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Household Expenditure Patterns and Access to Consumer Goods in a Transitional Economy

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It is hypothesised that in a transitional economy increased degrees of consumer access to goods and services, directly influence the culturally determined component of a household's subsistence expenditure. The demonstration effect is thought to underpin this process. The hypothesis is empirically analysed through the study of the expenditure patterns of village craftworkers in Papua New Guinea. The hypothesis is statistically confirmed through the estimation of a modified extended linear expenditure system via limited dependent variable techniques. The principal impact of increasing accessibility falls mainly on the subsistence expenditures of locally grown and marketed traditional produce and a range of other miscellaneous expenditures. To upgrade the living standards of remote households, policies should be implemented which improve the accessibility to goods through road upgrading, better transport systems, .. etc.

I. Introduction

The transition from a relatively stagnant, traditional subsistence economy to one characterised by specialised production and cash based exchange is still far from complete throughout much of the third world. Export lead expansion in countries such as Papua New Guinea has often impacted inequitably and left substantial pockets of humanity with vastly different opportunities to engages in either cash production

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or the consumption of the goods and services that accompany the money economy. Even as we approach the twenty first century it is estimated that 60% of PNG's population remain partly or wholly engaged in non-monetised or subsistence production.

The pervasiveness of the imported technologies, capital and personnel that necessarily accompany export based initiatives, be they in primary production or manufacturing, seldom however leave even the remotest corners of a nation untouched. The expansion of road works and telecommunications networks so vital to the distribution and exchange mechanisms of the more specialised production modes, eventually expose traditional societies to imported consumer goods and services or to the domestic complements and substitutes that have been stimulated in the wake of this intrusion. As was first recognised by Hla Myint (1967) almost thirty years ago, imported consumer goods were not only a cheaper way of satisfying the existing wants to consumers, they also stimulated entirely new wants. In doing so they became a dynamic force facilitating the expansion of export production. The taste patterns and consumption behaviour of traditional village households were to be forever altered by the inexorable impact of the "demonstration effect" as the new incentive goods became more widely accessible throughout the countryside.

In Papua New Guinea, particularly prior to its independence in 1975, the spread of the cash economy was limited and the access of Papua New Guineans to an array of incentive consumer goods was far from even. The economy throughout most of the Highlands, the Western Districts and outer islands remained at the earliest stages of transition. Whilst the array of consumer goods available in Port Moresby and the larger regional centres was not dissimilar to that which might be found in a comparable Australian town, for a large proportion of the indigenous population, the consumer fruits of Western capitalist development were often contained within the four tin walls of one small village trade store. Access to a wider array of goods invariably involved a long walk and/or a truck ride on roads that often may have been impassable. Improved access depended as much on road upgrading and extension as on the continuing spread of the range of consumer goods and services. The "demonstration effect" on consumer behaviour in these transitional societies is thus potentially as uneven as the uneven access to the goods and services described above.

Along with the usual estimation of household expenditure functions this study seeks to determine the effect of the unequal accessibili-

ty to cash goods and services on the consumption behaviour of a sample of Papua New Guinean households. It will attempt to do so by modelling this variable in a way consistent with the developments that have occurred in consumer demand theory. In the next section, previous household consumption empirical studies and the underlying theoretical model employed to describe consumer behaviour is outlined. The data set used and the index of accessibility employed to measure the relative exposure of households to goods is described in Section III. Section IV outlines the empirical model and discusses the results obtained. We conclude in Sectin V.

II. Household Consumption Models and Transitional Economies

Household consumption is a substantial component of overall aggregate demand which, along with private investment, government economic activity and the external sector, determines national income levels and growth rates. It is thus perhaps surprising that there are relatively few studies of consumer behaviour which relate specifically to the developing economies and to issues which affect them. Little, in fact, appears to have been done to examine the impact of the differential exposure to (or, access to) the array of goods and services which symbolise the modern cash economy, especially in those societies where the transition from pure subsistence to cash is still far from complete.

