TESTS OF INCOME POOLING ON HOUSEHOLD BUDGET DATA:

THE AUSTRALIAN EVIDENCE*

by

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ABSTRACT

The unitary household model implies pooling of all individual incomes. This study distinguishes between various types of income pooling and tests them on Australian household income/expenditure data. The tests recognise the endogeneity of both earned and unearned income and are performed using a 3 SLS estimation procedure that allows feedback between the various equations. The results support income pooling for some items, though not for others. Moreover, income pooling across gender seems much less likely for old people than for the younger individuals. The study, also, provides evidence on the interaction between the various types of income.

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I. INTRODUCTION

Welfare analysis of the household has, traditionally, been based on the unitary household or common preference model [Samuelson (1956), Becker (1981)]. This approach has proved useful for its elegance and analytical tractability. The design of commodity taxes provides an illustrative example of the usefulness of unitary household models in policy applications [Atkinson and Stiglitz (1980)].[i]

The unitary household model has, however, via its assumption of common preferences, two significant behavioural implications that appear quite restrictive, namely, (a) individual members pool their income in achieving household outcomes, and (b) the identity of the income recipient is of no consequence for household behaviour, eg. in making expenditure allocations. While these have proved convenient in analysing household expenditure pattern on budget data which seldom contain disaggregated income and expenditure information on individual members, they nevertheless raise the question of their empirical plausibility. From a policy viewpoint, (b) is quite restrictive since it suggests that the targeting of welfare benefits to individual members inside the household is unlikely to matter in the achievement of specific welfare objectives. The adverse welfare consequences of intra household inequality that Haddad and Kanbur (1990) discuss, for example, cannot be reversed by such targeting. Such a negative view is contradicted by the evidence of Lundberg, Pollak and Wales (1997) who observe that the targeting of child benefits to mothers in the UK led to a change in the expenditure pattern of households towards items which figure prominently in children's consumption. Further evidence against the unitary household model is provided in Maitra and Ray (1999) who observe, on South African data, that the marginal impact of income on expenditures is different for earned income, public pension and private transfer.

There has been a rapidly expanding empirical literature that tests the major implication of the common preference model, namely, the pooling of all income by the household members so that total family income, not its components separately, will affect household expenditure patterns. In other words, the identity of the income recipient has no effect on a household outcome. Examples of studies that test, on a variety of data sets, the idea of income pooling between household members include Schultz (1990), Thomas (1990), Hoddinott and Haddad (1995), Lundberg, Pollak and Wales (1997), Phipps and Burton (1998), Thomas, Contreras and Frankenberg (1990), Maitra and Ray (2000) and Quisumbing and Malucco (2000).[ii] These studies test the pooling hypothesis underlying the unitary model, namely, that the sum of the spouses' incomes, not their individual incomes separately, affects household outcome. The papers by Thomas (1990), Thomas, et.al. (1990) and Quisumbing and Malucco (2000) do not use unearned income but assets at marriage as indicators of bargaining power in the tests of the unitary model. While Phipps and Burton (1998) use "earned income" in their test of pooling on household income/expenditure data, Thomas (1990) uses total unearned income and Schultz (1990) uses income from particular sources such as property income or transfers. The use of "earned income" in tests of pooling has been criticised by Lundberg, Pollak and Wales (1997, p. 465) on the ground that "earnings are clearly endogenous with respect to the household's allocation decisions … differential effects of husband's earnings and wife's earnings on consumption patterns are consistent with the common preference framework because households with different ratios of husband's earnings to wife's earnings are likely to face different prices and have different preferences, even with total household income held constant".

Consequently, much of the above cited literature on tests of income pooling between household members have done so using unearned or non labour income since, unlike earned income, they are not contaminated by price effects. However, in lumping together all non

labour income under "unearned income" and conducting pooling tests based on this heterogenous item, the literature overlooks the fact that unearned income consists of different components (namely, asset returns and pensions) that have different sets of determinants and recipients, have different behavioural and welfare impact and, most seriously, are simultaneously determined with household outcomes such as expenditure patterns. Further, with the exception of Maitra and Ray (2000), there is no test of whether households pool these different components of "unearned income". Implicitly, the literature has assumed the latter pooling by lumping together the disparate components of unearned income. Yet, in most households, the recipients of asset returns and pensions are different individuals (often belonging to different generations), with different preferences, and the results might be significantly biased if we assume pooling of these incomes.

The principal motivation of this study is to provide Australian evidence on income pooling addressing, on the way, the limitations of the existing literature on pooling tests discussed above. In particular, this study takes pensions out of 'unearned income' and treats it as a separate variable in the estimations reported below. The paper proposes and performs tests of income pooling underlying the unitary household model explicitly recognising:

(a) the endogeneity of earned income, unearned income (mostly, asset returns) and pensions in the budget share equations,

(b) the need to treat these resource flows as separate variables and test for their different impact on the budget shares, and

(c) the need to test both types of pooling, ie. (i) non labour earnings between men and women, and (ii) unearned income and pensions, separately for men and women.

