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IMPACT OF DEMOGRAPHIC CHANGE ON INDUSTRY STRUCTURE IN AUSTRALIA

A joint study by the Australian Bureau of Statistics, the Department of Employment and Industrial Relations, the Department of Environment, Housing and Community Development, the Department of Industry and Commerce and the Industries Assistance Commission

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EFFECT OF ETHNIC ORIGIN ON HOUSEHOLD CONSUMPTION PATTERNS IN AUSTRALIA

by

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EFFECT OF ETHNIC ORIGIN ON HOUSEHOLD CONSUMPTION PATTERNS IN AUSTRALIA

ABSTRACT

The aim of this paper is to demonstrate that household consumption behaviour is dependent on the ethnic origin of the household head. To show this dependence, Lluch's (1973) Extended Linear Expenditure System (ELES) is estimated for households belonging to different ethnic groups, and the parameters of the system are compared to show whether significant differences exist. The data used is from the 1966-68 Australian Survey of Consumer Finances undertaken by Macquarie University. In order to overcome the apparent problem with this data of understatement of incomes, a restriction involving the Frisch parameter is built into the ELES estimating equations.

9. The hypothesis of the i^{th} and j^{th} ethnic groups having the same marginal budget share for commodity k is tested in large samples using

$$t = (\hat{\beta}_{ik} - \hat{\beta}_{jk})/S_{\hat{\beta}_{ik}-\hat{\beta}_{jk}} \quad , \quad \text{for} \quad i \neq j \ ,$$

where the standard error of the difference in marginal budget shares of the k^{th} commodity for the i^{th} and j^{th} groups is given by

$$S_{\hat{\beta}_{ik}-\hat{\beta}_{jk}} = (S^2_{\hat{\beta}_{ik}} + S^2_{\hat{\beta}_{jk}})^{\frac{1}{2}}$$

and t is approximately Normal $(0, 1)$.

10. Replacing permanent income by current income in equation (2), and summing over commodities yields the ELES consumption function $v = (1 - \mu)1'\gamma_h^* + \mu y$. Now if (9) is rearranged, it is seen that $1'\gamma_h^* = v(1 + \omega^{-1})$ which, substituted into this consumption function, shows the relationship between μ and ω to be $\mu = -a[\omega - a(1 + \omega)]^{-1}$, where $a = v/y$, the average propensity to consume.

11. One other interesting aspect of these family size coefficients is the apparent relationship they bear to the marginal budget share. However, the insignificance of many of these family size coefficients necessitates further research in this area before reaching definite conclusions.

12. It must be noted, however, that part of these differences in expenditure patterns between the ethnic groups may be due to income differences.

13. Further analysis is being undertaken and it is envisaged that more conclusive results will be available shortly.

FOOTNOTES

* This paper is based on part of my unpublished Masters thesis (1976). I am greatly indebted to Alan Powell and Ross Williams for helpful comments and criticisms; to Ellen Hope who managed most of the computational requirements; and to C.R. Wymer for his RESIMUL program. I also benefitted from discussions with Peter Praetz and the staff of the IMPACT project at the Industries Assistance Commission.

1. See the Mexican study by Williams (1975), United States study of Benus, Kmenta and Shapiro (1976) and the study of United Kingdom data by Pollak and Wales (1976).

2. Hereinafter referred to as the Macquarie Survey.

3. Other assumptions made include perfect capital markets, exogenously determined commodity prices and labour income, and constant rates of discount.

4. Here 1' is the summation vector (1, 1, 1, ... , 1).

5. This procedure is adopted in two studies of Lluch and Williams (1975a, 1975b). Notice that capital gains are ruled out.

6. Recent empirical studies by Lluch and Williams (1974) and Lluch and Powell (1975) have supported this conjecture.

7. Clearly it is an arbitrary decision as to which intercept term is replaced: for convenience that of the nth equation is chosen.

8. This technique has been adopted in earlier studies of this type of Podder (1971) and Williams (1975a, 1976b).

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T A B L E S

Clearly, it is also important to examine the effect of this restriction and consider alternative methods of overcoming this data problem. These are envisaged as the subjects of future studies.

The components of subsistence expenditure, as well as subsistence expenditure evaluated at mean family size were also examined and despite the insignificance of many of these estimates, large differences in the subsistence patterns of the different ethnic groups were found. Particularly notable were the different rankings of commodities according to the size of subsistence expenditure for the four ethnic groups.

All of the above remarks about significant differences are based on asymptotic tests. The experience reported above with the Italian and East European data suggests that these tests are not necessarily robust. In particular, the difference in the estimated marginal propensities to consume of the two East European samples is too large to be consistent with their asymptotic standard errors. Further research on this anomoly is under way.

