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An Application of the Linear Expenditure Systems (LES) to the Pattern of Consumer Behavior in Jordan during the Period 1990-2018 (Static and Dynamic Estimates)

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Abstract: The main aims of the current study are to apply linear expenditure system (LES) to Jordanian household expenditure midst the period 1990-2018, and to formulate a dynamic demand system which applies to Jordanian household expenditure.

The estimated result of the (LES) signalize that the subsistence expenditure per person in Jordan is about JD (1051.5) which used to cover the basic needs for survival. The expenditure elasticity estimates of demand imply that food, housing and transportation commodity groups are necessity goods, while clothing, durables and miscellaneous community groups are luxury goods.

All uncompensated own-price elasticity estimates are negative and less than unity in absolute value. The value of welfare indicator (ω) for Jordan is estimated to be (-3.1) which reflect the middle income brackets. On the other hand the estimated results of Dynamic linear Expenditure System (DLES) indicate that the subsistence expenditure per-person in Jordan is about JD(909.82) which constitute nearly 88% of per-capita income in Jordan. Total expenditure elasticity estimates indicate that the expenditure elasticities of demand for food and housing commodity groups are inelastic, which confirms that these commodities group are necessities. On the other hand, the demand for the other commodity groups are elastic. The difference between the two estimates (Static and Dynamic LES) that it has been found the demand for transportation is inelastic.

The study concluded that the analysis has important contribution for Jordan production strategies concerned with expenditure, prices, subsidy policies and promotion of reasonable standards of social welfare .

Keywords: Subsistence expenditure, Elasticities, Welfare, Linear expenditure system.

1. Introduction

For the last sixty years, the theory of utility maximization has been extensively applied in deriving complete system of equations. Different approaches have been developed in order to obtain complete system of demand equations. Such approaches are the direct utility approach, the indirect utility approach and the cost function approach. The direct utility approach is based on the assumption that an individual consumer is rational. This indicates that the consumer will allocate his expenditure so as to maximize his satisfaction. By maximizing his utility function subject to his budget constraint. The complete system of demand equations could be derived. Therefore, the main aims of the present study are to apply the linear expenditure system (LES), which is derived from the utility maximization to Jordanian data, and to derive and apply the dynamic system of demand equations from maximize klein-Rubin utility function.

The importance of the study stems from the fact that demand plays a major role in economic development in an economy, which consists of two important sectors. The first being final demand and the second being production function. Household demand constitutes a very huge percentage of final demand for any country. For regarding to Jordan, it constitutes on the average about 70% of final demand (Department of Statistics, 2020). So that the analysis and estimation of household demand is considered to be very essential for Government national decision makers.

Accordingly, the present study will analyze and estimate final demand for Jordanian household. Furthermore, this is because the community composition of the personal demand varies with price and income, it follows that an economy with growing per-capita GDP (like Jordan) may require a change balance among its productive activities. Therefore, economic planning should take into account this change.

the main objectives of the present study are as follows:

2. To apply the (LES) to Jordanian private consumption expenditure.
3. To estimate the compensated and uncompensated price elasticities.
4. To estimate the subsistence level of six commodity groups for Jordanian private consumption expenditure: Food, Clothing, Housing, , Durables, Transportation and Miscellaneous.
5. To formulate and estimate a complete System of (DLES) which is suggested by the researchers.

2. Literature review

Neoclassical theory is concerned with developing a constrained model of consumer choice, given tastes, preferences and limited opportunity set. The theory says that, from the opportunity set available to the consumer he selects certain commodities that rank highest in his ordering. Thus is choice becomes observable in the quantity demanded by him.

The theory is meant to explain the quantity purchased of each commodity in the set, which can be done in a number of ways. First of all it can be assumed that the consumer allocates his expenditure so as to purchase the collection of commodities and service which maximize his satisfaction with given prices. Second it may be assumed that the consumer is

willing to minimize the outlay necessary to attain a specified level of satisfaction. Clearly the commodity bundles chosen in both cases must be the same. Hence the optimal solution to the consumer choice, problem can be determined using two equivalent methods. The first method is described as "primal", whereas the second is described as "dual". Therefore, in principle there are four methods to obtain the demand functions, one of these method is through direct utility function. The LES model is obtained from the direct utility function, which will be applied to the Jordanian data.