Perhaps the most comprehensive account of consumer demand studies undertaken on data from countries at different levels of development is that which has been complied by Lluch, Powell and Williams (1977) (LPW hereafter), as a World Bank project. This particular work also briefly reviews earlier studies relating the structure of consumption to economic development, beginning with those of Clark (1940) and Kuznets (1962) and later by Chenery and Syrquin (1975). However, it is their use of the advancements in utility theory, of econometric developments in consumer demand modelling and in their use of more sophisticated estimation techniques that sets the work of LPW and the incorporated studies by Howe, Musgrove and Betancourt apart. Specifically, a basic model developed by Lluch (1973) and known subsequently as the extended linear expenditure system (ELES) underlines an empirical analysis aimed at revealing systematic tendencies in demand and savings behaviour.

Even though further developments in demand modelling have been made which primarily seek to make more flexible the estimating func-

tional form (e.g., the Almost Ideal Demand System (AIDS) and translog models, see Deaton (1986, pp. 1788-1790), the ELES has specific properties which make it particularly attractive to our study of expenditure patterns in a transitional economy.

First, for cross section data sets estimation is relatively straight forward as the system of demand equations can be equivalently estimated using single equation estimators (see LPW (1977, pp. 31-32)). Unlike other demand systems complex non-linear simultaneous equation estimators are not required. Second, the ELES does not require the explicit use of price information to estimate the standard demand system's attributes (i.e., price elasticities, expenditure elasticities, ... etc.) This is an attractive feature for studies of developing countries wehre such price data is not available. In this present study price data is unavailable. Thirdly, our results can be compared to other developing country studies which have also used the ELES methodology, LPW (1977). Fourthly, the ELES allow modellers to simply and explicitly estimate subsistence expenditures and this permits us to focus directly upon the effects which increased access to goods has on subsistence expenditures. Finally, the simple linear specification of the ELES allows us to employ limited dependent variable (LDV) (see Jarque (1987)) estimators which explicitly recognise that all commodity expenditures for a household must be non-negative and some expenditures may be zero. Standard least squares regression techniques produce biased and inconsistent parameter estimates when data sets contain such censored or truncated observations. Our data set contains many household commodity expenditures which are zero.[1]

Unlike earlier studies, all consumer demand decisions are modelled simultaneously in the ELES framework using a demand systems approach. Estimation is confined to broad commodity groups and the major explanatory variables are mostly limited to income and relative prices. Then, by imposing constraints (i.e., a priori restrictions) a very considerable amount of information can be generated. Other relevant explanatory variables (e.g., the size and composition of families, the age of the household head and the location and/or the socioeconomic class of the households) are, in most cases handled by subdividing the data prior to estimation. The model was applied (in LPW (1977)) to national accounts data for seventeen countries broadly spanning the development spectrum and household budgetary (cross sectional) data

[1] The estimation of simultaneous equations which explicitly recognise the limited dependent variable nature of expenditures and a priori restrictions is rather complex and often computationally not feasible, see Jarque (1987, p. 38).

from eight developing countries. The latter, particularly, permitted an examination of how demand parameters respond to changes in a number of socioeconomic and demographic variables and, as such, are of interest to the present study.

Lluch's ELES is a modification of the Linear Expenditure System (LES) first introduced into the literature by Klein and Ruben (1947) and brought into prominence in the mid-fifties by Richard Stone (1954) who applied the model to British expenditure data. The behaviour implicit in the LES was shown to be consistent with a utility function that became known as the Stone-Geary utility function. The extension to the LES made by Lluch was to endogenize total consumption expenditure by explicitly modelling the savings decision. In particular, the ELES can be derived (Lluch (1973)) from an intertemporal consumption optimisation program which explicitly recognises the time value of money. Equivalently, as illustrated by Howe (1975), incorporating savings directly into the utility function of an atemporal consumption optimisation program also produces the ELES specification. The mathematical form of the ELES for each household is:

$$(1) \qquad v_i = p_i\gamma_i + \beta_i^*(y - p'\gamma) \qquad i = 1,2,\ldots.n. \text{ (goods)}$$

where, v_i is the expenditure on commodity i;
p_i is the price for commodity i;
γ_i is the subsistence quantity for commodity i;
β_i^* is an estimable unknown parameter;
y is the household's disposable income;
$p = (p_1, p_2, \ldots p_n)'$ and $\gamma = (\gamma_1, \gamma_2, \ldots. \gamma_n)'$

The significance of the model for our present purposes is that the expenditure on a good is seen to consist of two parts. The consumer first allocates some minimum required or precommitted expenditure to each good ($p_i\gamma_i$), and provided that the cost of this expenditure is not greater than income, i.e. $(y - p'\gamma) > 0$, the amount so purchased is determined quite independently of income and relative prices. This purchase has become known as the "subsistence expenditure" and is generally assumed to be a fixed amount. Following the purchase of the subsistence bundle of goods, the consumer's residual (or, "supernumerary" income, viz. $(y - p'\gamma)$ is then assumed to be spent in fixed proportions (β_i^*), between the goods.