Despite these difficulties, the evidence seems sufficient to conclude that the ethnic origin of the household head is an important determinant of household consumption behaviour. However, it is clear that there are many other demographic factors -- such as age distribution -- which also affect expenditure patterns, and it would be useful, where sufficient data exists, to consider a break-down by age distribution within ethnic groups. Thus much of the variability may be reduced, so that more estimates become significant and expenditure patterns can be established for many different representative consumers. Of course such analysis could easily extend further into other broadly defined demographic characteristics - such as education and employment.

An attempt was made to overcome the problem of understatement of incomes by the participants in the Macquarie Survey by incorporating a restriction involving the Frisch parameter in the estimating equations of the model.

EFFECT OF ETHNIC ORIGIN ON HOUSEHOLD CONSUMPTION PATTERNS IN AUSTRALIA*

I INTRODUCTION

In many recent studies of household budget data, a number of demographic factors have been identified among the determinants of household consumption behaviour. One of these variables, family size, has been investigated by different authors for several countries.[1] Their work shows that the parameters of the expenditure system, particularly the marginal budget shares of the different commodities, are influenced by family size and as a result this variable has been used in recent Australian studies by Williams (1976a, 1976b). As a consequence it is also included in this examination of Australian data, although the principal objective here is to investigate the influence of ethnic variables on household consumption behaviour. The particular ethnic variable considered is the country of origin of the head of the household.

The data used is the 1966-68 Australian Survey of Consumer Finances, undertaken by Macquarie University[2] in which responses to the question concerning country of origin are classified into nine groups. Hence to examine the effect of this variable on household consumption patterns, expenditure systems are estimated for the different ethnic groups and the resulting parameter estimates are compared. The size and significance of differences between the parameter estimates -- particularly the marginal budget shares -- are then used as a basis for deciding whether ethnic origin is an important determinant of consumption patterns and thus a worthwhile inclusion in future studies.

The remainder of this paper is organized as follows. In Section II the expenditure system is briefly examined and the family size variable is incorporated. A restriction is built into the model in Section III in an effort to overcome understatement of income by the survey participants.

* Footnotes to text are to be found on pages 22 and 23.

Section IV contains the results of the Full Information Maximum Likelihood (FIML) estimation of the expenditure systems for the different ethnic groups, while a brief summary and conclusions are presented in the final section.

II SPECIFICATION

Lluch's (1973) Extended Linear Expenditure System (ELES) is estimated so that the tradeoffs the consumer makes -- that is, the tradeoff between now and later, and the tradeoff between the different consumer goods -- can be considered as being made simultaneously. Hence the consumer's saving behaviour can be examined in conjunction with his concurrent allocation of expenditure to the various goods.

To derive this system, the present value of a consumer's utility stream is maximized subject to a wealth constraint. To simplify the system an intertemporally additive utility function is chosen so that the utility derived at different times can be discounted and the present value can be calculated. Lluch chooses the directly additive Klein-Rubin (1947-48) utility function so that the utility derived form the n goods available to the consumer is the sum of the utilities derived from the individual goods. To prevent violations of this additivity assumption being too frequent, goods are grouped in broad categories.

The deterministic part of the i^{th} equation in ELES is[3]

$$v_{ih} = p_{ih}\gamma_i + \mu\beta_i[z_h - p_h'\gamma] \qquad (1)$$

$$i=1, \ldots, n \text{ (commodities)};$$

$$h=1, \ldots, H \text{ (households)};$$

Examination of the subsistence terms in Table V reveals further differences between the two samples for each country. Apart from the second Eastern European sample, few intercepts or family size coefficients are significant, and in many cases these parameter estimates differ in both size and sign between the two samples. Although the ranking of the nine commodities by magnitude of family size coefficients is similar for both Eastern European samples, negative coefficients for many commodities in the second sample prevent this occurring with the Italian data. Differences also occur in the total subsistence expenditures for each commodity evaluated at mean family size, although Food and Household are the largest and next to largest subsistence expenditures respectively for all four samples.

V CONCLUSIONS

Several criteria are used in this study to determine whether the country of origin of the household head is a determinant of consumption behaviour. The size and significance of the marginal budget shares for each ethnic group were compared, and in many cases significant differences were found between the estimates for the different ethnic groups. The ranking of commodities by size of marginal budget shares also differs between the ethnic groups, further supporting the hypothesis of differing expenditure patterns for different ethnic groups. Although the mpc's are different for the four ethnic groups, this is a result of the prespecification of values of the Frisch parameter for each country being incorporated into the model to overcome understatement of income by participants in the Macquarie Survey. One method of alleviating this problem may be to examine the actual household data and omit misleading observations, but in this process bias may still be introduced into the results.