This paper, also, departs from the previous literature on pooling tests by adopting a simultaneous equations estimation framework that allows for correlation between errors in the different equations using the systems based, three stage least squares (3SLS) procedure. We subdivide household income into the following components: (i) earned income of men and

women, (ii) unearned income of men and women, and (iii) pension received by the household, disaggregated by the gender of the recipient. The pooling tests are conducted in terms of their implications on the household's expenditure allocation. Consequently, we estimate a system of equations where the endogenous variables are (i) – (iii) and the expenditure shares. The 3SLS estimation procedure, used here, not only takes note of the joint endogeneity of these variables, but also of the mutual feedback between the equations through a non diagonal covariance matrix of the estimated errors. The Breusch and Pagan (1980) statistic, reported later, confirm that the 3SLS procedure is a significant improvement over the single equation based 2SLS procedure used before.[iii]

The Australian pensions are largely means tested with the tests for eligibility applied to both income and assets. In March, 2001, the full pension rates were $394.10 per fortnight (with a pharmaceutical allowance of $5.60) for a single person, and $657.80 (with a pharmaceutical allowance of $5.60) per fortnight for a couple.[iv] The income cut off for pensions is $1105.75 per fortnight for a single person, $1847.00 per fortnight for a couple. The pensions are reduced by $0.40 in every $1 of income over $106 per fortnight for a single person, $188 per fortnight for couples.

The rest of this paper is organised as follows. Section 2 presents the theoretical framework, the estimating equations and the pooling hypotheses in testable form. Section 3 describes the Australian budget data set used here, and reports some summary measures. The results are presented and discussed in Section 4. The concluding comments are contained in Section 5.

II. THEORY

Consider a household consisting of S members. The utility of each member depends on the commodity consumption of all the household members, namely, $x = \{x_{is}\}$, i = 1,…,I;

s = 1,…,S (where i indexes commodity, s indexes the individual) and leisure, $\ell = \{\ell_s\}_{s=1}^{S}$. Each member's utility U^s is, therefore, defined over $\xi = \{x, \ell\}$ ie. $U^s = U^s(\xi; \theta, \varepsilon)$, s = 1,…,S, where θ, ε denote the set of household and individual level characteristics that affect the utility of each individual. The household welfare function is given by

$$W = W\left[\{U^s(\xi; \theta, \varepsilon)\}_{s=1}^{S}\right] \tag{1}$$

The full income constraint of the household is given by

$$p'X = \sum_{s=1}^{S}\left[w_s(T - \ell_s) + I_s\right] \tag{2}$$

where p denotes the price vector, X is the vector of aggregate demand $\left(X_i = \sum_s x_{is}\right)$, T denotes the time endowment of each individual, w_s denotes the wage rate, and I_s the non labour income of individual s. p and w_s are assumed to be fixed exogenously. Maximising (1) with respect to (2) gives a set of reduced from demand functions for item k for each individual s as follows

$$\xi_{ks} = \xi_{ks}(I_1,...,I_S; w_s, p, \theta, \varepsilon_{ks}) \tag{3}$$

The unitary household model assumes identical preferences across individuals, with the household being thought of as a single unit. This implies that only the sum of non labour earnings in the household, not its distribution between individuals, will affect commodity demand.

In other words,

$$\xi_{ks} = \xi_{ks}\left(\sum_{s=1}^{S} I_s; w_s, p, \theta, \varepsilon_{ks}\right) \tag{4}$$

Note that (4) is, itself, quite restrictive since it assumes that each individual pools the two components of her/his non labour earnings considered here, namely, Unearned income (U_s) and Pensions (P_s). A more general form for the demand function is, therefore, given by

$$\xi_{ks} = \xi_{ks}\left(U_1,...,U_S;P_1,...,P_S;w_s,p,\theta,\varepsilon_{ks}\right) \tag{5}$$

In the context of this study, the general non unitary household model [eqn. (5)] yields the following set of earnings and commodity demand equations for individual s

$$w_s H_s \equiv E_s = \xi_{1s}\left[U_m, U_f, P_m, P_f, w_s, p;\theta,\varepsilon\right] \tag{6}$$

$$x_{is} = \xi_{2is}\left[U_m, U_f, P_m, P_f, w_s, p;\theta,\varepsilon\right] \tag{7}$$

$s = m,f$
$i = 1,\ldots,n$

where H = T - ℓ_s is labour supply, m, f denote male, female, respectively, x_{is} is demand for item i by individual s, and E_s is 'earned income' or labour earnings of s. Since we do not observe individual consumption of goods, we aggregate equation (7) over the S individuals to obtain

$$X_i = \sum_s x_{is} = \xi_{2i}\left[U_m, U_f, P_m, P_f, \{w_s\}_{s=1}^{S}, p;\theta,\varepsilon\right] \tag{8}$$

(8) reminds us of the fact that in the present study, non labour income has 4 components; U_m (unearned income of males), U_f (unearned income of females), P_m (male pensions), P_f (female pensions). These resource inflows, together with the labour earnings of men (E_m) and women (E_f), constitute the total income of the household.

