the CSA set child support payments. But, as noted earlier, courts and child support agencies are not able to enforce the orders very well. For instance, among UK families in Summer 2000 for whom the Child Support Agency (CSA) had assessed an amount of child support payment, about 35% of non-resident parents were in arrears, and official statistics for those who used the Child Support Collection Service indicate that only 49% of non-resident parents were fully compliant during the quarter to February 2001 (Wikeley et al 2001, Chapter 6). Enforcement action was taken by the CSA in only about one-quarter of the arrears' cases, and most "parents with care" (mostly mothers) judged the CSA to be an ineffective enforcement agency (Wikeley et al 2001, Chapter 6). The Family and Children Study (1999-2002) data indicate that child support receipt is not very stable

[10] Lone mothers also receive in-work benefits (Family Credit (FC) before October 1999 and Working Families Tax Credit (WFTC) afterwards) if they work 16 hours or more per week and have low to moderate incomes. In the calculation of these benefits mothers' child support income is fully disregarded under WFTC, and the disregard was £15 per week under FC.

over time, suggesting weak enforcement. For instance, 21% of mothers reporting receipt of child support in one year do not receive it in the next. With weak enforcement, the voluntary payment model is probably relevant for most fathers.

Data and econometric issues

We aim to estimate a special case of equation (1). As is common in demand analysis, we express the child support transfer function in terms of a share of father's household income, s/y_h; it is assumed to be given by:

$$(5) \qquad (s_{it}/y_{hit}) = \alpha(\boldsymbol{Z_{it}}) + \beta\ln(y_{hit}) + \delta(y_{mit}/y_{hit}) + \lambda_p(y_{pit}/y_{hit}) + \lambda_o(y_{oit}/y_{hit}) + u_i + e_{it}$$

where $\alpha(\boldsymbol{Z_{it}}) = \alpha_0 + \alpha_1 Z_{1it} + \alpha_2 Z_{2it} + \ldots$, the Z_{kit} are "preference shifters", like the number of children in the father's new household for father i in year t; y_{hit} is father's household income; y_{mit} is the income of the mother's household; y_{oit} is household income other than the father's or his new partner's and u_i and e_{it} are other influences on the child support share, with e_{it} being distributed independently of u_i. The "father-specific" unobservable u_i may reflect, among other things, his preferences and durable household public goods like housing. We experimented with other attributes of the mother in our relatively small sample of matched father-mother pairs, including whether or not she has a new partner, distinguishing between her own income and other household income and whether or not she receives IS. The parsimonious specification of the mother's household in terms of the ratio of her household income to the father's household income appeared sufficient. Note that equation (5) takes the form of an equation from the "Almost Ideal Demand System" (Deaton and Muellbauer 1980), supplemented by possible effects of the intra-household distribution of income on expenditure shares. It can be thought of as a first order approximation to the general unknown relationship in equation (1).

Despite the poor enforcement of child support orders for the minority who have one, discussed in the previous section, *some* fathers may comply with such an order and make payments according to 'formulae' that are expressed as a proportion of father's income. Such compliance would produce a negative association between partner's income share and child support share. Our strategy for estimating equation (5) treats u_i as a fixed effect. Thus, cross-section variation is not used to identify the effect of partner's income share; only 'within-father' variation is used. Whether and how fathers complying with a child support order affect our parameter estimates depends on the extent to which orders are adjusted as father's income changes. Taking one extreme, assume that the child support order is fixed at the time of separation and not adjusted subsequently. Then, using within-father variation, child support as a share of household income would be inversely related to household income, but not related to partner's share. At the other extreme, if child support orders that are proportional to father's income are periodically adjusted, then child support as a share of household income would be negatively related to the partner's share of household income, but not the level of household income. These formulae would not affect the impact of partner's income share on the probability of making some payment (full or partial "compliance"), and so we also estimate a fixed effect model for this probability.

The key parameters for our purposes are λ_p and λ_o, which will be zero if $\partial\mu/\partial y_j=0$, $j=f,o$ (see equation (3)). We have assumed that these parameters are invariant to the intra-household income distribution, but they could vary when preferences are caring, or if there are household public goods to which both partners would contribute in a non-cooperative Nash equilibrium and this provides the threat

points for bargaining. Our sample of fathers is not large enough to attempt to allow for this variation.