TABLE V: COMPONENTS OF SUBSISTENCE EXPENDITURE[#] FOR ITALIAN AND EASTERN EUROPEAN SAMPLES[†]

COMMODITY	ITALY						EASTERN EUROPE					
	SAMPLE I			SAMPLE II			SAMPLE I			SAMPLE II		
	γ_{oi}^*	γ_{Li}^*	γ_i^*	γ_{oi}^*	γ_{Li}^*	γ_i^*	γ_{oi}^*	γ_{Li}^*	γ_i^*	γ_{oi}^*	γ_{Li}^*	γ_i^*
Food	100.90	203.928	950.266	296.330	187.336	1077.334	150.470	206.897	915.782	-32.491	305.010**	1095.741
Cigarettes	82.036	23.063	178.186	88.876	7.536	120.294	-58.087	37.566	80.870	-115.564	45.761	53.706
Clothing	-296.210	91.493	85.224	13.286	23.745	112.279	-82.368	89.685	249.377	-311.461	118.169*	125.646
Household	298.632**	13.904	356.598	383.971**	-12.473	331.971	181.823	21.630	261.832	290.575**	14.554	344.410
Durables	-294.561	69.873	-3.260	216.462	-20.882	129.405	123.832	23.098	209.272	-170.512	47.145	3.877
Personal	13.507	54.730	241.676	12.093	45.191	200.494	-10.886	61.823	217.797	120.589	46.103	291.124
Transport	79.615	36.124	230.216	69.084	7.244	99.284	129.369	29.818	239.666	27.415	76.628	310.862
Recreation	-68.471	19.824	14.175	7.489	-5.306	-14.632	-82.368	82.836	224.042	-338.619	91.060	-1.788
Other	-73.037	39.961	93.560	63.168	6.487	90.212	-223.604	47.406	-48.249	-149.512	74.703*	126.814
Total Subsistence Expenditure			2146.64			2146.64			2350.39			2350.39

Notation as in Table III.

† One asterisk on the γ_{oi}^* or γ_{Li}^* terms indicates the estimate is significantly different from zero at a 5% level of significance; two asterisks indicate significance at the 1% level.

where:

p_{ih} = the price of the i^{th} good to the h^{th} household;

v_{ih} = expenditure on good i by household h;

γ_i = subsistence level or minimum requirement of i^{th} good;

z_h = permanent income of h^{th} household;

μ = marginal propensity to consume out of permanent income;

β_i = marginal budget share of i^{th} good (with $0 < \beta_i < 1$ for all i);

and

$$\sum_{i=1}^{n} \beta_i = 1 .$$

As cross-section data do not contain price information, it is assumed that all consumers face the same prices in the survey period. Hence, $p_{ih}\gamma_i$ can be replaced by γ_{ih}^*, the subsistence expenditure on the i^{th} good by the h^{th} household at the prices which prevailed when the survey was made. Now (1) can be rewritten[4] as

$$v_{ih} = \gamma_{ih}^* + \beta_i [z_h - 1'\gamma_h^*] , \qquad (2)$$

with

$i = 1, \ldots, n$ (commodities);

$h = 1, \ldots, H$ (households);

and

$$\beta_i^* \equiv \mu\beta_i .$$

One of the problems still remaining however is that values of permanenent income, z_h, are not generally available. Here, this problem is avoided by assuming that the present value of expected changes in labour income is zero, so that permanent income and current labour income coincide.[5] Another alternative is to replace permanent income by total expenditure as in Podder (1971) although this causes identification problems as the sum of the dependent variables is an explanatory variable. In this case further information is required to identify the underlying parameters

and with the addition of other variables such as family size even more extraneous information is required. However even if such information were available, simultaneity problems would arise in estimation as a result of the sum of the dependent variables being used as an explanatory variable.

The use of labour income also involves estimation problems as it is likely, particularly with cross-section data, that observations on income are not free of measurement error so that resulting Ordinary Least Squares (OLS) estimates will be inconsistent. A solution to these estimation problems is to use Livitan's (1961) method of Instrumental Variables to obtain consistent estimates. Here total expenditure would be used as the explanatory variable with labour income as the instrument, and any other variables would act as their own instruments. Using this method, Williams (1976c) shows that the additional information required to unscramble the subsistence parameters can be obtained from independent estimates of the expenditure elasticity of the marginal utility of expenditure. Rather than adopt this procedure however, a restriction involving this expenditure elasticity is built into the model to compensate for understatement of income, and current labour income is used as the income variable. As this restriction results in estimating equations which are non-linear in parameters, non-linear estimation techniques are required and the estimation problems associated with OLS do not arise.