Another distinguishing feature of this study is the appearance of a poverty variable, Pov, denoting a household's poverty status (1, if poor, 0, otherwise), as one of the determinants of the commodity demand, ie. budget share, equations. This is in addition to the

continuous income variables mentioned above. The poverty variable, whose endogeneity is taken into consideration in the estimation, captures the discrete jump in preferences for several items that occurs when the household crosses the poverty line. Expressing the commodity expenditure equations in budget share form, b_i, we have the following set of estimable equations. As before, m and f denote male, female, respectively.

$$U_m^h = f_1\left(Z_1^h;\theta_1\right)+\eta_1^h \tag{9}$$

$$U_f^h = f_2\left(Z_2^h;\theta_2\right)+\eta_2^h \tag{10}$$

$$E_m^h = f_3\left(Z_3^h,\underline{U_m^h},\underline{U_f^h};\theta_3\right)+\eta_3^h \tag{11}$$

$$E_f^h = f_4\left(Z_4^h,\underline{U_m^h},\underline{U_f^h};\theta_4\right)+\eta_4^h \tag{12}$$

$$P_m^h = f_5\left(Z_5^h,\underline{U_m^h},\underline{U_f^h},\underline{E_m^h},\underline{E_f^h};\theta_5\right)+\eta_5^h \tag{13}$$

$$P_f^h = f_6\left(Z_6^h,\underline{U_m^h},\underline{U_f^h},\underline{E_m^h},\underline{E_f^h};\theta_6\right)+\eta_6^h \tag{14}$$

$$Pov^h = f_7\left(Z_7^h;\theta_7\right)+\eta_7^h \tag{15}$$

$$b_i^h = f_{7+i}^h\left(Z_8^h,\underline{U_m^h},\underline{U_f^h},\underline{E_m^h},\underline{E_f^h},\underline{P_m^h},\underline{P_f^h},\underline{Pov^h};\theta_{7+i}\right)+\eta_{7+i}^h \tag{16}$$

$$i = 1,\ldots,n$$

where the superscript h denotes household, the Z^hs are the predetermined, exogenous vector of determinants, the η^hs are the stochastic error terms, the θs denote the parameter vectors, and the other variables are as defined before. The endogenous variables appearing on the right hand side of the estimating equations have been underlined. Note that all the six income (resource) variables (namely, U_m, U_f, E_m, E_f, P_m, P_f) are defined in per equivalent adult terms, using the equivalence scale estimates reported in Lancaster and Ray (1998). The poverty variable, Pov, representing the household's poverty status, was based on information on poverty line for 1993/94 provided by the Melbourne Institute of Applied Economic and Social Research.

The poverty line for a single adult in the year of the sample, namely, 1994 was constructed by deflating the 1999 poverty line (weekly) figure of $255.06 in the June Quarter of 1999 by the CPI, relevant to the poor, of 1994. The latter, ie., the price index, was obtained by taking the ratio of the CPI based poverty lines in 1998/99 and 1993/94 of a "benchmark family" available in the quarterly bulletin, "Poverty Lines: Australia" (June Quarter, 1999) published by the Melbourne Institute of Applied Economic and Social Research. A household is, then, considered poor if its aggregate weekly expenditure is less than the 1994 poverty line for a single adult, thus constructed, multiplied by $\left(n_a + q n_c\right)^r$, where n_a is the number of adults and n_c is the number of children in the household. The equivalence scale parameters (θ, ρ) were set at their estimated values of $\hat{\theta} = 0.52,\ \hat{\rho} = 0.71$.

Note that, while we allow pensions to depend on earned income, we assume the latter to be independent of the former. While this aids identification, equations (9) – (16) reflect a 4 stage decision making process. In stage 1, the household members learn the quantum of their "unearned income" (U_m, U_f), which is a function of their individual and family characteristics. In stage 2, conditional on their unearned income levels and of others in the household, the individuals decide on their labour hours and, hence, on their labour earnings (E_m, E_f), again as a function of individual and family attributes. In stage 3, conditional on their "unearned" and "earned" income levels, the authorities decide on the pension levels of men (P_m) and of women (P_f) in the household. Finally, in stage 4, the household decides on its expenditure outlays by aggregating the individual demands which are dependent on, besides the exogenous determinants, the six distinct income variables, which are determined in the previous three stages.

Besides investigating the behavioural consequences of the various resource inflows, this study tests the following four income pooling hypotheses relating to the four non labour income components, namely, U_m, U_f, P_m, P_f:

(a) Men pool their unearned income and pensions (ie. $U_m + P_m$ appears in the determinants, rather than the two separately)

(b) Similarly, for women: $U_f + P_f$

(c) Unearned income (U) is pooled between men and women (ie. $U = U_m + U_f$ appears on the right hand side of the budget share equations rather than U_m, U_f separately)

(d) Similarly, for pensions: $P = P_m + P_f$.

The pooling hypotheses, described in (a) – (d) above and referred to as H_A to H_D below, are specified as testable restrictions on the parameters of the budget share equations [eqn. (16)]. Let $f_{7+i}^{R,h}$ denote the income dependent component of the budget share equation of item i in household h. It is specified as follows:

$$f_{7+i}^{R,h} = \alpha_{i,1}U_m + \alpha_{i,2}U_f + \alpha_{i,3}P_m + \alpha_{i,4}P_f + \alpha_{i,5}E_m + \alpha_{i,6}E_f \qquad (17)$$

The income pooling hypotheses imply the following nested restrictions on the parameters of the budget share equations [eqn. (17)].