The LES has been used very widely for the last sixty tears in applications to a wide range of data for various countries. It was applied for the first time by Stone (1954) using Britich data, Parks (1969) using Swedish data, Pollach and Wales (1969) using USA data, Yoshihara (1969) using Japanese data, Deaton (1974 and 1975) using Britishdata, Lluch and Powell and Williams (1977) using seventeen OECD nations. Chen and Wei (2009) studied on changes of consumption expenditure of in Ningxia, China. principles, methods, and advantages of the Expanded Linear Expenditure System Model (ELS) are there in introduced. Sarntisart and Warr (1994) study the consumption structure of two residents, Jiangxi province-based on the Extended Linear Expenditure System model (ELS)

Lluch and Powell (1975) applied the LES model for 19 countries consumption pattern. Moreover Beaten (1988) and Chang and Fawson (1994) have also applied the LES model. Dybczak et al(2010) applied the LES to Czech Household budget survey during the period 2006-2008. They found that the demand for food, energy and health are necessary goods as the elasticity estimates are positive and less than unity. On the other hand the budget elasticity estimates for clothing, transportation, communication and education are luxury since their elasticity estimates are greater than unity.

Banks et al. (1997) estimated own price elasticity for food, clothing and fuel commodity groups about -0.57, -1.14 and -0.77 respectively. Adusumalli et al. (2012) estimated the linear expenditure system to Indian rural household data. Chihwa and Mark (2001) applied the linear expenditure system with binding non-negativity constraints[1].

The demand system presented in the previous part of this paper is static, since the consumer is assumed adjust instantly to a new equilibrium when income or prices changes. This assumption does not provide a realistic description of how contains behave in real life.

Phlips (1974, p.149) pointed out: “in fact consumers often react with Some delay to price and income Changes with the implication that the adjustments towards a new equilibrium situation is spread over several time periods” static demand system, however, ignore such adjustments that occur due to habit formation, Changes in tastes and purchases of

[1] The neoclassical theory of consumer demand is well documented in a number readily available sources; examples include Houthahakker (1960), Barten (1964, 1967, 1968, 1969, 1977, and 1993), Powell (1974), Theil (1967, 1975, and 1976), Brown and Deaton (1972, Green (1976), Phlips (1971, 1974, and 1983), Lluch, Powell and Williams (1977), Deaton and Muellbauer (1980 a and b), Thomas (1987, Blundell (1988), Romer P (1994), Lall (1996), Verspagen (2004), Lawson (2006), Colander et al. (2004), Dodgson, et al. (2011) Eparvier (2005), , Fagiolo and Roventini (2012). Blaug (1992). Bruni (2002), Dardi (1991), Ellingsten (1994), Friedman (1999, 2000, 2001, 2004, 2005), Ranchetti (1998), Weber (1999).

durable goods. Therefore, static demand systems may provide results indicating that consumers do not behave optimally, and this may be due to ignoring dynamic specifications of demand behavior. So that empirical application of the static demand systems concluded the rejection of the restrictions of homogeneity and Symmetry which are the care of properties of demand. The Failures to accept these restrictions have led economists to dynamize demand equations. Three different approaches have been employed to modelling of consumer behaviour over time, which are the follows:

1) Ad - Hoc Specification Approach:

Ad-Hoc Specification has been adopted by several economists in to dynamize demand systems. The simplest of these were to add trend variables to the demand equations derived from utility maximization.

Hypothesis so as to reflect changes in tastes and other Se cio-economic factors. Examples are those of Barten (1967) and Stone etal (1964) others attempted to dynamize the System of demand through more sophisticated techniques as was done by Houthhakker and Taylor (1970) when they formulated a state adjustments modal.

Blanciforti and Green (1983) proposed a dynamic version of the AIDS incorporating habit formation of the form proposed by Pollack and Wales (1969).

2) Dynamic utility Function.

The second approach to the problem of explaining persistence in consumption patterns from the use of a dynamic utility function. The function is made dynamic by incorporating changing tastes, example are those of Pollak and Wales (1969), Pollak (1970) Phlips (1972), Houthhakker and Taylor (1970), Gaertner (1976) and others. Maximization of the dynamic utility function provides a comprehensive system of demand functions which is theoretically plausible. Moreover, the derived demand will be characterized by a distributed lag Scheme.

