ESTIMATION OF THE FOOD DEMAND IN PAKISTAN: WORKING-LESSER APPROACH

Kauser Naheed & Ijaz Hussain
Department of Economics, Gomal University, Dera Ismail Khan

ABSTRACT
In the estimation of parametric Model , the most important issue preferred by the researchers, is regression for a single equation In most of the studies in Pakistan , different models like almost ideal demand system (AIDS), and its linear approximate version (LA/ AIDS) and the linear expenditure system (LES) have been estimated in order to predict food demand in future In these studies the factors which have enormous effects are traditional economic variables can lead to biased estimates of income effects and resultantly biased projections of food demand However to overcome this problem Working's model measures several socioeconomic variables., the age of household head, Adult equivalent Age, years of schooling of household head ,simultaneously, the employment and industrial status have been measured Working's model, more mathematical and flexible in nature, that generates demand equations by defining the total differential equation for each food product. The results indicate that all factors have a significant impact on all food items, but not in same manner Like Adult-equivalent and log of Monthly Food expenditure, are significant for all food items. However, Milk, Sugar and Vegetables are the food items which are not affected by the majority of these socio economic factors

INTRODUCTION
The econometric specification of Food demand systems has been a topic of great interest by the researchers measuring the effects of variables other than the traditional, are called socio economic factors In a number of studies, the consumer choice is deal in a static framework. Ignoring important issues such as for, the effects of demographic or other variables that affect demand, welfare comparisons across households (equivalence scales), and the many issues concerning aggregation across consumers. (William A. and Apostolos 2008)

This study is motivated by the earlier studies estimating food demand in Pakistan. Barki (1997) analyzed the existence and the nature of structural change is tested by using both the generalized axiom of revealed preference (GARP) and the first difference LA/AIDS model. The data set satisfies symmetry and homogeneity. The estimates of price and income elasticity are also consistent with economic theory.

Burney and Khan (1992) examined the household consumption patterns in Pakistan by estimating three different functional forms of the Engel curve namely linear, double logarithmic and Working Leser for six different income groups. Engel and Granger (1987) showed the connection between error correction models and cointegratin, and they proposed ways to test for long run relationship. Since then, their methods have been used to estimate single-equation models in many areas.

Forecasts of the demand for disaggregate food products are of interest for agricultural producers, the food processing industry, and policy makers. Forecasts made by models not formally derived from economic theory, may be good for pure forecasting purpose; however they are not very useful for forecasting the effects of price or income changes. Forecasting models derived directly from economic theory are more useful for policy purposes.Kastens and Brester (1996) used out -of- sample forecasts to select among demand systems

for food products.Using the Root Mean Square Error (RMSE) criterion, they found that forecasts derived from elasticity were superior to direct statistical forecasts (Gustavsen and Rickertsen 2003)

Although economic theory is generally silent regarding the functional form of econometric model, applied demand analysis provides two utility based approaches for generating demand systems (Theil &Clements,1987) One classical approach include, linear expenditure system and Almost Ideal Demand System (AIDS).A second approach that is more flexible, include the Rotterdam model and Working model.

Several empirical studies have been conducted in Pakistan on food consumption pattern using demand systems, include Malik and Babar (2005-2006), Ahmad (2004),Malik and Siddique (2002).In old centuries, the studies have been conducted by Rehman(1963),Ali (1981) Bussink(1970)

DATA SOURCES AND MODEL ESTIMATION

The database is taken from Federal Bureau of statistics, Pakistan. This is a nation-wide conducted survey in every province in Pakistan during the period (2004-2005) specifically called Pakistan Social and Living Standard Measurement Survey (PSLM). This report summaries the National/Provincial findings of the first round of the Pakistan Social and Living Standards Measurement (PSLM) Survey. During this round, 76520 households were covered across urban and rural communities. Information was collected from households on a range of social sector issues. These are primarily focussed on the sectors covered under Poverty Reduction Strategy Paper (PRSP) i.e. Education, Health,Household Assets/ Amenities, Immunisation, Pre/Post Natal care of females and Household satisfaction by facilities and services.The main content of the survey includes detailed demographic information, quantities and expenditure of major commodities purchased in the market, the employment statues of each household member, year and housing condition and ownership of durable goods as well as food items consumed by household through the country. With the use of household micro data for detailed commodities; however, we encounter an econometric problem with some households having zero consumption, as stated before. This problem stems from the fact that some households do not consume some of the items considered. This zero consumption problem is particularly severeIt is known that using only observed positive purchase data to estimate consumption behavior by OLS regression produces inconsistent estimates of coefficients. The dependent variables, which are the budget shares for the food items specified, are zero if a household does not purchase the food item and positive if one does. In this study, we apply Heckman's two-step model to correct zero consumption problem.