A. <u>Males' Pooling of Unearned Income and Pensions</u>

$$H_A : \alpha_{i1} = \alpha_{i3}$$

B. <u>Females' Pooling of Unearned Income and Pensions</u>

$$H_B : \alpha_{i2} = \alpha_{i4}$$

C. <u>Pooling of Male and Female Unearned Income</u>

$$H_C : \alpha_{i1} = \alpha_{i2}$$

D. <u>Pooling of Male and Female Pensions</u>

$$H_D : \alpha_{i3} = \alpha_{i4}$$

Each of these four hypotheses on income pooling is tested, item by item, using the likelihood ratio test based on Chi square with 1 degree of freedom.

III. DATA AND DESCRIPTIVE STATISTICS

The data set used in this study comes from the 1993/94 Household Expenditure Survey (HES) published by the Australian Bureau of Statistics (ABS). The HES, conducted throughout Australia during July, 1993 to June, 1994, contains information on household characteristics, income and detailed expenditure breakdown of households in Australia, as well as information on the characteristics of persons in the household. The 1993/94 HES contains unit record information on approximately 8400 households. The present study utilised the information on 8106 households, omitting the others for reasons of inferior data quality.

As mentioned above, the resource inflow into the household consists of: (i) earned income (E_m, E_f), (ii) unearned income (U_m, U_f), and (iii) pensions (P_m, P_f), disaggregated by the gender of the recipient. While all pension benefits, eg. age pension, widows pension, invalid pension were aggregated into the pension variable (P), the unearned income variable (U) consists mainly of income from interest, from investments and from property rent. In contrast, earned income (E) consists mainly of income from wages and salary.

Table 1 shows variation between provinces of the household poverty rates and the mean share of the six income components. Northern Territory and the ACT record the lowest poverty rates, South Australia and Tasmania the highest. The breakdown of aggregate household income into its various components does not show much variation between regions. Such variation is expected between household types, distinguished by household size and composition. This is confirmed by Table 2 which shows the variation in the income breakdown between households which contain, at least, one pensioner and those which do not. It is remarkable that the poverty rates increase five fold with the presence of one or more pensioners in the household. The numbers point to the vulnerability of pensioner households

to poverty. Note, also, the much larger dependence on female pensions than male pensions in such households.

The 3SLS estimation of equation system (9) – (16) was performed using the STATA estimation package. Let us now turn to the results.

IV. RESULTS

Table 3, Panel A presents the 3SLS estimates of the six income equations and of the poverty status equation. The Breusch Pagan statistic of 4573.50 shows convincing rejection of diagonal variance covariance matrix of residuals on a Chi square test with 78 degrees of freedom. The following additional points are worth noting:

(i) The estimated parameters of the income equations vary, quite sharply in several cases, with the gender of the income recipient. There are some similarities too. For example, the house ownership variable has a significant, positive impact on both female unearned income and on male unearned income, although the latter effect is much weaker. Households with Australia born household head experience higher male earned income but marginally lower female earned income than other households.

(ii) Female and male unearned income have opposite effects on male earned income. A similar result holds for the female earned income regression estimates, with male unearned income crowding out female earned income, while female unearned income has a positive impact on female earned income.

(iii) Female unearned income crowd out male pensions, but male unearned income impact positively on male pensions. A similar picture holds for the estimated female pensions equation. Female headed households receive more female pensions, male headed households receive more male pensions. Male earned income sharply reduce male pensions, but have a statistically insignificant impact on female pensions. Similarly, female earned income impact negatively on female pensions but exert little impact on male pensions.

(iv) The estimated poverty variable equation shows the sharp positive impact that an increase in the number of unemployed in the household has on the probability of that household falling below the poverty line. In contrast, a marginal increase in the number of workers sharply reduces the probability of the household finding itself below the poverty line. The provincial dummy coefficients show the regional impact on a household's poverty status.

Table 3, Panel B presents the 3SLS estimates of the budget share equations. The following results are worth noting.

(i) The poverty variable has a significant impact on the budget share of several items. In other words, a large discontinuous shift of preferences occurs when a household crosses the poverty line. For example, *ceteris paribus*, a poor household devotes a significantly larger share of its budget to Housing, and a significantly lower share to Food compared to a non poor household.

(ii) Of particular interest in these estimates, are the impact of the six income variables on budget share. Male and female unearned income have opposite impact on the budget share of several items. For example, *ceteris paribus*, female unearned income increases the budget share of Food, decreases the share of Housing – the reverse occurs for male unearned income. The gender differences are much less significant for the impact of earned income and pensions on budget shares.

(iii) The estimated co-efficients of unearned income and pensions disagree with one another for several items. This is particularly true of Housing. These estimates do not suggest that men and women pool their non labour earnings or that individuals pool the components of such income in making their purchases of every item. More formal tests are presented later.

(iv) Consistent with previous Australian evidence [see, for example, Lancaster and Ray (1998)], household composition has a strong impact on the budget share of most items. The provincial dummy coefficients are generally insignificant for Food and Housing suggesting that there is not much regional variation in consumer preference for these large items of expenditure. This is, however, not true for 'Alcohol and Tobacco' and 'Fuel and Power'.

(v) Of the other variables, the country of birth of the household head, representing ethnicity, has a significant impact on preferences. For example, households with Australia born head spend a lower share of their budget on Food and Housing, and a higher share on 'Transport' compared to others.