3) Rational Habit Formation

Some researchers proposed dynamic demand models for rationed habit formation, which refers to the case of consumer who is forward as well as backward Looking Example are those of Lluch (1974) , Phlips (1974) , Pollak (1976) and Spinnewyn (1981) and Pashardes (1986)

3. Methodology

The methodology used to determine the parameters of demand system has been derived from the neoclassical theory of consumer choice. Klein and Rubin (1947-1948) have presented a comprehensive set of demand relations which has become to be known as the Linear Expenditure System. Klein and Rubin began with the Following General Formulations of demands:

$$q_i = \sum_j a_{ij} \frac{p_j}{p_i} + \beta_i \frac{m}{p_i} \qquad (for\ i = 1,2,\ldots..n) \qquad \ldots.(1)$$

Where q_i is the quantity of i commodity, p_i is the price of ith commodity, m is the consumer's total expenditure or income multiplying both sides of equation (1) by b_i and sum over I we got

$$\sum p_i\, q_i = \sum_i \sum_j a_{ij} p_j + m \sum \beta_i = m \qquad \ldots.(2)$$

In order to satisfy the adding –up condition two sets of restrictions are required, which are:

$$\sum \beta_i = 1 \qquad\qquad \sum_i \sum_j a_{ij} p_j = 0 \qquad \ldots.(3)$$

The symmetry condition of the Slutsky equations required

$$\frac{\partial q_i}{\partial p_i} + q_j \frac{\partial q_i}{\partial m} = \frac{\partial q_i}{\partial \gamma_i} + q_i \frac{\partial q_i}{\partial m}$$

This implies

$$\frac{a_{ij}}{p_i} + a_j \frac{\beta_i}{p_i} = \frac{q_{ji}}{p_j} + a_i \frac{p_j}{p_j} \qquad \ldots.(4)$$

Substituting (1) into (4) they got

$$q_i = \gamma_i + \sum \beta_i \gamma_j \frac{p_j}{p_i} + \beta_i \frac{m}{p_i} \qquad \ldots.(5)$$

Equation (5) could be written in the following for

$$p_i q_i = \gamma_i p_i + \beta_i \left(m - \sum \gamma_j\, p_i \right) \qquad \ldots.(6)$$

Equation (6) is the (LES)

Geary (1950-1951) derived the utility function from which the LES may be derived.

$$\mu = \sum \beta_i \log\,(q_i + \gamma_i) \qquad \ldots.(7)$$

Where μ is the utility and the other notation as defined above.

The above utility function is called Stone-Geary or Klein-Rubin, Utility Function. That is maximizing equation (7) subject to budget constraint leads to the LES equation (6)

The LES is derived from an additive utility function, which means that the utility provided by the consumption of one good is not influenced by the consumption of any other good. This seems not to be a good approximation of reality, but the additive assumption might be a realistic assumption when we are dealing with broad aggregate of goods such as food, clothing, housing etc.

According to equation (7) the utility function is only defined for all value of $q_i > \gamma_i$ and the non-satiety axiom of demand theory requires that $\left(\frac{\partial \mu}{\partial q_i}\right) > 0$ this implies

$$\beta_i (q_i - \gamma_i)^{-1} > 0 \quad \ldots (8)$$

Hence $\frac{1}{q_i - \gamma_i} > 0$ is positive which means that $q_i > \gamma_i$

Furthermore, equation (8) requires that $\beta_i > 0$. This , however, rules out inferior goods, this seems to be realistic assumption when we are dealing with aggregate commodity groups.

All price elasticities of demand in the LES are less than unity in absolute value, unless some of the parameters $\gamma_i$are permitted to be negative. the own-price elasticity

e_{ij} of the ith commodity is given as

$$e_{ij} = \frac{(1 - \beta_i)\gamma_i - q_i}{p_i} - \frac{p_i}{q_i} = \frac{(1 - \beta_i)\gamma_i}{q_j} - 1 \quad \ldots . (9)$$

The cross price elasticities e_{ij} is given as :

$$e_{ji} = -\frac{\beta_i \gamma_j p_j}{p_i q_i} \quad \ldots . (10)$$

The compensated cross-price elasticities are given as

$$\frac{\beta_i p_j q_j}{p_i q_i} + e_{ji} \quad \ldots . (11)$$

The compensated own-price elasticity is given as

$$e^*_{ii} = \left[\frac{(1 - \beta_i)\gamma_i - q_i}{p_i} + q_i \frac{\beta_i}{p_i}\right]\frac{p_i}{q_i} = e_{ii} + \beta_i \quad \ldots . (12)$$

The income or total expenditure elasticity is given as

$$e_m = \frac{\beta_i}{w_i} \quad \ldots . (13)$$

Were ω_i is the budget share of i commodity

$$w_i = \frac{p_i q_i}{m} \quad \ldots . (14)$$

The LES model equation (6) involve cross equation restrictions on the parameters, such that each of γ_i parameters take the same value in all equations of a given model. This constraint requires the demand system to be estimated as a whole, by methods which allow for the cross- equation constraints. Furthermore, the system of equations must be estimated by an appropriate regression technique in which the system must be additive where the sum of estimated expenditure has to be equal to the sum of observed expenditure in each time period.