Model

Since the functional form specification is a dominant aspect in the empirical estimation of demand. There is no single "one-size-fits all" functional form that is ideal for all applications (Pollak and walles 1992).The estimation of functional form will help to analyze the specific data and then forecasting the policy recommendations in future. For example if the income elasticity of Grain demand from two models were different the implications of income effects for future grain demand would be quiet different (Kang E.Liu and Wen S Chern 2001)

We have selected nine food items namely tea, sugar, pulses, milk, meat, ghee, vegetables, cereals and fruits.

As the data are cross sectional, which has usually the given price in one point in time; hence Working model is applied as it does not involve prices over time. Therefore we have selected a model that can satisfy our assumption Fortunately, Working-leser model satisfies this assumption. Working's model (1943) is one of the examples of demand system expressing the budget share of good i as a linear function of log of the prices and of the total expenditure on food items in question. A linear regression model defines the conditional mean of the dependent variable ,y.as a Linear function of the explanatory variables, x, (Gustavsen and Rickertsen 2003)

Working leser model is single equation model which deals with estimation of single equation at a time. More specifically, the following working-leser model will be used in the study

:

$$w_i = \alpha_0 + \alpha_i log x + \sum_j \beta_{ij} log P_j + \sum_k \gamma_{ij} H_k + \varepsilon_i$$

4.1

Where subscripts (i, j) are nine food items, as explained above

w_i=Expenditure share of food of ith item among the nine food items

P_j=price of jth food item

x=total food expenditure of all items in the model

H_K includes the following demographic and economic variables:

EARN = no of earners

AGE-1PER = no of family members having the age group up to 5 years.

AGE-2PER = no of family members having the age group of 6 to 12years

AGE-3PER = no of family members having the age group of 13 to 18 years

AGE-4PER = no of family members having the age group of above 18 years

AGE = age of the household head

EDU= years of schooling of the head,

Ln (Exp) = log of the monthly food expenditure,

AGRI= 1, if industry of the head is agriculture, = 0 otherwise

MANUFAC =1, if industry of the head is manufacturing, = 0 otherwise

CONST=1, if industry of the head is construction, = 0 otherwise

W_SALE= 1, if industry of the head is wholesales, = 0 otherwise,

TRANS= 1, if industry of the head is transport, = 0 otherwise

S_P_SERV=1, if industry of the head is social and personal services, = 0, otherwise

OTHER= 1, if industry of the Head is other ,= 0 otherwise

PE= 1, if employment status of the head is paid employee, = 0 otherwise

SE= 1, if employment status of the head is self-employed, = 0 otherwise

EMPLOYER=1, if employment status of the head is employer, = 0 otherwise

In the above model, the employment status and industrial classification of the household head are dummy variables; having unemployed as a base category.

Income Elasticity in Working-Leser Model

Since the Working-Leser model uses total expenditures for the group of food items includedin the model, it does not provide a direct estimate of income elasticity so Engle function will be estimated, in order to estimate income elasticity.

RESULTS AND DISCUSSIONS

We have used ordinary least squares (OLS) techniques on Working-Lesser model of 9 food items. In overall Pakistan, majority of variables has significant effect on Meat, Cereals and Ghee that means if there is a change in the variables mentioned,the quantity of Meat, Cereals and Ghee significantly change and if we measure the

change in quantity of food items by numberinng ,the items Pulse and Fruit being affected by the variables secondly. Similarly the Vegetables and Sugar are items on third number. However Age of Household head has no effect on any of 9 food items considered. The OLS (Working-Lesser) results have been depicted in the tables in Appendix A.In table 1, three items have given. A detailed result by applying OLS technique indicates that **Tea,** the first commodity in sequence is affected by the variables is no of earners, Adult equivalent, Monthly food expenditure. However if role of employment status and industrial status is concerned, the role of transport industry is significant at 5%.Next item **sugar** also affected by years of schooling of household head, Adult equivalent and monthly food expenditure. **Pulse** is third item mentioned in the table:1 :is being affected through the variables are years of schooling of household head, Adult equivalent, monthly food expenditure along with industrial status significant at 1% in over all Pakistan.
In table 2 another three food item are considerd.**Milk** is the first food item in this table ,on which the variables are going to affect positively include Age-1per household, Adult equivalent and monthly food expenditure. Next item is given in the said table, is **Meat** on which the role of said variables is significant for almost all items. Here Meat is the second food item among major food items. Fruit in the said table is being affect by the variables are age 2 and age 3,years of schooling, Adult-equivalent, Monthly food expenditure etc. n the table ;3,Cereals is included like earlier in the major food items because it is affected by the majority of variables. Last one item is the vegetables. With the help of the information given in these tables we can summarize that Ghee is not only included in major food items but it is on the first one number in the sequence of food items in this study. However Meat is as usual on second number and Cereals is the third food item affected by the majority of variables. Other food items Pulse, Fruit, Tea, Sugar and vegetables, Milk are on 4,5,6,7 and 8 number in ranking.