When labour supply is endogenous and μ depends on each partner's earnings, as suggested by Basu (2006), then we can interpret equation (5) as a equation for child support conditional on labour supply decisions, which affect μ. Household income and partners' income shares are clearly endogenous in this interpretation, as would also be the case when there are measurement errors in these variables. We address this endogeneity in some of our estimation methods.

Primary sample

Our primary sample consists of 179 formerly married fathers of dependent children with new partners (i.e. it excludes fathers separating from a cohabiting union), contributing 698 person-year observations. The dependent variable is expressed as monthly child support payments as a percentage of monthly household income. Including the zeroes, child support averages 3.9% of household income, and among fathers paying something (54%) the mean is 7.3%. The new partner's income represents on average 34% of household income, and about 4% of household income is contributed by young adult offspring of either the father or his new partner (for one-fifth of the observations there are more than two adults in the household). In 71% of the person-years, his partner has a job; in 57% of them the father is married to his new partner. For 36% of the observations, the father has children in common with his new partner, for 43% his new partner has children from a previous partnership and for a third of the observations there are no dependent children in the father's household. Other descriptive statistics are shown in Table 1.

A scatter plot of the child support transfer share and the father's new partner's share of household's income is shown in Figure 1. A tendency for the share of

household income transferred in child support to decrease with the partner's share is evident from the simple regression line, thereby suggesting that income pooling in the household can be rejected and that a higher partner's income share increases her control over family resources. A simple fixed effect regression relating the share of child support payments to the partner's share of income strengthens this suggestion. It yields a coefficient (standard error) of -0.029 (0.010); that is, each 10 percentage point increase in the partner's share reduces the percentage of income devoted to child support by about 0.3. Further, a fixed effect logit regression for the log odds of the father paying any child support as a function of his partner's income share produces a coefficient (standard error) of -0.045 (0.012).

Matched sample

Our data provide information about the mother for only about one-fifth of the fathers in our primary sample. Before discussing our main estimates from the primary sample, we explore how the omission from equation (5) of the mother's household income relative to the father's may affect our parameter estimates. Recall that even after controlling for the two parents' household incomes and the father's new partner's income share, the probability of paying any child support may be lower if the mother receives Income Support (IS). Table 2 presents linear fixed effects' estimates of the parameters with and without inclusion of variables for the household income of the mother (ex-wife) relative to that of the father and whether or not she receives IS. The first two columns only include fathers previously married to the mother, and, in order to boost the sample size, the last two columns also include previously cohabiting couples.

Each 10 percentage point increase in the partner's household income share reduces the percentage of income devoted to child support by about 0.7 (0.5) in the previously married (all separated couples) sample. Perhaps because of the compulsion

of IS-recipients to use the CSA, or because of insufficient within-variation of IS-receipt in the sample, the mother's IS-receipt does not significantly affect the amount of child support paid by the father. The mother's household income relative to the father's has the expected negative impact on child support payments by the father, but its effect is not precisely determined.[11] Importantly, the estimates of λ_p, λ_o and β are not affected much by the exclusion of the mother variables; if anything, the estimates of λ_p are biased toward zero by their exclusion. On this basis, we are more comfortable that when using the larger, primary sample of fathers the exclusion of mother's relative household income does not bias our results toward finding effects of intra-household income distribution on child support transfers.

Main parameter estimates

So far we have seen that a simple scatter plot and a bivariate fixed effect estimator for the primary sample and a multivariate fixed effect estimator for a sample of fathers matched with mothers all indicate that a higher partner's share in household income significantly reduces the share of household income paid in child support. We now discuss two sets of fixed effect estimates using the primary sample. The first assumes that within-father variations in household income and income shares are exogenous, while the second treats them as endogenous and allows for lagged adjustment. Similar estimates of the impact of partner's income share emerge in the two sets.

Exogenous incomes

Initially we assume exogeneity of the explanatory variables. Note that, in the context of the model in (5), exogeneity of a variable x_{it} means that $E(x_{it}e_{it})=0$, while $E(x_{it}u_i)$ can be non-zero. This is a weaker assumption than would be required with cross-section data. It means that errors in measurement of or shocks to child support

[11] In the larger sample, its coefficient (standard error) is -0.874 (0.452) when the insignificant children and IS variables are excluded, with a corresponding p-value of 0.055.

transfers are not correlated with explanatory variables like household income or income shares.