Therefore, the error terms of equations are not independent which means that Zeliner's method for Seemingly Unrelated Regression is appropriate.

The Dynamic LES Model (DLES)

To formulate and estimate a complete System of dynamic demand equation; the dynamic model is based on the hypothesis that the expenditure on the ith commodity (V_i) in any one period t depends not on the actual values of income or total expenditure but on the "expected" or "permanent" level of m_t at time t i.e, m_t^*. So that if we replace m_t in the budget constraint by m_t^*, the budget constraint could be written in the following form.

$$\sum_i p_i q_i = m_t^* \qquad \ldots\ldots\ldots (15)$$

Giving Stone–Geary utility function of the following form

$$\mu = \sum_i \beta_i \log (q_i - \gamma_i) \qquad \ldots\ldots\ldots (16)$$

Maximizing (16) subject to budget constraint equation (15) gives the LES in the following form

$$V_i = \gamma_i p_i + \beta_i \left[m_t^* - \sum_{i=1}^{n} \gamma_j p_{jt} \right] + u_t \qquad \ldots\ldots\ldots (17)$$

But since the expected income or expected total expenditure m_t^* is unobserved, it is therefore, necessary to substitute by an observable variable. This can be done by postulating the expectation concerning its value is formed by the adaptive rule (Cogan 1956). That is

$$m_t^* - m_{t-1}^* = \alpha\left(m_t - m_{t-1}^*\right) \qquad 0 < \propto \leq 1 \qquad \ldots\ldots (18)$$

Where α is the expectation co-efficient, implying the elasticity of expectation less than one.

In order to replace the unobservable expected expenditure in (18) with an observable variable; we obtain from equation (17)

$$m_t^* = \frac{V_{it}}{\beta_i} - \frac{\gamma_i}{\beta_i} p_{it} + \sum_j \gamma_j p_{jt} - \frac{u_t}{\beta_i} \qquad \ldots (19)$$

Lagging (19) one period we have

$$m_{t-1}^* = \frac{V_{it-1}}{\beta_i} - \frac{\gamma_i}{\beta_i} p_{it-1} + \sum_j \gamma_j p_{jt-1} - \frac{u_{t-1}}{\beta_i} \qquad \ldots (20)$$

Substituting m_t^* and m_{t-1}^*in (19 and 20) into (18) we obtain the Dynamic Linear Expenditure System (DLES model)

$$V_{it} = \gamma_i p_{it} + \beta_i \alpha m_t - \beta_i \sum_j \gamma_j p_{jt} + (1-\alpha)\left[V_{it-1} - \gamma_j p_{jt-1}\right] + \beta_i (1-\alpha) \sum_j \gamma_j p_{jt-1} + u_t - (1-\alpha) u_{t-1} \qquad \ldots \qquad \ldots (21)$$

Equation 21 is the new version of the DLES model is formulated and contributed by the researchers and will be applied to the Jordanian data.

An annual Jordanian time series data from 1990-2018 has been used to estimate the LES and (DLES) model in which the primary source of data series is based on the Statistical Bulletin of Central Bank of Jordan. In this study, Six commodity groups are used to estimate the model. Which are as follows: Food, Clothing, Housing, Transportation, Durables, and Miscellaneous

4. Empirical results

(1) The LES Estimates

The system of equation (6) has been applied to annual Jordanian time-series data for the years 1990-2018.

Table (1) presents parameter estimates, which are estimates of marginal budget shares β_i and the committed commodities (subsistence level) γ_i along with the calculated values of R^2 statistics and Durbin Watson statistics . Also estimated results seem to be plausible from a statistical point of view, since that all the coefficients parameters are highly significantly different from zero. Overall goodness of fit is very high for all equations on the system. The value of the coefficient of determination, R2 exceeds 97 percent for all equations except clothing equation which was 77 percent.