Family size is incorporated in the model by allowing it to affect the subsistence parameters γ_i (or in this case γ_i^*, the subsistence expenditures with $i=1, \ldots, n$). For simplification, a direct linear relationship is chosen, as in Williams (1976a, 1976b), although this restriction is not crucial to the analysis.

Denoting family size of household h as f_h, and recalling that γ_{ih}^* is the subsistence expenditure of the h^{th} household on the i^{th} good,

Food being 29.7% in the first sample and 20.6% in the second, while for Transport the corresponding shares are 8.2% and 18.1%, they are also evident in the Eastern European data, particularly for Recreation, Durables and Cigarettes. Despite the size of these differences, the marginal budget shares of Transport for the two samples from the Italian ethnic group are the only estimates which are significantly different at a 5% level.

The ranking of the different commodities in terms of size of the marginal budget shares also differs between the two samples for both the Italian and Eastern European ethnic groups. Although both Italian samples have Food with the largest share and Household with the smallest, the remainder of the rankings are quite different with Transport being the second largest marginal budget share in one sample and Durables in the other. Eastern European data exhibit this same tendency with Recreation being the largest marginal budget share in the first sample and Food the largest in the other, the only rankings in common between the two groups being Durables (second largest) and Household (smallest).

Discrepancies also occur between the marginal propensities to consume of the different samples. One sample from the Eastern European data has an mpc of 0.8848 whereas the mpc for the other sample is 0.3139 lower at 0.5709, while the mpc's for the Italian samples differ by 0.0882. Although this difference for the Italian samples is not significant at a 5% level, the mpc's for the two Eastern European samples are significantly different at a 1% significance level. This result is surprising in view of the similar characteristics of the two samples, and the fact that none of the marginal budget shares for this group differ significantly between the two samples at a 5% level. Extensive statistical analysis does not support the rejection of the hypothesis that the two samples are random, so that doubts as to the applicability of asymptotic theory in this case are raised.[13]

TABLE IV: MARGINAL BUDGET SHARES[#]: SAMPLES OF ITALIAN AND EASTERN EUROPEAN DATA[†]

COMMODITY	ITALIAN DATA		EASTERN EUROPEAN DATA	
	SAMPLE I	SAMPLE II	SAMPLE I	SAMPLE II
Food	0.2964**	0.2059**	0.1191**	0.1638**
	(0.0404)	(0.0428)	(0.0313)	(0.0242)
Cigarettes	0.0656**	0.1021**	0.0660**	0.1158**
	(0.0182)	(0.0236)	(0.0118)	(0.0309)
Clothing	0.1413**	0.1227**	0.1343**	0.1398**
	(0.0274)	(0.0246)	(0.0243)	(0.0172)
Household	-0.0167	-0.0305	0.0399*	0.0521**
	(0.0266)	(0.0257)	(0.0174)	(0.0170)
Durables	0.1970**	0.1185**	0.1874**	0.1482**
	(0.0435)	(0.0400)	(0.0427)	(0.0428)
Personal	0.0707**	0.0963**	0.0801**	0.0697**
	(0.0263)	(0.0275)	(0.0126)	(0.0166)
Transport	0.0824**	0.1807**	0.0812**	0.0896**
	(0.0285)	(0.0348)	(0.0149)	(0.0219)
Recreation	0.1247**	0.1453*	0.2003**	0.1403**
	(0.0239)	(0.0563)	(0.0302)	(0.0207)
Other	0.0386	0.0590*	0.0917**	0.0807**
	(0.0218)	(0.0232)	(0.0208)	(0.0160)
m.p.c. = μ	0.8692**	0.7810**	0.8848**	0.5709**
	(0.0945)	(0.1108)	(0.0598)	(0.0671)

Standard errors are contained in parentheses beneath the corresponding marginal budget share.

† One asterisk indicates the estimate is significantly different from zero at a 5% level of significance; two asterisks indicate significance at the 1% level.

then the relationship between subsistence expenditure and family size can be expressed as:

$$\gamma_{ih}^{*} = \gamma_{oi}^{*} + \gamma_{Li}^{*} f_h , \qquad (3)$$

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

$$h=1, \ldots , H ,$$

where γ_{oi}^{*} is an intercept term, that is, the part of subsistence expenditure on good i by household h that is not dependent on family size, and γ_{Li}^{*} is the family size coefficient.