A common econometric approach for dealing with the concentration of budget shares at zero (46% in our data) is to estimate a "Tobit model". We allow for the father-specific unobservable (u_i) to be correlated with the right-hand side variables in (5) by assuming that $u_i = \eta\bar{x}_i + \varepsilon_i$, where $\bar{x}_i$ is a vector of means of the time-varying variables on the right hand side of (5) and ε_i is orthogonal to these variables. Estimates of the parameters of this model are shown in the first column of Table 3, with their marginal effects on E(s/y_h) shown in the second column.[12] For comparison, linear fixed effect (FE) estimates that ignore the concentration of zeroes (but includes them in the sample) are shown in the third column of Table 3. The marginal effects from the Tobit parameter estimates are generally similar to the estimates from the FE linear model. In particular, a relatively large negative value for λ_p is estimated, and fathers cohabiting with their new partner pay more (relative to married fathers). These results are consistent with higher bargaining power for partners contributing a larger share of household income and for partners who are married. A test for the exclusion of the individual means (i.e. that the vector η=0) soundly rejects this hypothesis. Similarly, we reject the orthogonality assumption required for linear random effects' estimates to be consistent (see Hausman test in Table 3).

The estimate of the vector η in the Tobit model indicates that the father-specific unobservable is significantly correlated with the father-specific means of a number of variables. In particular, these correlations indicate that fathers whose preferences or the unobserved attributes of ex-partners incline them to pay more child

[12] Note that the estimated impact of the *k*-th variable on the expected child support share is, $\partial E(s/y_h)/\partial x_k$, is $\theta_k F(\theta \boldsymbol{x}/\sigma)$, where $F(.)$ is the standard normal distribution function and θ is the vector of

support have higher household income, a lower other income share and a higher partner's income share than those inclined to pay less. These estimates point to the value of having panel data for estimating how intra-household income distribution affects expenditure patterns and the need to allow for correlation between explanatory variables and father-specific heterogeneity.

Even though we use fixed effect estimators, there may still be concern that the estimated relationship between father's income and share of household income paid reflects the payment formulae for fathers who comply with court or CSA child support orders, as discussed earlier. Such formulae would not, however, affect the impact of income shares on whether or not any payment is made. The first column of Table 4 presents fixed effect estimates of the parameters of a logit model for the log odds of payment (using Chamberlain's conditional logit estimator). A higher partner's share and being married significantly reduces the probability of paying any child support, a result consistent with these affecting the partner's bargaining power.[13] Among fathers paying something, a higher partner's income share reduces the share of household income paid in child support, as does higher household income and children with his new partner. These estimates suggest that treating the extensive and intensive margins as the same, as is done in Table 3, may be incorrect (e.g. note the different effects of household income in Table 4). Nevertheless, we shall maintain this simpler treatment in the dynamic model with endogenous incomes in the next section.

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parameters in (5), and its impact on the probability of paying something is $\theta_k f(\theta\mathbf{x}/\sigma)$, where $f(.)$ is the standard normal density function.

[13] We come to the same conclusion when we estimate a probit model that includes individual means of the explanatory variables, analogous to the Tobit model in Table 3, or when we estimate a fixed effect linear probability model.

Endogenous incomes and dynamics

Up to this point we have assumed that the within-father variations in partner's and other adults' income share and household income are exogenous (i.e. not correlated with e_{it}), which may be doubtful because labour supply choices affect income. In addition, it is possible that changes in partner's income share and other variables may not produce an immediate full adjustment in the child support share, and so we allow for lagged adjustment to changes in the explanatory variables:

(6) $(s/y_h)_{it} = \gamma(s/y_h)_{it-1} + \alpha(\boldsymbol{Z_{it}}) + \beta\ln(y_{hit}) + \lambda_p(y_p/y_h)_{it} + \lambda_o(y_o/y_h)_{it} + u_i + e_{it}$

As is well known (e.g. Arellano and Bond, 1991; Arellano, 2003), if we take first differences in equation (6), instrumental variable estimation of the difference equation (using a generalised 'method-of-moments' estimator) provides consistent parameter estimates for this model. The instruments are all lags of the endogenous variables (including the dependent variable) from t-2 backwards, as well as lags of first differences in the strictly exogenous variables from t-1 backwards. In addition, the first difference in the number of adults is used as an instrument. Thus, only fathers contributing at least 3 years of data can contribute to the estimation, which reduces the sample to 107 fathers and 336 person-year observations. The number of instruments varies with the father according to the number of years that the father is observed.