Moreover values of the Durbin-Watson statistic, on the other hand indicate strong markov positive first order serial correlation in the residuals of individual equation. This however suggest that the reported standard errors, should be interpreted with care. The estimated budget shares β_i are all positive and satisfy *a priori* knowledge in the since that the value of each β_i estimate is less than unity as required by the model. Moreover, the estimated values of γ_i are also positive as required by the model and at the mean values of p_i the $p_i\gamma_i$estimates are less the mean of actual per-capita expenditure for all commodity groups.

Estimated total subsistence expenditure is almost JD 1051.5 per person, which is given by the sum of γ_i, estimates. This represents over 93% of the average of total expenditure. This suggests that a substantial share of the Jordanian total expenditure is used to satisfy the basic needs for survival. This is considered to be very high relative to other countries. For example Lewis and Andrews (1989) found out that the total subsistence level for China was 42.4% of average total expenditure and they found that subsistence expenditure on food group accounted about 50% of the average expenditure on food. Whereas, the subsistence expenditure on food group for Jordan accounts over 70% of average food expenditure in Jordan.

The marginal budget shares measure the proportion of extra JD's of discretionary expenditure which is spent on the group of commodity concerned. The important of food and miscellaneous groups expenditure to Jordanian consumers are clearly evident. The value of 0.273 and 0.518 marginal budget shares for food and miscellaneous groups respectively compares to 0.036, 0.047, 0,072 and 0.054 for clothing, housing, transportation and durable group respectively.

The actual spending on various commodity groups exceeds the subsistence expenditure $p_i\gamma_i$ for all commodity groups for all of the years of the sample period with only one exception. That is, for the first year of the sample it has been found that the subsistence expenditure for housing exceeded actual per-capita expenditure on this commodity group. This may be due to the omission of relevant variable or variables; which result in the parameter estimates for the included variables being biased and hence overestimated. Many researchers, however, argued that there are other factors affect demand, for example Deaton (1974) pointed out it is undoubtedly true that factors other than prices and income affect demand. Whereas, other researchers such as Lluch etal (1977) suggested to handle this problem by imposing constraint on the value of the γ_i, in this estimation procedure, on the other hand Stoker (1986) has shown that parameters estimated by using aggregated data such as used in representative agent models contain distributional biases which can't be measured by using aggregate data only. The role of distributional effects in demand system has been also confirmed by Buse (1992) using the LES model, who has shown that distributional effects are statistically significant and can displace AR (1) dynamics in the disturbances. Therefore, it has been required that attempts should be implemented in order to dynamism the LES that should take into account the habit formation when formulating the dynamic LES. This would be implied into Part (2).

Table (2) contains estimates of total expenditure (income) elasticities, uncompensated own –price elasticities and cross-price elasticities evaluated at sample mean values.

Total expenditure elasticities indicate that the expenditure elasticity of demand for food, housing, and transportation commodity groups were smaller than one where the expenditure elasticity coefficient is 0.71, 0.42 and 0.50. This indicates that the increase of one percent in all expenditure leads to have an increase in demand for food, housing and transportation by 0.71 , 0.40 and 0.50 percent on average (ceteris paribus). Consequently, these groups can be classified as necessary goods. The highest expenditure elasticity coefficients are those for clothing, durables and miscellaneous commodity groups. These groups can be classified as luxury goods. Similar results regarding food, clothing, housing and miscellaneous commodity groups was obtained by Lluch et al (1977) for six out of seventeen OECD countries, in which the LES model was applied to their data. Thus countries were Thailand, South Africa, Ireland, Puerto Rico, Greece and United States of America. (Janský, 2014); (Dybczak et al. ,2010), and (Blacklow et al., 2010) presented similar results.

Table (1)
Estimated Results of the Linear Expenditure system Fitted to Jordanian Time Series Data
During the period (1990-2018)

Commodity Groups	Marginal Budget shares β_i	Stone Geary paramet γ_i	R^2	$D.W$
Food	0.273 (38.3)	404.3 (3.03)	0.99	0.72
Clothing	0.036 (6.7)	55.3 (4.84)	0.77	0.75
Housing	0.047 (71.4)	231.7 (3.39)	0.99	0.53

Transportation	0.072 (24.3)	151.2 5.48	0.97	0.46
Durables	0.054 (44.9)	50.9 (3.17)	0.97	0.72
Miscellaneous	0.518 (55.8)	158.1 (5.53)	0.99	0.63

Table (2)
LES estimates total expenditure and uncompensated price elasticities for Jordanian