The results of the tests of income pooling, ie. tests of the four hypotheses, H_A to H_D outlined earlier, are presented in Table 4. The income pooling hypotheses are convincingly rejected for several, but not all, items. Housing and Transport report rejection, and Clothing reports non rejection of all types of income pooling. The rejection of income pooling for spending on Housing is at variance with the Canadian evidence of Phipps and Burton (1998) based on earned income. With the exception of Clothing and the residual category, "Other Items", the data rejects, by a large margin, the hypothesis that old men and old women pool their pensions in making their spending on the various commodities. While men pool their unearned income and pensions in order to spend on Alcohol and Tobacco, and women do likewise, it is interesting to note that there is no income pooling between men and women in making purchases of this item. In case of spending on Fuel and Power, while women pool

their unearned income and pensions, men do not. Again, for spending on this item, men and women pool their unearned income, but not their pensions. The overall message from these pooling tests is that the results vary with item and, for a given item, they vary between the different types of income pooling considered here.

The budget share equations [eqn. (17)], whose estimates are presented in Table 3, Panel B are linear in the income variables. In order to capture higher order terms and, consistent with the recent Australian evidence in favour of rank three demand systems [see Lancaster and Ray (1998), Ray (1999)], we re-estimated eqns. (9) – (16) with the income dependent component of the budget share equations specified as follows:

$$f_{7+i}^{R,h} = \alpha_{i,1}U_m + \alpha_{i,2}U_f + \alpha_{i,3}P_m + \alpha_{i,4}P_f + \alpha_{i,5}E_m + \alpha_{i,6}E_f + \alpha_{i,7}Y^2 \qquad (18)$$

where $Y = U_m + U_f + P_m + P_f + E_m + E_f$ is the household's aggregate income per equivalent adult (ie. income from all sources). The estimated coefficients are not presented here for space reasons but will be made available on request. The estimated quadratic expenditure coefficient $(\hat{\alpha}_{i,7})$ was found to be highly significant in case of all the items except Fuel and Power. Table 5 presents the results of the tests of the various hypotheses on income pooling in the presence of the higher order terms in the budget share equations. A comparison of Tables 4, 5 shows that the rejection of the alternative types of income pooling, especially of the major items of expenditure, namely, Housing and Transport, is robust to the inclusion of higher order terms in the budget share equation. It is interesting to note, however, that Clothing continues to display evidence in favour of income pooling, especially of men and women pooling their unearned income. In contrast, introduction of the quadratic term in the budget share equation leads to a decisive rejection of all types of income pooling in the context of Food expenditure.

The results presented and discussed above assume that: (i) earned income depends on unearned income, but not vice versa [eqns. (9) – (12)], and (ii) there is a discrete jump in

preferences for several items when the household crosses the poverty line. While the former assumption has been rationalised by a 4 stage decision making process outlined earlier, the latter assumption embodies the view that the poor have a fundamentally different preference structure from that of the non poor. Moreover, the endogeneity of the poverty variable is a significant feature of the estimation procedure. As the referees noted, while neither of these assumptions may be valid, the endogeneity of the poverty variable could be inappropriate. This raises the issue of robustness of the estimates and of the tests of income pooling to departures from the above framework. To investigate this issue, we re-estimated the equations after allowing the unearned income variables to depend on earned income, dropping the poverty variable altogether, while retaining the other features of the above equation system.

To save space, we have reported in Table 6 the 3SLS coefficient estimates of only the unearned and earned income equations. The tests of income pooling in the presence of joint endogeneity of earned and unearned income are presented in Table 7. It is clear that, contrary to the assumption made earlier, both the earned income variables have a significant impact on unearned income. There are, however, sharp gender differences in the nature and magnitude of this impact. A comparison of the coefficient estimates of the earned income equations between Tables 3 and 6 shows, however, that, in most cases, the qualitative nature of the estimates is quite robust to the inclusion of the earned income variables as determinants in the unearned income equations. It is, incidentally, interesting to note that the joint dependence of unearned and earned income causes the country of birth of the household head to lose its statistical significance in the male earned income equation. A comparison of Tables 4 and 7 shows that allowing the joint dependence of unearned and earned income, far from providing support to the unitary model, actually increases the number of rejections of the income pooling hypothesis underlying this model. For example, all types of income pooling are rejected in the context of spending on Food, unlike before. The overall picture yielded by the

income pooling tests, reported in Table 7, is quite similar to that implied by Table 4 with (a) income pooling not rejected in the case of spending on Clothing, and (b) men and women seen to pool their unearned income but not their pensions in case of expenditure on Fuel and Power. The principal result of this study, namely, that the unitary model is not uniformly rejected for all items is quite robust to the estimation framework and, in particular, to the inclusion or otherwise of the Poverty variable in the estimation.

In the estimations reported so far, we have not allowed for shifts in preferences and behaviour between pensioner households (ie., those with at least one pensioner) and others. To do so, we re-estimated the equations with a pensioner dummy (1 for a pensioner household, 0, otherwise) appearing on the right hand side of the estimated equations. The estimated coefficient of the pensioners' dummy was found to be highly significant in the budget share equations of Alcohol and Tobacco (negative), Transport (positive), but weakly significant or insignificant in case of the other items. Table 8 presents the test results on income pooling in this more general case where we have allowed for behavioural differences between pensioner and non pensioner households. Once again, the overall picture is quite similar to that obtained earlier, with the spending on Clothing and Fuel and Power reporting evidence in favour of income pooling, while the others, especially Housing and Transport reject it quite decisively.