The concept that there is some minimum "subsistence" expenditure not directly dependent on the usual economic variables of relative prices and income is of interest on several counts. During the

1960s and 70s, a number of models appeared in the literature attempting to explain what at first appeared to have been rather perverse supply response and demand behaviour as traditional village societies were initially exposed to the cash economy. Of particular note are the early works of Wharton (1963), Mellor (1963), Nakajima (1969) and Fisk (1975). Each defines a minimum subsistence standard of consumption or income. However, there is no assumption or requirement in any study that this minimum subsistence level represents only some absolute minimum "physiologically determined" level of consumption necessary simply to survive. In each case, scope exists for the incorporation of an additional or "culturally determined" component which may well be at a level in excess of basic survival. What is regarded as a minimum subsistence standard of consumption by a household or consumer in one particularly society may differ quite substantially from that in another and this quantity may also change over time. Indeed, the empirical studies recorded in LPW emphasise that the parameters which estimate subsistence consumption make sense only in terms of being perceived minimum requirements (LPW (1977, p. 242)).

In addition to the normal economic variables, a number of other factors have been proposed as having an effect on demand and savings behaviour, viz. family size, location (urban/rural), socioeconomic class and the age of the household head. In the LPW studies, such factors have been examined in relation to cross-sectional data from Mexico, Chile, Yugoslavia and Korea as well as from the consumer budgets of city household in Columbia, Equador, Peru and Venezuela. The age of the household head, location and particularly, socioeconomic class appear to have been key determinants of the subsistence expenditure estimates. Also, Howe and Musgrove's (1977) study of the South American city households concluded that for many categories of expenditure the "subsistence levels seem to be determined by past consumption experience, income expectations, or some other largely psychological influence" (LPW (1977, p. 176)).

In the present study we propose that at the very early stages of the transition to cash production and consumption, as evidenced in pre-independent Papua New Guinea, subsistence expenditures are likely to be a large component of the total cash expenditures of village households. Furthermore, we hypothesise that the subsistence expenditure on most categories of cash consumption goods is a function of the household's relative accessibility to money consumer goods and services in general. In other words, one's contact with (and experience with) the cash economy as measured by the relative availability of an array of consumer incentive goods and services and the relative ease

with which these items can be accessed, is believed to affect consumer expenditure patterns in transitional economies. This is akin to the "culturally determined" component mentioned above. In addition, we propose that the "physiologically determined" component of subsistence demand is a function of household size.

By making the relative "accesibility" of consumer goods a function of subsistence expenditure we have a way of accounting for taste shifts (or taste differences among households). In terms of the usual indifference curve model of consumer demand, the origin represents the subsistence quantities consumed of each of the two goods represented on the axes. Improved access thus has the effect of moving the origin (and thus the taste function represented by the indifference curve set) upwards and outwards.

III. The Data and Index of Accessibility

Philp (1976) studied the labour supply response of 57 handloom wool weaves who worked on a piece rate basis producing woven floor rugs and other woven artefacts in weaving cells located within a number of villages in the Eastern Central Highlands of New Guinea and in suburbs and villages surrounding Port Moresby, Papua. Some of these villages and weaving cells were quite remote (i.e. Marawaka, Tarabo and and Yonki) and others were within walking distance or a short vehicle ride from regional market centres (i.e. Chimbu-Kundiawa, Makia-Goroka and Hohola-Port Moresby). For the majority of the weaver-households, the weaving activity and the income that it earned represented the first substantial and sustained contact with the cash economy. The sample certainly belongs to an earlier stage of the economic transition process than appears to be the case for those households studied and reported in LPW.

In this research (and later reported in Philp (1986)) a modified version of the LES was used to estimate the elasticity of work effort (or, the demand for "leisure") in respect to earning rates and other exogenous income. In the course of fieldwork associated with this research, data were collected on the non-weaving cash income earnings and on the expenditure behaviour of the households to which the weaver belonged. Formal consumer expenditure modelling, however, has not previously been applied to this data.