The parameter estimates are shown in Table 5. Second-order serial correlation in the residuals would suggest model misspecification (negative first order serial correlation is expected), but there is no evidence of it. The Sargan test (asymptotically distributed as chi-square conditional on a common variance of e_{it}) cannot reject the 261 over-identifying restrictions. There is no evidence of significant lagged adjustment. The estimate of λ_p indicates that a 10 percentage point increase in the share of partner's income reduces the share of child support expenditure in household

income by about 0.5 percentage points, similar to the estimates in Table 3. The child support share declines with household income, and the share is higher for fathers who are cohabiting with (as opposed to married to) their new partners. The latter suggests that married partners have more bargaining power in household decisions.

The estimated impact of the new partner's income share on father's child support payments appears, therefore, to be robust to the different ways of estimating it; the point estimate is always around -0.05.[14] This certainly suggests that intra-couple income distribution affects the father's control over household resources and his welfare.

Conclusion

The primary contribution of this paper is to construct a sample of formerly married fathers who have formed new partnerships, and to use these data to estimate how intra-household distribution of income affects child support transfers by fathers to mothers of their dependent children living elsewhere. The idea is that new partner's preferences are not likely to value expenditures on the man's children from his previous union. As a consequence, his own and his partner's income would have different impacts on his child support payments if partners' relative incomes affect bargaining power in household decisions. Our estimates indicate that a higher share of father's income in household income (a lower share of partner's income) increases the probability that he pays some child support and the amount of child support relative to

[14] Note 7 indicated that, when labour supply is endogenous and the preferences of the father and his partner are separable in non-market time, we could interpret the child support function as a conditional one. When the separability assumption does not hold, the child support function should condition on non-market time. We approximate it for the father's partner by dummy variables for the partner not having a job and being self-employed (for whom working hours are not available) and the product of a dummy variable for being an employee and her normal working hours. These three job variables are treated as endogenous. They are not jointly significantly at the 0.05 level, which is consistent with the separability assumption and bargaining power being a function of endogenous earnings, as in Basu (2006). In the specification conditioning on the three job variables, the estimate (standard error) of λ_p is -0.032 (0.016), and the child support share declines with the partner's working hours and is lower when she is self-employed.

household income. There is not income pooling in the father's household, and partners' relative incomes appear to affect their bargaining power in household decisions and their welfare. While the households upon which we focus are not typical, there is no strong reason to believe that the role of intra-household income distribution in their decision-making is distinctly different from that in other households containing a married or cohabiting couple.

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Appendix

Let the mother's preferences be represented by the utility function

$U=a\ln(C-\gamma_C) + (1-a)\ln(x_m)$, $\gamma_C \geq 0$.

The father's preferences are represented by the utility function

$V=b\ln(C-\gamma_C) + (1-b)\ln(x_f-\gamma_f)$ $\gamma_j \geq 0$, $j=C,f$.

The father's partner's preferences are represented by the utility function

$W=\ln(x_p-\gamma_p)$ $\gamma_p \geq 0$.

The mother maximises U subject to $x_m=y_m+s$, implying $C=a(s+y_m) + \gamma_C$.

The father's household maximises $V + \mu W$ subject to

$y_f+y_p=s+x_f+x_p$ and $C=a(s+y_m) + \gamma_C$.

Solving this problem, the *child support function* for $s>0$ is

$$\text{(A1)} \quad s = \frac{b}{1+\mu}(y_f + y_p) - (1-\frac{b}{1+\mu})y_m - \frac{b}{1+\mu}(\gamma_f + \gamma_p)$$

Under the null hypothesis that μ is not a function of individual incomes, the impacts of each partner's income should be the same.

We might add the following function for the determination of bargaining power:

$$\text{(A2)} \quad 1+\mu = \exp(\alpha_0 + \alpha_1 \frac{y_p}{y_f + y_p}) .$$

Expressing child support in terms of a share of household income by dividing (A1) by y_f+y_p, the null hypothesis of income pooling/the unitary model is that $\alpha_1=0$, in which case the partner's income share would not affect the child support share.