V. CONCLUDING COMMENTS

The unitary household model, that forms the basis of demand estimation and welfare analysis on household level data, implies pooling of all income by individual members in the achievement of various outcomes. The unitary model assumes, either, identical preferences of various household members or dictatorial decision making of the household head who takes the preferences of all the household members into consideration. Apart from the issue of

empirical plausibility of these assumptions, the unitary model sees little or no role for targeting of welfare benefits to specific individuals since the cash injection is pooled with other incomes. For example, in the pooling scenario, unemployment benefits aimed at the unemployed, pension benefits aimed at the old, or child benefits aimed at children in deprived households will end up with their benefits spread thinly across all members rather than being exclusively with the specific individuals who are targeted. On the demand behavioural front, the pooling hypothesis implies that a dollar is a dollar regardless of its origin – in other words, the marginal impact of income on the expenditure share of an item is the same for all types of income.

The principal motivation of this exercise has been to test the pooling hypothesis on Australian budget data. In doing so, the study distinguishes between the alternative types of income pooling that are implied by the unitary model. The tests of pooling of non labour income are performed using a 3 SLS procedure that recognises the endogeneity of incomes and of the household's poverty status in a simultaneous equation framework. The present evidence suggests significant improvement over the single question, 2 SLS methods used in other recent tests of the pooling hypothesis. The results do not suggest wholesale rejection of the pooling hypothesis, i.e. on all items. Nor do they support income pooling for all items. Consistent with recent Canadian evidence, but using a different empirical methodology, the Australian results suggest rejection of income pooling for some items, notably Housing and Transport, though not for others, e.g. Clothing. The results, also, suggest that old men and old women are much less likely to pool their pension incomes than younger men and women pooling their unearned income.

While the present results do not support the unitary household models, they do not point to any specific type of non unitary model, e.g. the bargaining model or the "collective

model" that have been proposed [see Thomas, et.al. (1997) for a review]. Clearly, there is scope for further analytical and empirical work in this area.

Table 1: Household Poverty Rates and Share of Income Components by Province

Mean Values	**NSW**	**Vic**	**Q'ld**	**SA**	**WA**	**Tas**	**NT**	**ACT**
Poverty Rate	0.31	0.31	0.32	0.35	0.31	0.34	0.17	0.18
Income Share of:								
Male Pensions	0.11	0.12	0.12	0.13	0.11	0.13	0.07	0.06
Female Pensions	0.20	0.19	0.18	0.22	0.19	0.21	0.12	0.13
Male Unearned Income	0.04	0.04	0.04	0.05	0.05	0.05	0.03	0.06
Female Unearned Income	0.04	0.05	0.05	0.04	0.05	0.05	0.02	0.05
Male Earned Income	0.39	0.37	0.38	0.37	0.38	0.36	0.49	0.42
Female Earned Income	0.22	0.22	0.23	0.19	0.22	0.20	0.28	0.29

Table 2: Household Poverty Rates and Share of Income Components in Pensioner, Non Pensioner Households

Mean Values	**Households with No Pensioner**	**Households with at Least One Pensioner**
Poverty Rate	0.089	0.442
Income Share of:		
Male Pensions	0.0	0.185
Female Pensions	0.0	0.313
Male Unearned Income	0.065	0.031
Female Unearned Income	0.055	0.038
Male Earned Income	0.537	0.289
Female Earned Income	0.344	0.144

Table 3: 3SLS Estimates[1] of the Thirteen Equation System[2]
Panel A: Estimates, with t Values, of the Unearned Income and Pensions Equations

ıcome			Pensions	
	Men	**Women**	**Variable**	**Men**
ehold Head	3.23 (12.61)	1.77 (7.76)	Male Unearned Income	0.79 (13.80)
pied House (1 = yes, 0 = no)	4.85 (2.85)	11.59 (8.11)	Female Unearned Income	-0.83 (11.45)
elling	0.0001 (15.74)	0.0001 (12.99)	Male Earned Income	-0.20 (19.51)
	-19.76 (10.22)	-9.72 (5.52)	Female Earned Income	-0.01 (0.74)
			No. of Males	5.11 (6.29)
			No. of Females	-10.98 (13.81)
			Age of Household Head	-0.04 (0.21)
			Gender of Household Head (1 = Male Headed, 2 = Female Headed)	-37.08 (8.74)
			Constant	124.22 (17.46)

Table 3: Panel A (Continued): Estimates, with t Values, of the Poverty and Earned Income Equations