The expenditure patterns of these households were recorded for two periods each of two weeks during 1974. The recording periods in the Highlands were separated by an average of approximately three

months and larger expenditures (i.e. on durables, travel, etc.) made in the intervening period were recorded during the second session. All expenditures and cash income earnings were then averaged to a per week basis. Expenditure data related to the household (i.e. not on a per capita basis) and thus the final model has also to account for household size which has been measured in terms of "adult equivalent consumption units" (see Philp (1976, pp. 107-110)). Although some crude attempts were made to construct regional price indices, this was not very successful and like much of the cross sectional expenditure data used elsewhere, reliable price data were simply not available.

For the present study the collected expenditure data is aggregated into seven groups, i.e., marketed traditional produce (traditional and other locally grown produce, and Betel nut); subsistence substitutes (rice, flour products, tinned fish and meats); other foods (fresh and frozen meats and chicken, ice-cream, confectionery, sugar, dripping softdrink, ... etc.); stimulants (tobacco products and alcohol); personal expendables (clothing, suitcase, umbrellas, hair oil, soap, ... etc.); household expendables (tools, dishes, lamps, fuel, washing powders, ... etc.); and miscellaneous expenditures (fares, entertainment, gambling losses, ... etc.)

In his earlier study, Philp also attempted the construction of an "index of accessibility" in an attempt to capture the relative exposure of each of the weaver households to the consumer cash economy. Essentially, a list was compiled of the goods and services that each of the various weaver households had at one time or another purchased either from their local village trade stores or from larger European owned department stores during one or more of their visits to a larger regional centre. This total list of goods and services, all of which could be found at the largest regional centres, was given a value of 1.0. Note that no weighting has or could be given to imply the relative importance of each of these items. Then, the proportion of these goods and services that were available (a) in each household's local trade stores or market centres (a_L) and also in various intermediate centres (a_I), where this was relevant, were noted and recorded as a decimal. Finally, the time (t) it took to travel (often on foot), measured in hours, from the household dwelling to the nearest local market centre or trade store (t_L); from the local market centre to an intermediate centre (t_I); and from the local market centre to the nearest large regional centre where all goods were available ($t_{1.0}$), was recorded. For large distances between centres the approximate time taken to travel in a public motor vehicle (PMV) was used. Allowance, unfortunately, could not be made for time spent in waiting for transport services or for the (informally

imposed and extremely variable) costs associated with this form of travel. However, the essential notion that accessibility to the consumer cash economy depends not only on the availability of an array of incentive consumer goods but also on the ease or otherwise of accessing them, was able to be partly captured. The concept assumes that all households have access to all listed goods and services if they wish to seek them but differ substantially on the relative degree of this access. The extension of road networks and road upgrading thus enhances access.

The index of accessibility can be expressed as follows:

$$(2) \qquad A = 1/((t_{1.0} - t_I)(1 - a_I) + t_I(a_I - a_L) + t_L)$$

By taking the reciprocal, the higher values of the index represent a greater relative access to the listed consumer items. The values of the index in the household sample ranged from 0.12 for Marawakan households who had a fairly well stocked local trade store but faced an arduous 4-5 day walk to larger centres where all goods were available, to 3.85 for the Makia village weavers near Goroka and 5.00 for those living and working in the suburbs of Port Moresby.

IV. The Empirical Model and Estimation Results

In this section the extended linear expenditure system (ELES) is outlined and modified to permit subsistence quantities to depend upon the accessibility to commodities and the number of household consumption units. To a large extent we follow LPW (1977, ch. 2) and Jarque (1987), thus the detail is brief. Assume subsistence quantities to be a linear function of the accessibility index and household size:

$$(3) \qquad \gamma_{ih} = \tau_i + \lambda_i A_h + v_i U_h$$

$$\text{with } \tau = (\tau_1, \ldots \tau_n)' \quad \lambda = (\lambda_1, \ldots \lambda_n)' \quad v = (v_1, \ldots v_n)'$$

$$\gamma = \tau + \lambda A + vU$$

$$\text{and } i = 1, \ldots n \text{ (goods)} \quad h = 1, \ldots H \text{ (households)}$$

where, γ_{ih} is the subsistence quantity of commodity i for household h;
A_h is the accessibility index for household h;
U_h is the number of household consumption units for household h;
τ_i, λ_i and v_i are estimable parameters.