Equation (3) can now be summed over commodities, i, to obtain:

$$1'\gamma_h^{*} = 1'\gamma_o^{*} + f_h 1'\gamma_L^{*} . \qquad (4)$$

Now substituting (3) and (4) into (2) and replacing permanent income z_h by labour income y_h, the ELES equation for the i^{th} good can be expressed as

$$v_{ih} = \gamma_{oi}^{*} - \beta_i^{*} 1'\gamma_o^{*} + \beta_i^{*} y_h + f_h[\gamma_{Li}^{*} - \beta_i^{*} 1'\gamma_L^{*}] \qquad (5)$$

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

$$h=1, \ldots , H .$$

III MAKING THE MODEL OPERATIONAL

One of the major problems encountered when using data such as that contained in the Macquarie Survey is understatement of income. In many cases total expenditure of households is much greater than the income they claim to receive, thus resulting in unreliable parameter estimates. To overcome this problem, a restriction involving the Frisch parameter is incorporated in the estimating equations. This parameter in the context of the Klein-Rubin utility function is the inverse of the negative supernumerary ratio, where supernumerary income is the difference between total expenditure and subsistence expenditure, so that the Frisch parameter is given by the expression

$$\omega = -v(1 - 1'\gamma_h^*)^{-1} , \qquad (6)$$

where v is total expenditure.

As this 'parameter' (strictly speaking in the current context, a variable) is the expenditure elasticity of the marginal utility of expenditure, it forms a measure of real wealth or welfare which Frisch (1959) conjectured would decrease in absolute value as real expenditure increased.[6] Hence the problem of understatement of income can be overcome by specifying a particular welfare level of the population in terms of an appropriate value of the Frisch parameter.

To incorporate the Frisch parameter into the ELES equations, (5), ω is evaluated at mean total expenditure, $\bar{v}$, so that (6) becomes

$$1'\gamma_h^* = \bar{v}(1 + \tfrac{1}{\omega}) . \qquad (7)$$

Equating this expression with equation (4) and evaluating at mean family size we obtain

$$1'\gamma_o^* = \bar{v}(1 + \tfrac{1}{\omega}) - \bar{f}\ 1'\gamma_L^* , \qquad (8)$$

so that the intercept term in the subsistence expenditure equation for the n^{th} commodity,[7] γ_{on}^*, is given by the expression

$$\gamma_{on}^* = \bar{v}(1 + \tfrac{1}{\omega}) - \bar{f}\ 1'\gamma_L^* - \sum_{j=1}^{n-1} \gamma_{oj}^* . \qquad (9)$$

Hence by substituting equations (8) and (9) into equation (5), the deterministic parts of the final estimating equations are obtained:

$$v_{ih} = \gamma_{oi}^* - \beta_i^*[\bar{v}(1 + \tfrac{1}{\omega}) - \bar{f}\ 1'\gamma_L^*] + \beta_i^* y_h + f_h[\gamma_{Li}^* - \beta_i^*\ 1'\gamma_L^*] , \qquad (10)$$

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

$$h=1, \ldots H ,$$

expenditure for this commodity. Hence very little expenditure on Clothing is regarded as essential by this group, but as income increases, more will be allocated to this commodity. The subsistence expenditure on Durables by Greek households is also very low when compared to the corresponding amounts for the other ethnic groups, whereas the amount for Cigarettes and Alcohol is very large for this ethnic group relative to subsistence expenditure on this commodity by the other households.

Together, these results show that certain differences exist between the parameter estimates for the different ethnic groups, and the size and significance of these differences particularly for the marginal budget shares is sufficient to suggest that country of origin of the household head is a determinant of household consumption behaviour.[12] However, the analysis here is restricted to four ethnic groups due to the program limitation of 100 observations. To examine the possibility of extending the analysis by including the larger samples from other groups, two samples were formed from each of the Italian and Eastern European groups. In each case the first sample is formed from every second observation, while the remaining households comprise the other sample. As the households in the Macquarie Survey are not documented as being listed according to any particular characteristic, this procedure should not cause biased estimates.