Commodity Groups	Total Expenditure Elasticities	Food	Clothing	Housing	Transportation	Durables	Miscellaneous
Food	0.71	-0.45	- 0.011	- 0.03	- 0.02	- 0.03	- 0.08
Clothing	1.68	- 0.22	- 0.25	- o.o6	- 0.04	- 0.01	- 0.23
Housing	0.42	- 0.25	- 0.02	- 0.31	- 0.03	- 0.04	- 0.21
Transportation	0.50	- 0.28	- 0.03	- 0.05	- 0.38	- 0.02	- 0.11
Durables	1.13	- 0.31	- 0.013	- 0.04	- 0.03	- 0.36	- 0.09
Miscellaneous	3.44	- 0.52	- 0.04	- 0.07	- 0.05	- 0.06	- 0.93

All uncompensated own-price elasticities are negative and less than unity in absolute value as shown in table (2) which mean that they are inelastic. This latter result is expected since it is considered to be one feature of the LES model provided that all the γ_i estimates are positive. The uncompensated own-price elasticity estimates range from – 0.25 for clothing to – 0.93 for the miscellaneous commodity group. According to the theory of economy, the price effect is usually negative and this was proven for all expenditure groups.

Uncompensated cross-price elasticity estimates are negative and less than unity in absolute value and most of the cross-price elasticity estimates for the individual equations dominates the own-price elasticity estimates. This result consistent with *a priori* knowledge in the sense that the demand for any particular commodity is most strongly affected by its own-price elasticity. Jansky (2014) observed a weak dependence between the analyzed groups

As shown in table (2) all commodity groups are price inelastic, and the negativity of the uncompensated cross-price elasticities indicate that the income effects swamp by the substitution effects. It is worth mentioning that in the context of the LES model there are no inferior good and each commodity group in the system is a normal good, this in fact is plausible when we are dealing with broad commodity groups.

Table (4) presents the ratio of own-price elasticities to total expenditure elasticities for all commodity groups. These ratios offer limited support for Deaton's hypothesis that there is a proportional relationship between own-price elasticities and total expenditure elasticities in the context of the LES model. As shown in the table (4) ratios for clothing, for example, differ from the ratios of other commodity groups. But the ratios of housing and transportation commodity groups are very close.

Table (4)

Ratio of absolute own-price elasticities to total expenditure

Commodity Groups	Ratio %
Food	0.65
Clothing	0.15
Housing	0.73
Transportation	0.76
Durables	0.31
Miscellaneous	0.27

In comparison with elasticity estimates obtained by other research. Lester (2005) founds that the transportation, miscellaneous, and housing expenditures have the highest elasticities (for both own-price and total expenditure) while food and utility expenditures have the lowest elasticities . Lester (2005) found that Agriculture, Food, and Textiles can be classified as necessity goods. Selvanathan and Selvanathan (2006) suggest that food is a necessity in most countries and the own-price elasticities show that demand for food is price inelastic in all 43 developing countries. With regard to budget elasticities, they have been estimated by Banks et al (1997) as 0.57, 1.14, and 0.48 for food, clothing, and fuel bundles, respectively. Dybczak et al (2010) found that clothing is a luxury commodity with budget elasticity over 1. As well as food and energy are normal goods with budget elasticity below 1. In addition, the response of energy demand to income changes seems to be lower compared to reaction of food demand in both previous studies. Concerning both compensated and uncompensated price elasticities. Banks et al. (1997) found that the compensated price elasticities of food, clothing, and fuel are -0.78, -0.96, and -0.77, respectively while Dybczak et al (2010) estimates have comparable outcomes for fuel but lower outcomes in the case of food and clothing.

Table (5) presents the compensated own-price and cross-price elasticity estimates as evaluated at mean values. All compensated own-price elasticities are negative and all cross-price elasticities are positive. The sum of the compensated own-and cross price elasticities are equal zero for all commodity groups.

Accordingly, all the estimated results, which are discussed above the LES model satisfies all the requirements of the underlying theory.

The elasticity of the marginal utility of total expenditure or money flexibility is given in the context of the LES as

$$\omega = -\frac{m}{m - \sum p_j \gamma_j} \quad \ldots.(15)$$

The value of ω can be interpreted as a welfare indicator; the more a country is developed, the smaller $-\omega$ is likely to be. The absolute value of ω for various countries was reported by Bieri and de Janvry (1972, p.44) ranged from 0.61 for high income countries to 0.39 for low income countries. At the mean values of total expenditure and prices ω for Jordan has been estimated to be – 0.31 which suggests according to Frisch (1959 p.189) this value reflects the middle income bracket. This seems to be true for a country like Jordan which has been classified by the World Bank as one of the middle income group.