Incorporating this modification changes the ELES to:

$$(4) \qquad v_{ih} = \alpha_i + \beta_i^* y_h + \pi_{1i} A_h + \pi_{2i} U_h + e_{ih}$$

$$(5) \qquad s_h = \zeta + \delta y_h + \theta_1 A_h + \theta_2 U_h + u_h$$

where, v_{ih} is expenditure on good i by household h;
y_h is income for household h;
s_h is savings by household h;
e_{ih} and u_h are stochastic error terms;
α_i, β_i^*, π_{1i}, π_{2i}, ζ, δ, θ_1 and θ_2 are estimable parameters.

The parameters in this system have specific economic meaning defined by:

$$(6) \qquad \begin{aligned} \alpha_i &= p_i\tau_i - \beta_i\mu p'\tau \\ \beta_i^* &= \beta_i\mu \\ \pi_{1i} &= p_i\lambda_i - \beta_i\mu p'\lambda \\ \pi_{2i} &= p_i v_i - \beta_i\mu p' v \\ \zeta &= -(1-\mu)p'\tau \\ \delta &= 1 - \mu \\ \theta_1 &= -(1-\mu)p'\lambda \\ \theta_2 &= -(1-\mu)p' v \end{aligned}$$

where, p_i is the price of commodity i and $p = (p_1, \ldots\ldots p_n)'$;
β_i is the marginal budget share of commodity i;
μ is the marginal propensity to consume;

The system is perfectly identified and thus given estimates for α_i, β_i^*, π_{1i}, π_{2i}, ζ, δ, θ_1 and θ_2 unique estimates for μ, β_i, $p_i\tau_i$, $p_i\lambda_i$ and $p_i v_i$ exist:

$$(7) \qquad \begin{aligned} \mu &= 1 - \delta \\ \beta_i &= \beta_i^*/(1-\delta) \\ p_i\tau_i &= \alpha_i - \beta_i^*\zeta/\delta \\ p_i\lambda_i &= \pi_{1i} - \beta_i^*\theta_1/\delta \\ p_i v_i &= \pi_{2i} - \beta_i^*\theta_2/\delta \\ \text{and } p_i\gamma_{ih} &= p_i\tau_i + p_i\lambda_i A_h + p_i v_i U_h \end{aligned}$$

Finally, adding up restrictions must be placed on the estimable parameters to ensure internal consistency:

$$(8) \qquad \zeta = -\sum_{i=1}^{n} \alpha_i$$

$$\delta = 1 - \sum_{i=1}^{n} \beta_i^*$$

$$\theta_1 = - \sum_{i=1}^{n} \pi_{1i}$$

$$\theta_2 = - \sum_{i=1}^{n} \pi_{2i}$$

The ELES is typically estimated by ordinary least squares (OLS) regression techniques. OLS is applied to equations (4) while the adding up conditions in equations (8) derive the estimates in equation (5). These estimates from equations (4) and (5) (and hence (6)) uniquely determine the economic parameters of interest in equations (7). In contrast to OLS, Jarque (1987) and others have argued that given the strict non-negative nature of actual expenditures then alternative limited dependent variable (LDV) estimation methods should be employed.[2]

Effectively, LDV techniques explicitly modify estimation techniques to recognise the fact that actual expenditures must be either positive or zero. Jarque (1987) proposes two specific techniques: i) if all expenditures are positive then employ the truncated normal model, ii) if some expenditures are also zero then employ the tobit model. For each of our commodity classifications some sampled expenditures are zero, thus below we employ the tobit model. The tobit model explicitly allows for a non-zero probability for zero expenditures and is estimated via maximum likelihood techniques. Once tobit estimates are gained, estimates must be adjusted to account for the realisation that given non-negative expenditures the expected value of the error term is no longer zero, Jarque (1987, p. 37) provides formulae for the associated adjustments to the intercept and slope coefficients. These adjusted estimates are used for determining the economic parameters of interest in equations (7). Apart from the use of tobit estimates and adjusted coefficients, the identification of parameters,... etc., is identical to that described above for the standard OLS case.