		Earned Income	
	Coefficient Estimate	**Variable**	**Men**
ummy:		Male Unearned Income	1.92 (8.15)
), Otherwise)	0.04 (2.06)	Female Unearned Income	-1.36 (4.80)
	0.03 (1.27)	Country of Birth of Head (1 = Australia, 0 = Otherwise)	9.78 (2.22)
	0.05 (2.21)	No. of Non Dependents	-0.19 (0.04)
ılia	0.04 (1.82)	No. of Dependents	-9.79 (4.10)
tralia	0.03 (1.47)	Gender of Household Head (1 = Male Headed, 2 = Female Headed)	-139.69 (12.49)
	0.05 (2.41)	*Occupation Dummies:*	
ritory	-0.01 (0.62)	Professionals (1 = Professionals or Managers, 0, Otherwise)	286.84 (46.84)
ıdents	0.02 (3.97)	Traders (1 = Trades People, Clerks, or Sales Persons, 0, Otherwise)	229.42 (37.68)
es	0.04 (5.29)	Labourers (1 = Plant Operators or Labourers, 0 Otherwise)	205.81 (28.96)
ers	-0.21 (49.37)	Constant	222.67 (13.21)
ıployed	0.08 (7.60)		
	0.48 (24.86)		

Table 3, Panel B: Estimates, with t Values, of the Budget Share Equations

	Food	Alcohol & Tobacco	Housing	Clothing	Fuel & Power	Transport
ed Income	-0.0003 (1.14)	0.0003 (1.70)	.004 (8.31)	.00 (.05)	.00 (.51)	-.002 (5.98)
rned Income	.0006 (2.71)	-.0005 (3.48)	-.008 (17.00)	.00 (.43)	.0002 (2.51)	.004 (10.94)
ns	-0.0004 (4.51)	0.0006 (9.50)	-.003 (13.89)	.0001 (1.19)	-.0002 (6.29)	.002 (13.99)
ions	0.0007 (7.26)	-0.0003 (4.91)	-.0009 (3.67)	.0002 (2.77)	.00 (1.29)	-.0003 (1.66)
Income	-.0001 (2.83)	-.0002 (7.80)	.0002 (3.78)	.0001 (3.21)	-.00 (2.57)	-.0002 (5.27)
ed Income	-.0004 (13.16)	.0000 (1.13)	.0006 (9.47)	.0001 (3.14)	-.00 (7.66)	-.0002 (3.26)
l is Poor, 0, Otherwise)	-0.11 (6.71)	-0.04 (3.66)	0.59 (15.34)	-.015 (1.29)	.013 (2.53)	-0.29 (9.79)
	0.009 (5.27)	-0.004 (3.27)	.007 (1.94)	.0001 (.12)	-.00 (.65)	-.011 (3.55)
les	-0.011 (6.41)	0.002 (1.70)	.003 (0.78)	.009 (7.48)	-.003 (6.10)	.006 (2.11)
irth of Household Head) = Otherwise)	-0.009 (3.53)	0.008 (0.002)	-0.015 (3.09)	.002 (1.33)	-.0005 (.69)	.009 (2.16)

Table 3, Panel B (Continued): Estimates, with t Values, of the Budget Share Equations

	Food	Alcohol & Tobacco	Housing	Clothing	Fuel & Power	Transport
ummy:						
esident, 0 = Otherwise)	.010 (1.68)	0.014 (3.27)	-.008 (.54)	.0002 (.04)	-.008 (4.53)	-.005 (.49)
	.002 (.37)	.007 (1.48)	-.009 (.55)	.003 (.73)	.006 (3.03)	-.015 (1.22)
	.002 (.007)	0.012 (2.37)	.008 (.46)	-.005 (.98)	-.014 (6.22)	-0.15 (1.14)
ılia	-.001 (0.1)	.011 (2.55)	-.027 (1.65)	.003 (.67)	-.001 (.74)	-.009 (.79)
tralia	0.000 (.063)	0.014 (2.94)	-.023 (1.38)	-.002 (.47)	-.005 (2.30)	-.001 (.08)
	.007 (1.07)	.011 (2.27)	-.010 (.59)	-.001 (.22)	.012 (5.98)	-.026 (2.14)
ritory	.012 (1.78)	.022 (4.84)	.015 (.88)	-.017 (3.81)	-.006 (2.98)	-.031 (2.60)
	0.277 (23.98)	.108 (13.09)	.050 (1.97)	-.002 (.23)	.055 (15.73)	.332 (16.37)

rentheses.

n statistics: $\chi^2_{78} = 4573.50$

consist of Recreation, Personal Care and miscellaneous Goods and Services.

Table 4: Tests of Income Pooling, χ^2 Values[a]

Item	Hypotheses Tested[b]			
	H_A	H_B	H_C	H_D
Food	0.33	0.04	3.72	60.86[d]
Alcohol & Tobacco	3.04	1.38	6.76[d]	92.39[d]
Housing	150.83[d]	133.58[d]	163.06[d]	38.05[d]
Clothing	0.13	0.34	0.03	1.05
Fuel & Power	6.46[c]	2.59	0.94	26.03[d]
Transport	99.11[d]	83.93[d]	72.57[d]	101.23[d]
Other Items	36.68[d]	55.28[d]	68.60[d]	0.01

[a] All the χ^2 values have 1 degree of freedom.

[b] H_A: Males pool unearned income and pensions.
H_B: Females pool unearned income and pensions.
H_C: Male and Female pool unearned income.
H_D: Male and Female pool pensions.

[c] Denotes statistical significance at 5% level.

[d] Denotes statistical significance at 1% level.