Figure 1: **Scatter Plot of s/y_h and y_p/y_h**

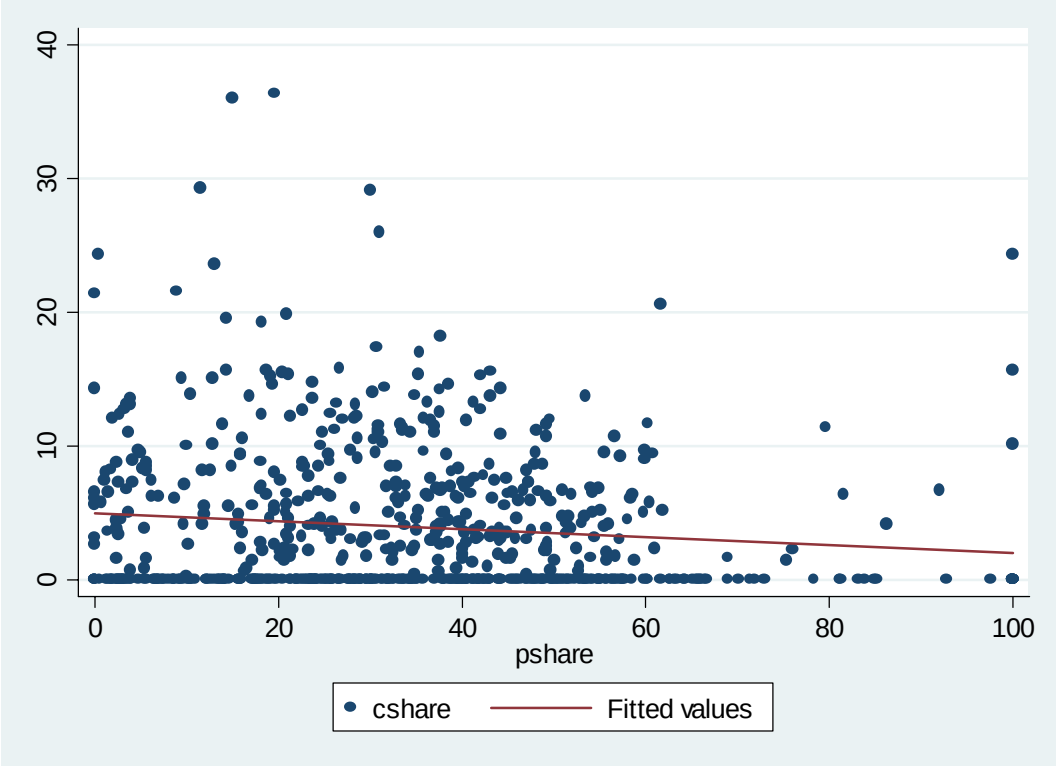

Table 1: Descriptive Statistics, Primary Sample

Variable	**Mean* (Overall Std. Dev.) [Within Std. Dev.]**
Child support share, %	3.9 (5.4) [3.2]
Partner's income share,%	33.6 (21.0) [13.4]
Other adults' income share, %	4.2 (11.7) [6.0]
Log household income	2.928 (0.599) [0.287]
Number of father's dependent children with new partner	0.54 (0.83) [0.34]
Number of new partner's dependent children from previous partnerships	0.73 (0.99) [0.34]
Cohabiting with new partner (cf. married)	0.427
New partner does not have a job	0.289
Usual hours worked per week*Partner an employee	19.8** (16.7) [8.2]
Partner self-employed	0.057
Age of father	39.0 (6.2) [2.1]
Years since separation	7.8 (3.9) [2.1]
Proportion separated but not divorced	0.115
Proportion paying some child support	0.540

*****Means calculated over 698 person-years for 179 fathers.

**Mean calculated over 693 person-years for 179 fathers.

Table 2: Fixed Effect Linear Estimates of Impacts on Child Support Payments as a Percentage of Household Income, Sample of Matched Mothers and Fathers, BHPS 1991-2003, standard error in parentheses

	Previously married couples		All separated couples	
Variable	**(1)**	**(2)**	**(3)**	**(4)**
Partner's income share,%	-0.068 (0.029)	-0.063 (0.028)	-0.045 (0.019)	-0.037 (0.018)
Other adults' income share, %	-0.051 (0.073)	-0.049 (0.071)	-0.064 (0.034)	-0.065 (0.034)
Log father's household income	-1.186 (1.927)	-1.062 (1.466)	-2.243 (0.864)	-1.613 (0.752)
Mother's household income/father's hh. inc.	-0.323 (0.862)	--	-0.771 (0.485)	--
Mother receives IS	0.628 (1.403)	--	-0.192 (0.904)	--
Number of common dependent children	-1.865 (1.017)	-2.074 (0.973)	-0.667 (0.698)	-0.958 (0.667)
Number of partner's dependent children	-0.234 (1.071)	-0.330 (1.056)	0.426 (0.714)	0.450 (0.715)
Cohabiting with new partner (cf. married)	2.95 (1.14)	3.06 (1.12)	1.81 (0.89)	2.01 (0.877)
Constant	10.06 (6.99)	9.43 (4.75)	12.33 (3.33)	9.18 (2.54)
***N* fathers** ***N* father-years**	36 140	36 140	59 214	59 214
F test for exclusion of mother variables (2df)	0.31 p=0.74		1.27 p=0.28	