Parameter estimates are presented in Table 1. Results are reasonably pleasing. The income variable generally produces the most explanatory power. It is significant (at a 5% level) for traditional produce, susbistence substitutes and stimulants. The income variable always has a t-ratio greater than unity. The accessibility index is

2 OLS assumes that the error term can always range from $-\infty$ to $+\infty$, this is not possible given a strictly non-negative dependent variable. For a general discussion of LDV methods, see Maddala (1983, ch. 6).

Table 1

EXTENDED LINEAR EXPENDITURE SYSTEM TOBIT ESTIMATES

Commodity Group	α_i Intercept	β_i' Income	π_{1i} Access	π_{2i} Con. Units	R^2	Total Expenditure Elasticity
Traditional Produce	−1.3205*	0.0683*	0.2341*	0.1901*	0.3487	1.509
	(−2.74)	(3.31)	(2.78)	(2.07)		
	[0.0174]	[0.0479]	[0.1641]	[0.1332]		
Subsistence Substitutes	0.2091	0.0851*	−0.0192	0.1016	0.2722	1.190
	(0.55)	(4.09)	(−0.24)	(1.20)		
	[0.4545]	[0.0798]	[−0.0180]	[0.0953]		
Other Foods	0.1825	0.0145	0.1028*	0.0016	0.2082	0.486
	(0.75)	(1.16)	(2.07)	(0.03)		
	[0.2964]	[0.0126]	[0.0895]	[0.0014]		
Stimulants	0.4122	0.0687*	−0.0951*	−0.0881	0.4206	2.198
	(1.90)	(6.04)	(−2.16)	(−1.91)		
	[0.4581]	[0.0622]	[−0.0861]	[−0.0797]		
Personal Expendables	0.6734	0.0283	−0.0067	−0.0244	0.0350	0.546
	(1.84)	(1.42)	(−0.09)	(−0.30)		
	[0.7663]	[0.0241]	[−0.0058]	[−0.0209]		
Household Expendables	−0.2456	0.0215	0.1018	0.1432	0.1453	0.569
	(−0.77)	(1.24)	(1.60)	(1.91)		
	[0.1604]	[0.0178]	[0.0842]	[0.1184]		
Miscellaneous	0.3849	0.0268	0.1542*	−0.0657	0.3352	0.595
	(1.14)	(1.68)	(2.45)	(−0.97)		
	[0.4952]	[0.0235]	[0.1357]	[−0.0578]		

* Denotes significance at a 5% level of significance.
Figures in ( ) represent t-ratios of estimates.
Figures in [ ] represent corrected parameter estimates which recognise that the expected value of the error term is no longer zero, see Jarque (1987, p. 37).

significant for four of the commodity groups. It is positive and significant for traditional produce, other foods and miscellaneous goods. It is negative and significant for stimulants, a result which most likely stems from the strong preference driven desire for bush tobacco by remote households whose general access to goods is poor. The consumption units variable generally has the weakest degree of explanatory power. It is positive and significant for traditional produce only, however significance is nearly attained for household expendables (positive) and stimulants (negative). The negative influence of stimulants primarily stems from the high alcohol preference of young small households. The measure of goodness of fit for the tobit model (R^2 which is the squared correlation between observed and predicted (Maddala (1983, p. 159) observations) is greater than 0.3 for traditional produce, stimulants and miscellaneous goods. The only commodity group for which explanatory power is very poor is personal expendables.

To check the validity of the estimated equations, conditional moment restriction tests for the tobit model were performed, see Pagan and Vella (1989) and Greene (1993, pp. 701-706). These tests directly check whether the moment restrictions assumed by the posited model are valid.[3] Results are presented in Table 2. The results appear satisfactory and are generally much better than those obtained by Jarque (1987, pp. 45-46) for Mexico and the standard ELES. The only inadequacies identified are for the miscellaneous goods grouping and specification error and normality. The wide variability in the types of goods purchased in the miscellaneous grouping may have lead to these significant findings. In general, these results provide overall support for the specification and approach of the modified extended linear expenditure system.