In Table IV the marginal budget shares and marginal propensities to consume of both samples are listed for each ethnic group. Results of both samples are reported as the similarities or otherwise of the two samples is the basis used to determine whether one sample can be considered representative of the data. Despite most of the marginal budget shares being significant, the Household term is negative and insignificant for both Italian samples. The main feature of these results, however, is the large differences between the marginal budget shares of the same commodity for the two samples from each ethnic group. Although these differences are larger for the Italian samples, with the marginal budget share of

seen from the table that the coefficient in the Food equation is large, positive and significant for all countries, so that an increase in family size will cause an increase in subsistence expenditure on Food for all ethnic groups. Transport and Clothing follow a similar pattern, although only the family size coefficients for the Greek and German ethnic groups are significant for these commodities. However in all these cases, the actual values of the family size coefficient differ between the four ethnic groups. The only other significant coefficient is on the Personal commodity for Greece where a unit increase in family size will result in an increase in subsistence expenditure on this commodity of $69.51. Negative family size coefficients occur on both Household and Other for the Asian ethnic group and Recreation for the German ethnic group, suggesting that as family size increases, subsistence expenditure on these commodities by the respective ethnic group decreases. However in all these cases, the estimates are not significant at the 5% level.[11]

An examination of the total subsistence expenditures, evaluated at mean family size, reveals considerable variation in values among the different ethnic groups for the various commodities. Despite this variation, certain similarities between the groups are evident, particularly in relation to the relative size of subsistence expenditure on some commodities. In all cases, the largest subsistence expenditure is on Food, while Household, Personal and Transport also have large values for all ethnic groups. However the range of values for these commodities is quite wide with subsistence expenditures for Food varying between $845 and $1192, while for Household the range is from $197 to $368. Even Recreation which has relatively low subsistence expenditure for all ethnic groups exhibits this variation, with values ranging from $27.5 for the German ethnic group to $103.3 for the Asian group.

One surprising result is that the Asian ethnic group which has the largest marginal budget share for Clothing has the smallest subsistence

and

$$v_{nh} = [\bar{v}(1+\tfrac{1}{\omega}) - \bar{f}\,1'\gamma_L^* - \sum_{j=1}^{n-1}\gamma_{oj}^*] - \beta_n^*[\bar{v}(1+\tfrac{1}{\omega}) - \bar{f}\,1'\gamma_L^*] + \beta_n^* y_h + f_h[\gamma_{Ln}^* - \beta_n^*\,1'\gamma_L^*] \qquad (11)$$

$$h=1, \ldots H .$$

An error term e_{ih} is appended to each equation, the vector of error terms $e_h' = (e_{1h}, e_{2h}, \ldots, e_{nh})$ having the properties that

$$E(e_h) = 0\,,\ E(e_h, e_h') = \Omega \quad h=h'\,; \qquad (12)$$
$$= 0 \quad h\neq h'\,;$$

so that serial correlation in errors is ruled out (that is, correlations between errors across households are assumed not to be present, although they can exist across commodities), the variance-covariance matrix of these errors being given by Ω, a $n\times n$ positive definite matrix.

The equations are now in a form in which they can be estimated being linear in variables, although non-linear in parameters. Estimation is performed using the program RESIMUL developed by C.R. Wymer at the London School of Economics, which calculates FIML estimates under these conditions. Unfortunately the version of the program currently available in Australia has one severe limitation, this being that the number of observations, which here refers to households, is limited to 100. As it is difficult to have this constraint removed, the present analysis is restricted to ethnic groups which contain less than 100 observations.

In an attempt to extend the analysis beyond the four ethnic groups which satisfy this size limitation, alternative samples are taken from two of the larger ethnic groups. A comparison of the results for the two samples from each group is then made to decide whether one sample of 100 observations taken from each of the larger ethnic groups can be considered representative of those groups. If such proves to be the case, then comparisons can be made between all the different ethnic groups.

In order to make the data more compatible, certain problem groups of observations were removed before analysis. These included households in which the head was female, households with no expenditure on food, and those with a household size of zero. As mentioned previously, a certain amount of aggregation among the commodities is desired in order to satisfy the additive utility specification, and also to simplify estimation. In this study the 40 commodities contained in the Macquarie Survey expenditure data are aggregated into 9 broad groups, these being Food, Cigarettes and Alcohol, Clothing, Household Overheads, Durables, Personal and Medical Care, Transport, Recreation, and Other.[8]

Finally it is necessary to specify a value for the Frisch parameter. Although many studies have yielded different estimates for Australia ranging from -2.18 in Lluch and Powell (1975) to -2.86 in the study of Lluch and Williams (1975b), it is necessary here to specify a value of ω for each ethnic group. This is done using a relationship derived from an international comparison of ω values in Lluch, Powell and Williams (1977) in which estimates of ω are fitted in a double-log relationship with per capita Gross National Product (GNP). This relationship is

$$-\omega = 36(GNP)^{-0.36} \qquad (13)$$

so that given a value for GNP (measured in $U.S. of 1970 per capita), an overall value for ω can be specified. Using National Accounts data, the value of the Frisch Parameter for 1966-68 is $\omega = -2.15$.