POLICY IMPLICATIONS.

1. To overcome the foreign exchange gap, due to increased cost of food imports, hence to explore major food items through Average relative share and Audult equivalent approaches have been used, in over all Pakistan
2. To forecast quantities consumed and budget share by estimated price and expenditure elasticities usiung Working Lesser Model, for aggregate food demand prediction in future, in both urban-rural regions.
3. To explore Pakistani consumer's reaction to change in prices of food product, resultent from the implimentation of texes policies in all regions of Pakistan.
4. To test the stability in consumer behaviour over time.
5. To aim at the most efficient long term policies to rise the incomes of the poors, may occur by examining food consumpton pattern.
6. To augment domestic production and supply of essential food items in order to meet expected demand in future, is being focused in said study, very useful for policy makers in Pakistan.

REFERENCES

Ahmad, N. (2004) Household behavior in Pakistan, Evaluation of Rural-Urban consumption pattern in Pakistan

Ali, M. S. (1981) Rural-urban consumption

patterns in Pakistan Pakistan Economic and Social Review, Vol.20 (2), pp 85-94

Bussink,W. C. F (1970) A complete set of consumption coefficients for West Pakistan.The Pakistan Development Review, Vole, 10(2) pp 193-231

Burki Abid A (1997) Estimating Consumer Preferences for Food, Using Time Series Data of Pakistan. The Pakistan Development Review 36:2 PP 131-153.

Burney Nadeem a (1992) House Hold Size, Its Composition and Consumption Patterns in Pakistan; an Empirical Analysis Using Micro Data. India Economic Review Vole; 27 PP 57-72

Burney N a and Ashfaq, H.K (1991) Household Consumption Patterns in Pakistan; An urban-rural comparison Using Micro Data. The Pakistan Development Review Vole; 30 PP145-171

Engle, R F and Granger, C.W.J. "Cointegratin and error correction: represention, estimation and testing" Econometrical 55 (1987): 251-276.

Gustavsen Geir Waehler and Rickertsen Kyrre (2003) Forecasting Ability of Theory Constrained Two Stage Demand System Published in European Review of Agricultural Economics30(4) 539-558..

Kastens, T. L, and Brester, G W.Model selection and forecasting ability of theory –constrained food demand systems "American Journal of Agricultural economics 78 (1996): 301-313.

Malik, S. & **Babar A (2005)** "Demand for Meat, reparability and structural changes (a nonparametric analysis) Journal of Research (Humanities) Vol.25, pp 111-125

Malik,S.& **Babar A (2006) "** Surmising consume demand system and structural changes using time series data for Pakistan."Pakistan and social Review, Vol 44(1), pp.117-136

Malik, S. & Siddique, S.A (2002).Expenditure elasticity for various household items by income stratum for Pakistan: 1990 -91 to1996-97, Journal of Business management, Vol, 1. pp1-23.

Pollak, R.A. and T.J Wales "Estimation of complete demand systems from household budget data: The linear and Quadratic Expenditure systems" American Economic review.vol 68, 1978, 348-359.

Rehman, A. (1963) Expenditure elasticity in Rural West Pakistan. The Pakistan Development Review, Vol. 3(2), pp.232-249.

Theil, H, and Clements, W.K. (1987) Applied demand analysis results from system wide approaches. Cambridge, M A Ballinger,

William A, and Serlets Apostolos (2008) The Differential Approach to demand analysis and the Rotterdam Model http:// mpra ub.uni-muenchen.de/12319/MPRA