Table 3: 'Tobit' and Linear 'Fixed Effect' Estimates of Impacts on Child Support Payments as a Percentage of Household Income, Primary (non-matched) Sample, BHPS 1991-2003, standard error in parentheses

Variable	**Tobit**	**Tobit Marginal effects***	**Fixed effects (Robust SE)**
Partner's income share,%	-0.095 (0.018)	-0.051	-0.050 (0.010)
Other adults' income share, %	-0.018 (0.043)	-0.009	0.005 (0.022)
Log household income	-4.053 (0.828)	-2.19	-2.896 (0.490)
Number of common dependent children	-0.835 (0.627)	-0.45	-0.370 (0.419)
Number of partner's dependent children	-0.534 (0.701)	-0.29	-0.034 (0.443)
Cohabiting with new partner (cf. married)	3.30 (0.74)	1.78	1.99 (0.49)
Separated (not divorced)	-1.15 (1.19)	-0.62	--
Means of:			
Partner's income share,%	0.040 (0.027)		
Other adults' income share, %	-0.212 (0.056)		
Log household income	9.005 (1.068)		
Number of common dependent children	-1.175 (0.773)		
Number of her dependent children	-0.134 (0.784)		
Cohabiting with new partner (cf. married)	-0.499 (1.079)		
Constant	-8.126 (2.331)		13.46 (1.36)
σ_u	5.25 (0.36)		5.39
σ_e	4.70 (0.19)		3.51
$\sigma_u^2/(\sigma_e^2+\sigma_u^2)$	0.556 (0.040)		0.703
***N* fathers** ***N* father-years**	179 698		179 698
Chi-sq.test for exclusion of individual means (6df)	83.14 *p*=0.0000		
Hausman test (6df)			78.80** *p*=0.0000

*Computed at average values for the explanatory variables.

**Comparing estimates with estimates from a linear random effects' model.

Table 4: Fixed Effect Logit Estimates of Impacts on the log Odds of Child Support Payment and Fixed Effect Linear Estimates of Impacts on the Percentage of Household Income Paid, Conditional on Non-zero Payment, Primary (non-matched) Sample, BHPS 1991-2003, standard error in parentheses

	Fixed effects Logit Parameter	**Linear Fixed effects, given *s*>0**
Partner's income share,%	-0.045 (0.013)	-0.036 (0.015)
Other adults' income share, %	0.010 (0.024)	0.005 (0.022)
Log household income	0.330 (0.517)	-6.292 (0.726)
Cohabiting with new partner (cf. married)	1.28 (0.50)	2.65 (0.55)
Number common dep. children	0.169 (0.365)	-1.321 (0.495)
Number of her dependent children	0.169 (0.365)	0.191 (0.535)
***N* fathers** ***N* father-years**	48 279	109 377
Hausman test (6df)	31.15 *p*=0.0000	40.43 *p*=0.0000

Table 5: IV Estimates of Impacts on Child Support Payments as a Percentage of Household Income, Primary (non-matched) Sample, BHPS 1991-2003, robust standard error in parentheses
Only numbers of common and partner's children and cohabiting treated as strictly exogenous*

Variable	**Parameter Est.**
Lagged child support share, %	0.063 (0.051)
Partner's income share,%	-0.046 (0.015)
Other adults' income share, %	0.024 (0.027)
Log household income	-1.885 (0.716)
Number of common dependent children	-0.442 (0.605)
Number of partner's dependent children	-0.178 (0.692)
Cohabiting with new partner (cf. married)	1.29 (0.67)
Constant	-0.195 (0.121)
Summary statistics:	
***N* fathers** ***N* father-years**	107 336
Test for zero correlation in residuals: ***order 1 p-value*** ***order 2 p-value***	 0.000 0.389
Sargan test for over-identifying restrictions (p-value), conditional on common variance	242.03 (0.794) ***(261df)***

*****First difference in number of adults treated as additional instrument.