Now to obtain the ω values for the different ethnic groups, a further relationship developed by Williams (1976b) is used; this being

$$-\omega = -K(\bar{v}^*)^{-0.36} \qquad (14)$$

where $\bar{v}^*$ = mean per capita total expenditure. The value of K is found by using the overall value of $\bar{v}^*$ for all households (regardless of ethnic origin), and also the fact that $\omega = -2.15$. In this way, K is found to be 30.7 so that ω values for each ethnic group can be found substituting

TABLE III: SUBSISTENCE INTERCEPTS (γ_{oi}^*), FAMILY SIZE COEFFICIENTS (γ_{Li}^*), AND SUBSISTENCE EXPENDITURES (γ_i^*) EVALUATED AT MEAN FAMILY SIZE†

COMMODITY	NETHERLANDS			GREECE			GERMANY			ASIA		
	γ_{oi}^*	γ_{Li}^*	γ_i^*	γ_{oi}^*	γ_{Li}^*	γ_i^*	γ_{oi}^*	γ_{Li}^*	γ_i^*	γ_{oi}^*	γ_{Li}^*	γ_i^*
Food	148.13	173.70*	862.38	192.66	227.60**	1191.59	169.94	182.53*	844.76	224.46	201.20*	982.38
Cigarettes	-12.53	11.87	36.28	117.37	10.94	165.38	-23.46	21.08	54.47	64.47	1.94	71.78
Clothing	-46.11	59.42	198.22	-378.35	109.18*	100.84	-20.62	56.82*	189.45	-62.12	31.36	56.01
Household	199.17	-0.57	196.83	288.63*	3.59	304.38	190.93	15.08	246.68	359.50**	-45.61	367.69
Durables	5.21	66.03	276.72	-342.49	81.76	16.35	128.38	37.01	265.21	158.17	-4.27	142.08
Personal	143.67	36.49	293.72	-87.13	69.51*	217.94	108.06	19.34	179.56	209.26*	9.31	244.33
Transport	-1.68	59.14	241.50	-101.50	68.51*	199.19	-18.68	79.48*	275.16	47.25	75.63	332.15
Recreation	7.90	10.59	51.45	-83.34	33.48	63.60	190.60	-44.11	27.52	131.26	-7.43	103.27
Other	-60.00	37.76	95.27	-363.08	85.81	13.54	-136.63	47.32	38.31	233.17	-60.96	3.53
Total Subsistence Expenditure			2252.37			2272.81			2121.12			2303.22

† One asterisk on the γ_{oi}^* or γ_{Li}^* terms indicate the estimate is significantly different from zero at a 5% level of significance; two asterisks indicate significance at the 1% level.

exceptions are the marginal budget share for Clothing which is significantly different from the estimates for the Greek and Asian ethnic groups, and the estimate for the Other commodity which differs significantly from the value for the Netherlands ethnic group.

The last row of Table II (showing the values of marginal propensity to consume, μ, for the various countries) also reveals considerable variation among the ethnic groups, with Asia having the lowest value of 0.54, then Germany 0.59, Greece 0.64 and the Netherlands with the largest value of 0.79. However it must be noted that these mpc's are dependent on the prespecified welfare level of each ethnic group, given by the value of the Frisch parameter, ω, which was incorporated in the estimating equations of the system.[10] Hence a comparison of these estimates of μ among the ethnic groups may be misleading as the differences between them are in part due to the differences in the ω values.

As described earlier, a linear relationship between subsistence expenditure and family size is assumed, as described by equation (3), so that subsistence expenditure comprises an intercept term (γ_{oi}^*) and a family size coefficient (γ_{Li}^*). In Table III these components of subsistence expenditure are set out for the four ethnic groups. Combined with the family size coefficient, the intercept term enables subsistence expenditure (γ_i^*) to be calculated for any given family size and in the table these are evaluated at the mean family size of each group.

Few intercept terms are significant, the main exception being the Housing intercepts for the Greek and Asian ethnic groups. These intercepts, and those for Food, are large and positive for all ethnic groups. However the remainder of these terms vary both in size and sign across the different groups. In regard to the family size coefficients, it can be

the mean per capita total expenditure for each group into equation (14), with $K = 30.7$. The resulting values are listed along with other relevant information in Table 1.