Table (5)
LES Estimates of compensated Price Elasticities For Jordanian

Commodity Groups	Price Elasticity					
	Food	Clothing	Housing	Transportation	Durables	Miscellaneous
Food	- 0.29	0.03	0.02	0.01	0.02	0.21
Clothing	0.16	- 0.68	o.o3	0.05	0.12	0.32
Housing	0.12	0.04	- 0.49	0.04	0.04	0.25
Transportation	0.15	0.06	0.02	- 0.58	0.09	0.26
Durables	0.21	o.o2	0.05	0.02	- 0.61	0.31
Miscellaneous	0.33	0.04	0.03	0.04	0.03	- 0.47

Table (6)
Estimated Results of the Dynamic LES Model
Fitted to Jordanian Time Series
Data During the period (1990_2018)

Commodity Group	Marginal Budget Shares β_i	Commodity Expenditure γ_i	R^2	Standard Errors of the Estimate
Food	0.324 (40.4)	523.2 (6.3)	0.995	34.6
Clothing	0.026 (8.20)	70.22 (12.40)	0.976	5.8
Housing	0.082 (90.24)	39.8 (10.4)	0.994	6.3
Transportation	0.042 (30.32)	115.9 (24.2)	0.987	3.1
Durables	0.034 (52.4)	67.4 (77.5)	0.998	12.2
Miscellaneous	0.492 (70.26)	160.7 (9.2)	0.995	32.4

$\alpha = 0.69$ $N = 29$ $t - ratios\ are\ in\ Parentheses$

2- The DLES Estimates

The dynamic LES model equations (21) has been estimated to the same set of data used in the previous section. The system has been estimated by the means of seemingly unrelated regression (SUR) estimator developed by Zellner (1962). Table (6) contains estimates of the marginal budget shares , β_i and the γ_i along with α and the coefficients of determination R^2.The estimated results seem to be plausible from statistical point of view , since all the coefficient parameters are highly significantly different from zero at the one percent level of significance. overall fit is very high as the values of coefficients of determination, R^2 exceed 95 percent for all equations in the system. The estimated marginal budget share β_i , are all positive and the estimated value of each $\beta_i$estimate is less than one and greater than zero . Moreover, the estimated value of α is less than unity and greater than zero and significant at 1%. At the same time the estimated values of all γ_i are positive and the sum of $p_i\gamma_i$ in each year the sample period is less than the actual expenditure in the corresponding year of the sample. The numerical value of α implies slow adjustment in expectations i.e 69% or one year and 5 months.

Total subsistence expenditure is about JD 909.82 per person which represent very high percentage of average of income, about 88%. this suggests that a substantial share of income is used to satisfy the basic needs.

Table (7) contains long-run total expenditure elasticities together with the long-run uncompensated own -and- cross price elasticities evaluated at sample mean value. Total expenditure elasticity estimates indicate that the expenditure elasticities of demand for food and housing commodity groups are inelastic, which confirms that these commodities group are necessities. On the other hand, the demand for the other commodity groups are elastic. The difference between the two estimates (static and Dynamic LES) that it has been found the demand for transportation is inelastic.

Table (7)
Dynamic LES Estimates of Total Expenditure
and Uncompensated Price Elasticities For Jordan

Commodity Groups	Income Elasticities	Price Elasticity Estimates					
		Food	Clothing	Housing	Transportation	Durables	Miscellaneous
Food	0.45	-0.32	-0.21	-0.05	-0.05	-0.06	-0.09
Clothing	1.72	-0.12	-0.35	-0.12	-0.12	-0.02	-0.12
Housing	0.87	-0.17	-0.07	-0.56	-0.56	-0.05	-0.35
Transportation	1.83	-0.21	-0.19	-0.04	-0.04	-0.07	-0.15
Durables	1.22	-0.42	-0.01	-0.08	-0.08	-0.82	-0.1
Miscellaneous	2.12	-0.62	-0.03	-0.09	-0.09	-0.05	-0.65

According to the LES static estimates, whereas, it has been found elastic according to the dynamic results. Furthermore, it has been found the elasticity of total expenditure estimates for food and miscellaneous are lower than those estimated by the static LES model, whereas, the estimated total expenditure for clothing, housing, transportation, and durables goods be higher in absolute value than the static model estimates. Uncompensated cross price elasticity estimates are all negative and less than unity in absolute value and none of the cross-price elasticities estimates for each individual equation dominate own-price elasticity estimates. The long-run compensated own-and- cross-price elasticities evaluated at the sample mean values are presented in Table (8). All compensated own-price elasticities are negative and all cross-price elasticities are positive. This indicates gross substitution among all commodity groups in the system. The sum of compensated own-and-cross price elasticities are zero for all commodity groups.