The economic parameters of interest based upon the corrected tobit parameter estimates (listed in ( ) brackets in Table 1) are presented in the last column of Table 1 and Table 3. These economic parameters are determined using equations (7) and (8) and employing constructed formulae found in LPW (1977, pp. 18-19). We focus our attention upon total expenditure elasticities and subsistence expenditure.[4]

[3] Specification error RESET type tests (PRED2 and PRED3) were employed for testing the zero mean error assumption. Heteroscedasticity tests relating the nature of the non-constant error variance to each of the three independent variables (HET (Income), HET (Access) and HET (Con. Units)) were performed. Tests for error normality were also performed by checking whether the 3rd (NORM (3rd)) and 4th moments (NORM (4th)) satisfy the assumptions of the normal distribution.

[4] Note, sufficient information is provided in Tables 1 and 3 to enable readers to evaluate all the standard ELES elasticities.

Table 2

CONDITIONAL MOMENT RESTRICTION DIAGNOSTIC TESTS

Commodity Group	PRED2 PRED3	HET (Income) HET (Access) HET (Con. Units)	NORM (3rd) NORM (4th)
Traditional	-0.760	-1.021	-1.037
Produce	-0.619	-1.424	-0.928
		-1.691	
Subsistence	-0.421	-1.239	-1.144
Substitutes	0.140	-1.007	-1.673
		-1.216	
Other Foods	-1.840	0.548	-0.559
	-1.681	0.598	0.232
		0.377	
Stimulants	1.645	0.198	1.198
	1.586	-0.425	0.073
		0.097	
Personal	-0.359	-1.656	-0.681
Expendables	-0.299	-0.259	-0.939
		-1.443	
Household	-0.123	-1.018	0.041
Expendables	0.009	-0.679	-0.246
		-1.101	
Miscellaneous	2.606*	1.914	2.173*
	2.695*	1.870	1.388
		0.609	

See footnote 3 for a description of the tests employed.
* Denotes significance at a 5% level of significance.
All test statistics represent t-ratios and hence are distributed as N(0,1).

The total expenditure elasticities (last column of Table 1) appear to fall into three groups: high, being greater than 1.5 (stimulants and traditional produce); medium, being approximately unity (subsistence substitutes); and low, being approximately 0.5 (other foods, personal expendables, household expendables and miscellaneous expenditures). As a means of comparison, note that the principal findings of LPW (1977, pp. 53-54) for 17 countries is that elasticities for food are always

less than unity, clothing and housing fall either side of unity while the remaining commodity groups tend to be greater than unity. All our results are consistent with these findings but for the low elasticity for miscellaneous expenditures and the greater than unity value the foods listed as subsistence substitutes. That is, other foods have an elasticity less than unity, personal expendables (clothing) and household expendables (housing) fall below unity and the other elasticities (traditional produce and stimulants) exceed unity.

The principal findings of the study are presented in Table 3. In the second column the parameters associated with the modified subsistence expenditure equation (7) are presented. As expected the constant term or base subsistence expenditure ($p_i\tau_i$) is always positive. The parameter associated with the accessibility index ($p_i\lambda_i$) is always positive but for stimulants where as previously suggested this commodity group appears to be strongly preference driven with the degree of accessibility playing little role. The greatest marginal impact of the accessibility index occurs with traditional marketed produce and miscellaneous expenditures. These results confirm our main hypothesis that increased accessibility to goods increase a household's subsistence expenditure. The parameter associated with consumption units (p_iv_i) is always positive except for stimulants, personal expendables and miscellaneous expenditures; even so, the magnitudes for these parameters are approximately zero. Relatively large marginal impacts for consumption units are found for traditional produce, subsistence substitutes and household expendables.

In the last four columns of Table 3 the subsistence expenditures ($p_i\gamma_i$) evaluated for different household groups are presented, the figures in parentheses represent average actual expenditures. Based on average values for all households and for the three disaggregated regional centres, the largest subsistence expenditures are generally associated with traditional produce and subsistence substitutes while the lowest values are estimated for other foods and stimulants. These results are generally consistent with the finding of LPW (1977, pp. 242-243) that subsistence expenditures are generally high for necessities and low for non-necessities.