TABLE I: COUNTRY OF ORIGIN BREAKDOWN OF MACQUARIE SURVEY DATA

COUNTRY OF ORIGIN OF HOUSEHOLD HEAD	NUMBER OF OBSERV-ATIONS	AVERAGE FAMILY SIZE $\bar{f}$	AVERAGE HOUSEHOLD EXPEND-ITURE $\bar{v}$	AVERAGE PER CAPITA EXPEND-ITURE $\bar{v}^*$ (i)	FRISCH PARA-METER ω
Australia	3,352	3.739	3911.00	1046.00	-2.16
Great Britain	667	3.453	3802.14	1101.11	-2.12
Italy	148	4.169	3851.03	923.73	-2.26
Greece	95	4.389	4086.71	931.13	-2.25
Netherlands	97	4.112	4146.20	1008.32	-2.19
Germany	76	3.697	3986.59	1078.33	-2.14
Eastern Europe	183	3.699	4649.49	1256.96	-2.02
Asia	43	3.767	4464.74	1185.22	-2.07
Other	59	3.593	4697.73	1307.47	-1.99
Weighted Average: (ii)				1060.09	-2.15

Notes: (i) $\bar{v}^* = \bar{v}/\bar{f}$.

(ii) Weights are the number of observations in each ethnic group.

IV RESULTS

Table II contains the marginal budget shares and corresponding standard errors of the different commodities for Netherlands, Greece, Germany and Asia; these being the four ethnic groups which satsify the program limitation of 100 observations. As almost all the marginal budget shares are significantly different from zero, meaningful comparisons among the different ethnic groups can be made.

The marginal budget shares exhibit large variation across the different ethnic groups, particularly for Food, Clothing and Durables. Both Greece and Germany have larger marginal budget shares for Food than Durables, whereas the reverse applies to Netherlands and Asia. In fact for the Asian ethnic group, the marginal budget share of Clothing (21.7%) also exceeds that of Food. The marginal budget share of Cigarettes for Germany (10.25%) exceeds the shares for the other three ethnic groups and is the third largest marginal budget share for that country. However for both the Transport and Recreation commodities, the Netherlands has larger shares than the other three ethnic groups whereas Greece has the largest marginal budget share for the Other commodity group.

Tests of significance conducted on these estimates[9] reveal that at a 5% level, significant differences exist between the marginal budget shares of the different ethnic groups for several commodities. Although significant differences between ethnic groups are not found for the Household, Durables, Personal and Transport commodities, they are particularly evident for Clothing where the marginal budget shares for both the Greek and Asian ethnic groups are significantly different from those for the other groups. In fact the marginal budget shares for the Netherlands and Greek ethnic groups are also significantly different from each other for the remaining three commodities. However few of the marginal budget shares for the German ethnic group are significantly different from those for the other groups, due mainly to the comparatively large standard errors of many of these estimates. The

TABLE II: MARGINAL BUDGET SHARES[#] (β_i) FOR DIFFERENT ETHNIC GROUPS[†]

COMMODITY	NETHERLANDS	GREECE	GERMANY	ASIA
Food	0.1264**	0.2251**	0.2153**	0.1230**
	(0.0266)	(0.0235)	(0.0435)	(0.0398)
Cigarettes	0.0776**	0.0451**	0.1025**	0.0562**
	(0.0118)	(0.0111)	(0.0307)	(0.0136)
Clothing	0.0777**	0.1487**	0.0698**	0.2167**
	(0.0135)	(0.0184)	(0.0177)	(0.0235)
Household	0.0549**	0.0629**	0.0784**	0.0275
	(0.0177)	(0.0156)	(0.0267)	(0.0194)
Durables	0.2908**	0.1794**	0.1922**	0.2772**
	(0.0505)	(0.0385)	(0.0546)	(0.0475)
Personal	0.0859	0.0794**	0.0797**	0.0572**
	(0.0585)	(0.0152)	(0.0198)	(0.0162)
Transport	0.1128**	0.0820**	0.0780**	0.0887**
	(0.0219)	(0.0131)	(0.0275)	(0.0330)
Recreation	0.1298**	0.0335	0.0879*	0.0568**
	(0.0257)	(0.0239)	(0.0365)	(0.0193)
Other	0.0441**	0.1439**	0.0962**	0.0967*
	(0.0118)	(0.0263)	(0.0206)	(0.0475)
m.p.c. = μ	0.7902**	0.6443**	0.5942**	0.5425**
	(0.0781)	(0.0658)	(0.0652)	(0.0638)

Standard errors are contained in parentheses beneath the corresponding marginal budget share.

† One asterisk indicates the estimate is significantly different from zero at a 5% level of significance; two asterisks indicate significance at the 1% level.