Table 5: Tests of Income Pooling in the Presence of Quadratic Income Variable in the Budget Share Equations (χ^2 values)

Item	Hypotheses Tested[b]			
	H_A	H_B	H_C	H_D
Food	30.26[d]	30.07[d]	10.48[d]	375.27[d]
Alcohol & Tobacco	88.46[d]	11.42[d]	11.28[d]	198.14[d]
Housing	344.95[d]	219.85[d]	301.98[d]	99.74[d]
Clothing	3.44	3.79	2.52	5.58[c]
Fuel & Power	27.98[d]	0.05	0.40	62.30[d]
Transport	290.93[d]	160.23[d]	176.63[d]	229.90[d]
Other Items	6.52[d]	28.86[d]	30.76[d]	4.25[c]

[a] All the χ^2 values have 1 degree of freedom.

[b] H_A: Males pool unearned income and pensions.
H_B: Females pool unearned income and pensions.
H_C: Male and Female pool unearned income.
H_D: Male and Female pool pensions.

[c] Denotes statistical significance at 5% level.

[d] Denotes statistical significance at 1% level.

Table 6: 3 SLS Estimates[a], with t Values, of the Unearned and Earned Income Equations in the Presence of their Joint Dependence

Unearned Income			Earned Income		
Variable	**Men**	**Women**	**Variable**	**Men**	**Women**
Male Earned Income	0.07 (11.87)	-0.06 (11.21)	Male Unearned Income	2.11 (9.51)	-1.76 (12.28)
Female Earned Income	-0.11 (13.76)	0.14 (19.35)	Female Unearned Income	-1.32 (4.64)	2.67 (14.20)
Age of Household Head	2.54 (8.97)	3.46 (14.36)	Country of Birth of Head (1 = Australia, 0 = Otherwise)	3.89 (0.93)	0.17 (0.08)
Owner Occupied House (1 = yes, 0 = no)	11.57 (6.53)	12.88 (9.09)	No of Non Dependents	-6.48 (1.81)	-8.56 (3.53)
Value of Dwelling	0.00 (11.49)	0.00 (10.10)	Gender of Household	-18.42 (8.19)	-14.42 (9.45)
Constant	-16.20 (5.96)	-23.13 (10.66)	Head (1 = Male Headed, 2 = Female Head)	-90.01 (8.34)	22.86 (3.23)
			Occupation Dummies		
			Professionals (1 = Male Headed, 2 = Female Headed)	312.33 (51.49)	198.28 (38.97)
			Traders (1 = Trades People, Clerks, or Sales Person, 0, Otherwise)	261.74 (44.32)	175.81 (42.14)
			Labourers (1 = Plant Operators or Labourers, 0 Otherwise)	227.08 (35.26)	160.51 (36.24)
			Constant	125.15 (7.85)	-58.68 (5.55)

[a] t values in parentheses

Table 7: Tests of Income Pooling in the Presence of Joint Dependence of Unearned and Earned Income (χ^2 Values)

Item	Hypotheses Tested[b]			
	H_A	H_B	H_C	H_D
Food	32.86[d]	9.21[d]	14.99[d]	14.91[d]
Alcohol & Tobacco	13.16[d]	25.62[d]	68.50[d]	55.81[d]
Housing	43.05[d]	103.24[d]	79.50[d]	41.50[d]
Clothing	0.42	1.55	1.64	0.03
Fuel & Power	9.68[d]	0.01	0.37	37.26[d]
Transport	76.37[d]	110.37[d]	100.26[d]	53.92[d]
Other Items	16.67[d]	42.28[d]	42.99[d]	0.83

[a] All the χ^2 values have 1 degree of freedom.

[b] H_A: Males pool unearned income and pensions.
H_B: Females pool unearned income and pensions.
H_C: Male and Female pool unearned income.
H_D: Male and Female pool pensions.

[c] Denotes statistical significance at 5% level.

[d] Denotes statistical significance at 1% level.

Table 8: Tests of Income Pooling in the Presence of Behavioural Differences Between Pensioners and Non Pensioners (χ^2 Values)[a]

Item	Hypotheses Tested[b]			
	H_A	H_B	H_C	H_D
Food	0.75	0.01	9.45[d]	59.37[d]
Alcohol & Tobacco	67.07[d]	0.04	2.28	114.72[d]
Housing	399.72[d]	194.12[d]	340.65[d]	92.24[d]
Clothing	1.50	0.59	0.56	2.36
Fuel & Power	22.12[d]	1.87	0.01	35.93[d]
Transport	321.20[d]	150.66[d]	209.67[d]	187.95[d]
Other Items	12.94[d]	31.62[d]	39.42[d]	0.89

[a] All the χ^2 values have 1 degree of freedom.

[b] H_A: Males pool unearned income and pensions.
H_B: Females pool unearned income and pensions.
H_C: Male and Female pool unearned income.
H_D: Male and Female pool pensions.

[c] Denotes statistical significance at 5% level.

[d] Denotes statistical significance at 1% level.

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Footnotes

[i] See Apps and Rees (1988) for an analysis of the implications of non unitary utility functions for tax policy.

[ii] See, also, the volume edited by Haddad, Hoddinott and Alderman (1997).

[iii] Under the null hypothesis of a diagonal covariance matrix, the Breusch Pagan statistic has a χ^2 distribution with degrees of freedom = $M(M-1)/2$, where M is the number of equations estimated.

[iv] We are grateful to Paul Blacklow for providing us with this information.