Table (8)
Dynamic LES Estimates of Compensated Price Elasticities for Jordan

Food	Clothing	Housing	Transportation	Durables	Miscellaneous
-0.19	0.03	0.04	0.02	0.03	0.07
0.17	-0.59	0.02	0.06	0.18	0.16
0.14	0.01	-0.31	0.02	0.03	0.11
0.16	0.04	0.01	-0.42	0.1	1.20
0.23	0.01	0.03	0.03	-0.48	0.18
0.35	0.03	0.04	0.05	0.06	-0.53

Table (8)
Dynamic LES Estimates of Total Compensated
Price Elasticities for Jordan

Commodity Groups	Price Elasticity					
	Food	Clothing	Housing	Transportation	Durables	Miscellaneous
Food	-0.19	0.03	0.04	0.02	0.03	0.07
Clothing	0.17	-0.59	0.02	0.06	0.18	0.16
Housing	0.14	0.01	-0.31	0.02	0.03	0.11
Transportation	0.16	0.04	0.01	-0.42	0.1	1.20
Durables	0.23	0.01	0.03	0.03	-0.48	0.18
Miscellaneous	0.35	0.03	0.04	0.05	0.06	-0.53

5. Conclusions and policy implications

The objectives of the present study are to apply the theory of consumer demand to Jordanian private expenditure, estimate a complete system of demand, and estimate the subsistence level of each commodity group for Jordanian household. Evidence from Jordan aggregate budget data suggests that estimated total subsistence expenditure is almost JD 1051.5 per person in Jordan. The represents over 93% of the average of total expenditure. This suggests that a substantial share of the Jordanian total expenditure is used to satisfy the basic needs for survival. Moreover, the important of food and miscellaneous groups expenditure to Jordanian consumers are clearly evident. However, this result indicates that this situation might

improve automatically as income increases. The low expenditure share (or level) of clothing, housing, transportation and durable group are also a very important issue that the policymakers should consider about.

The expenditure elasticity of demand imply that food, housing, and transportation commodity groups are necessity goods, while clothing, durables and miscellaneous commodity groups are luxury goods. All uncompensated own-price and cross-price elasticities are negative and consistent with *a priori* knowledge in the sense that the demand for any particular commodity is most strongly affected by its own-price elasticity. All commodity groups are price inelastic, and the negativity of the uncompensated cross-price elasticities indicate that the income effects swamp by the substitution effects. It is worth mentioning that in the context of the LES model there are no inferior good and each commodity group in the system is a normal good, this in fact is plausible when we are dealing with broad commodity groups. The ratio of own-price elasticities to total expenditure elasticities for all commodity groups offer limited support for Deaton's hypothesis that there is a proportional relationship between own-price elasticities and total expenditure elasticities in the context of the LES model.

Accordingly, all the estimated results, which are discussed above the LES model satisfies all the requirements of the underlying theory. The value of welfare indicator (ω) for Jordan has been estimated to be – 3.1 which reflects the middle income bracket.

The estimated results of the dynamic LES model seem to be plausible from statistical point of view. Total subsistence expenditure is about JD 909.82 per person which represent very high percentage of average of income, about 88%. this suggests that a substantial share of income is used to satisfy the basic needs. Total expenditure elasticity estimates indicate that the expenditure elasticities of demand for food and housing commodity groups are inelastic, which confirms that these commodities group are necessities. On the other hand, the demand for the other commodity groups are elastic. The difference between the two estimates (static and dynamic LES) that it has been found the demand for transportation is inelastic. The (DLES) estimates are fit the data better than the static (LES) from statistical and economical point view.

Finally, this study provides an important perceptions of consumer behavior in Jordan. In addition, this analysis has an important contribution for Jordan production strategies concerned with expenditure, prices, subsidy policies and promotion of reasonable standards of social welfare.

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