The estimated subsistence expenditures were often found to be greater than average actual expenditures. This occurred most often (5 out of 7 groups) for the lowest income area of Marawaka, and occurred least for the highest income area of Goroka. This finding that some subsistence expenditures are greater than average actual expenditures contravenes the meaningful properties of the Stone-Geary utili-

Table 3

SUBSISTENCE EXPENDITURES

Commodity Group	$p_i\tau_i$ $p_i\lambda_i$ p_iv_i	All House-holds	Marawaka	Chimbu	Goroka
Traditional Produce	0.191 0.188 0.146	1.040 (0.626)	0.790 (0.133)	1.064 (0.553)	1.286 (1.434)
Subsistence Substitutes	0.743 0.022 0.116	1.153 (1.322)	1.205 (0.977)	1.344 (1.436)	1.155 (1.817)
Other Foods	0.342 0.095 0.005	0.555 (0.511)	0.372 (0.163)	0.436 (0.454)	0.697 (0.629)
Stimulants	0.683 -0.055 -0.064	0.368 (0.558)	0.425 (0.224)	0.322 (0.318)	0.301 (0.884)
Personal Expendables	0.854 0.006 -0.015	0.821 (0.871)	0.796 (0.952)	0.784 (0.906)	0.834 (0.862)
Household Expendables	0.225 0.093 0.123	0.805 (0.616)	0.723 (0.668)	0.914 (0.066)	0.914 (1.218)
Miscellaneous	0.580 0.147 -0.052	0.725 (0.778)	0.393 (0.393)	0.429 (0.476)	0.962 (1.187)
Average Accessibility	—	2.087	0.117	0.740	3.599
Average Con. Units	—	3.142	3.962	5.041	2.881
Average Income	—	9.68	5.14	7.33	16.32

Figures in parentheses represent average actual expenditures.

ty function which underlies the ELES. Even so this finding is typical of many other ELES studies, for example, Howe and Musgrove (1977, pp. 167-176) find this contradiction for 41 out of 140 household groups for South America. Also consistent with our results is the LPW (1977) finding that the contradiction occurs more often for low socio-economic groups such as our group of weavers and in particular for groups with the lowest income.

Increasing subsistence expenditures were often identified as we moved to regions with greater accessibility to goods (i.e., Marawaka $A=0.117$, Chimbu $A=0.740$ and Goroka $A=3.599$). That is, for traditional produce, other foods, household expendables and miscellaneous goods, expenditures increase with access across these regions. The contrary finding for the other commodity groups occurs because consumption units do not correspondingly increase across the three regions (i.e., Marawaka $U=3.962$, Chimbu $U=5.041$ and Goroka $U=2.881$) and accessibility has a negative marginal impact on stimulants.

V. Conclusion

This study has supported empirically the hypothesis that in a transitional economy the subsistence expenditures of households are directly influenced by their relative accessibility to goods and services. The reservations impacting upon the validity of this claim, relate to the underlying methodology of the extended linear expenditure system.

Even though Deaton (1986, pp. 1787-1788) and others are critical of the simplistic restrictive assumptions underlying the ELES and Jarque (1987) finds less than solid support for the ELES through the use of LDV methods for Mexico, some of our results are more encouraging. First, the modification of the ELES to account for accessibility appears to be important and rather neglected by previous studies. Second, unlike Jarque (1987), our diagnostic test statistics for the LDV estimates point to only a few minor inadequacies in the estimated equations. Third, our study benefits significantly from the strong homogeneity of studying a single specific occupation group.

On the other hand, some results are less than encouraging. First, quite a number of the parameters in the estimated equations were statistically insignificant at conventional levels of significance. Second, the overall levels of goodness of fit (R^2) were not as strong as we would have liked. Thirdly, the frequent finding of estimated subsistence ex-

penditures exceeding average actual expenditures violates the theoretical underpinning's of the ELES.

Improvements in results can only be obtained through the use of more flexible functional forms for demand equations and the explicit use of price information. As indicated at various stages in this paper, however, the absence of appropriate data sets and of computationally feasible econometric techniques severely limits the possibility of gaining greater insights into cash expenditure behaviour within transitional economies of the type evident in Papua New Guinea.

The policy implications stemming from our empirical findings are important. Throughout the third world many remote households do have limited access to marketed goods and services and this severely affects living standards through expectations for smaller subsistence bundles. We have shown empirically, that subsistence expenditures (and consequently living standards) will rise given greater accessibility to marketed goods. Increased access can be achieved through efforts such as: road upgrading, improved transport vehicles, and the establishment of better equipped and serviced local stores. Government polices (and foreign aid allocations) which clearly direct resources to address these inadequacies can only serve to improve the living standards of remote households.

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