Appendix a Tables of Empirical Estimations

Table: 1 (OLS) Working-Lesser Model Results of tea, sugar and pulse

	Coefficient	p-value		Coefficient	p-value		Coefficient	p-value	
	TEA			SUGAR			PULSE		
(Constant)	0.058	0.000	*	0.107	0.000	*	0.026	0.000	*
No. of earners	-0.002	0.000	*	-0.002	0.000	*	0.000	0.006	*
age1_per	-0.001	0.602		0.003	0.298		0.000	0.849	
age2_per	-0.001	0.678		0.002	0.511		-0.002	0.001	*
age3_per	-0.001	0.699		-0.001	0.792		-0.001	0.118	
Years of schooling HEAD	0.000	0.252		-0.001	0.000	*	0.000	0.000	*
Adult equivalence	0.001	0.000	*	0.001	0.000	*	0.000	0.000	*
LN_monthly Food expenditure	-0.002	0.005	*	-0.013	0.000	*	-0.010	0.000	*
Agri	0.005	0.068		0.001	0.686		0.003	0.001	*
Manufac	-0.004	0.165		-0.007	0.058		0.000	0.957	
const	0.001	0.699		0.001	0.745		0.002	0.003	*
w_sale	0.003	0.215		-0.005	0.229		0.000	0.672	
transp	0.007	0.016	**	-0.003	0.443		0.001	0.322	
s_p_serv	0.001	0.675		-0.002	0.591		0.001	0.205	
others	0.006	0.025	**	0.001	0.710		0.002	0.028	**
Pe	0.002	0.485		0.003	0.374		-0.001	0.381	
Se	-0.004	0.167		0.001	0.800		-0.001	0.198	
Employr	-0.003	0.445		-0.006	0.350		-0.002	0.120	
Other	0.000	0.941		-0.005	0.181		-0.001	0.121	
Age	0.000	0.795		0.000	0.845		0.000	0.020	

Source: Authors own calculations

Table: 2 (OLS) Working-Lesser Model Results of milk, meat and fruit

	Coefficient	p-value		Coefficient	p-value		Coefficient	p-value	
	MILK			MEAT			FRUIT		
(Constant)	0.236	0.000	*	0.140	0.000	*	0.038	0.000	*
No. of earners	0.002	0.087		-0.002	0.013	**	0.000	0.498	
age1_per	0.020	0.010	*	-0.029	0.000	*	0.001	0.368	
age2_per	-0.006	0.424		-0.024	0.000	*	0.005	0.001	*
age3_per	0.002	0.684		-0.027	0.000	*	0.009	0.000	*
Yearsschooli_HEA	0.000	0.283		0.001	0.000	*	0.000	0.000	*
Adult equivalenc	-0.009	0.000	*	-0.003	0.000	*	-0.001	0.000	*
LN_monthly Food ependitur	0.062	0.000	*	0.008	0.000	*	-0.006	0.000	*
Agri	0.013	0.129		0.005	0.308		-0.004	0.019	**
Manufac	0.011	0.229		0.010	0.091		-0.001	0.545	
Const	-0.004	0.682		0.009	0.094		-0.002	0.222	
w_sale	-0.003	0.757		0.018	0.001	*	-0.002	0.280	
Transp	-0.002	0.867		0.015	0.009	*	-0.003	0.115	
s_p_serv	0.006	0.503		0.009	0.092		-0.002	0.205	
Others	-0.012	0.196		0.016	0.005	*	-0.001	0.453	
Pe	-0.003	0.696		-0.011	0.043	**	0.001	0.782	
Se	0.005	0.548		-0.013	0.015	**	0.002	0.343	
Employr	-0.022	0.119		-0.006	0.455		0.009	0.003	*
Other	-0.004	0.640		-0.011	0.045	**	-0.002	0.391	
Age	0.000	0.240		0.000	0.742		0.000	0.137	

Source Authors own calculations

TABLE 3 (OLS) Working-Lesser Model Results of cereals, ghee and vegetables

	CEREALS			GHEE			VEGETABLES		
(Constant)	0.229	0.000	*	0.178	0.000	*	0.045	0.000	*
No. of earners	-0.001	0.124		0.001	0.018	**	0.000	0.408	
age1_per	-0.016	0.009	*	0.004	0.279		0.000	0.792	
age2_per	-0.019	0.003	*	0.012	0.005	*	-0.001	0.256	
age3_per	-0.050	0.000	*	0.001	0.867		0.000	0.802	
Years of schooling_HEA	-0.004	0.000	*	0.000	0.583		0.000	0.000	*
Adult equivalence	0.009	0.000	*	0.004	0.000	*	0.001	0.000	*
LN_monthly Food expend	-0.042	0.000	*	-0.042	0.000	*	-0.016	0.000	*
Agri	-0.006	0.379		-0.020	0.000	*	0.001	0.400	
Manufac	-0.022	0.004	*	-0.010	0.037	**	-0.002	0.187	
Const	0.002	0.749		-0.017	0.001	*	0.000	0.951	
w_sale	-0.017	0.023	**	-0.014	0.004	*	-0.002	0.138	
Transp	-0.011	0.138		-0.010	0.056		-0.002	0.083	
s_p_serv	-0.012	0.101		-0.011	0.015	**	-0.001	0.565	
Others	-0.011	0.154		-0.016	0.001	*	-0.001	0.637	
Pe	0.017	0.019	**	0.010	0.027	**	0.001	0.262	
Se	0.011	0.128		0.011	0.022	**	0.002	0.181	
Employer	-0.001	0.911		0.020	0.009	*	-0.001	0.809	
Age	0.000	0.046		0.000	0.363		0.000	0.004	

Source Authors own c