האוניברסיטה העברית בירושלים
The Hebrew University of Jerusalem

המרכז למחקר בכלכלה חקלאית
The Center for Agricultural Economic Research

המחלקה לכלכלה חקלאית ומנהל
The Department of Agricultural Economics and Management

Discussion Paper No. 17.06

Quality, Quantity and Time Issues In Demand for Vacations

by

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Acknowledgements
We are especially grateful to Ziv Bar-Shira for the insights and suggestions that significantly improved the manuscript. We thank the Center for Agricultural Economics Research for funding this research.

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Introduction

The world tourism industry has grown rapidly in the past 50 years. The number of international tourist arrivals has increased at an average annual rate of 6.4% since 1950. The revenue generated by international tourism was $623 billion in 2004 and accounted for 6% of exports of goods and services in the world economy. Considering additional receipts from domestic tourism, tourism is one of the world's most important and rapidly growing industries. A growing number of rural and peripheral regions worldwide are benefiting from this growth. Rural tourism (or agritourism) in Israel is playing an important role in the economy of some regions and it was found to have a strong links to agriculture production (. The economic impact of tourism is determined, among other things, by the tourists' consumption patterns. Changes in income, prices and technology lead to different consumption decisions. In this research, we offer a framework to analyze vacation consumption patterns of households and apply it to Israeli data.

Changes in household tourism travel patterns and in tourism sites have been observed in many OECD countries. One important trend that has emerged is that households have moved away from one annual long main holiday to multiple short vacations taken throughout the year. Another observed trend is the replacement of traditional mass tourism resorts by new, more diversified and distant destinations (OECD, 2002; CENDANT, 2005). Boutique hotels in urban centers and luxurious B&Bs in rural areas offering high-quality services are rapidly emerging (Callan and Fearon, 1997). These changes indicate that households distinguish between the quality, quantity and length of their vacations in their tourism consumption. To analyze these recent trends, we broke down the household's vacation decision into its components, i.e.: how many vacations to take in a given time span, say, a year; what length of vacation to take, for instance, a short one over a weekend or a long one; and what quality level to choose for the vacations. Household expenditures on vacations are a product of these three factors and thus, solely analyzing expenditures will not reveal the changes in tourism-related consumption patterns.

The most important influences shaping these trends are an increase in disposable income and leisure and the vast improvement in transportation and communication technologies. The latter technological revolution is responsible for the decrease in quality-adjusted prices of different destinations which has made them affordable for many households. According to an OECD (2002) report surveying trends in household tourism travel, "more people travel further and more often than ever before."

Understanding these trends is important since they have major implications for transportation infrastructure, the environment, the land use and economy of some rural regions, and the products supplied by the tourism industry. People will prefer high-speed modes of transport to minimize transit time for shorter breaks. The environmental cost of tourism-related travel can be bigger than in the past since there is a need for more travel to multiple sites. Firms in the travel and tourism industry, farmers running B&B businesses among them, have to adjust their services to cater to the need for high-quality but shorter packages. Moreover, findings from this analysis can be applied to recreation consumption patterns which are similar to those of tourism.

The objective of this research is to understand how changes in quality-adjusted prices, alternative cost of time and household income level can affect households' vacation consumption by distinguishing between vacation quantity, quality and length decisions.

Most of the literature regarding tourism, recreation and vacations contends only with total expenditure, without distinguishing between its various subcomponents. For instance, Costa (1997, 1999) estimated only the total expenditures elasticities of recreation—tourism and vacation expenditures being a sub item - using over a century's worth of consumer expenditure surveys in the USA, from 1888 till 1991. She shows that recreation expenditures are a luxury good but that they are becoming more egalitarian. Elasticities fell from more than two in the early periods to slightly more than one in the later periods. Van Soest and Kooreman (1987) and Melenberg and Van Soest (1996), using vacation expenditures data of Dutch families, found that income elasticities are generally larger than one. In the latter paper, income elasticity of domestic tourism was less than one while elasticity of vacations abroad was over two. Similar results were found by Marder (2004) by analyzing the 1999 household expenditure survey data in Israel. She found that elasticity of vacation expenditures is 1.6, i.e., they are a luxury good.

These works, however, do not distinguish between the individual components determining the total expenditures nor do they take into consideration prices. The assumption that all households face the same level of prices is strong in the case of tourism consumption. Seasonality and ubiquitous price-discrimination practice lead to a heterogeneous pricing system in the tourism market.

In our analysis, we follow a number of papers analyzing household decisions while distinguishing between quality and quantity. The underlying assumption in these papers is that changes in income and prices have different impacts on quality and quantity consumption decisions. Thus a consideration of only total expenditures can be misleading. Becker and Lewis (1973) offer an analytical framework explaining the decision of households on number and quality of children. Goldman and Grossman (1978) expanded this analytical framework and developed a model analyzing household expenditures on pediatric care. In applying their model to health districts in New York, they found that properties of demand functions for quantity and quality of pediatric care differ. Cox and Wohlgenant (1986) revisited by Dong, Shonkwiler and Capps (1998) estimate demand for different food items from household-expenditure surveys. By dividing total expenditures of an item by quantity consumed of the same item they were able to obtain implicit prices and distinguish between demand for quantity and quality of the food items.

Another important issue that should be taken into consideration when analyzing tourism and recreation consumption is the length of the activity. Consumption of vacation and recreation requires an additional resource, leisure time of the consumer. In this case, the length of time of the activity becomes another decision variable. Following Becker and Lewis (1973) and Goldman and Grossman (1978), we develop a theoretical model more suitable for the analysis of tourism and recreation consumption. In our analysis, the length of the activity is considered an additional decision variable of the household, besides its quantity and quality.

We show that income, time-cost and quality-adjusted price affect quantity, quality and length of vacations differently in terms of magnitude and in some cases, in different directions. Thus, to identify the factor leading to the observed changes in consumption, a full analysis of the demand system has to be conducted.

The Model

Households derive utility from the number of vacations they take, v, the quality of their vacation, q, the length of the vacation, t, and other goods, z:

$$U = U(v, q, t, z) \tag{1}$$

Within a given household, quality per vacation and length of vacations are assumed the same for all vacations. An important feature of the utility function is that quality, quantity and length of vacations enter it as separate variables and not as total expenditures. The underlying assumption is that households at different income and price levels can take different combinations of length, quality and quantity of vacations, even though the total expenditures on vacation can stay the same. Keeping *v*, *q* and *t* separate allows us to investigate the trends in vacation consumption, their sources and their impact.

Price per day of vacation can be noted as follows:

$$p = \hat{p}q \tag{2}$$

Where $\hat{p}$ is the quality-adjusted price and q is the number of quality units per day of vacation. Total expenditures on vacations, $\hat{p}qtv$, are the product of price per day, $\hat{p}q$, number of vacations taken in a year, v, and number of days per vacation, t.

Consumption of vacations requires not only income but also leisure time. This means that additional expense is incurred by the household from the alternative cost of time, w. In this case, w is the salary per day of work of the household members that take the vacation.

The price of z is normalized to one and it is assumed that no time is needed in consuming it. Accordingly, budget constraint receives the following form:

$$I = \hat{p}qtv + wtv + z \tag{3}$$

where I includes income from all sources of all household members.

Maximizing household utility subject to budget constraint leads to the following first-order conditions:

$$U_v = \lambda(\hat{p}qt + wt) \quad (4)$$

$$U_q = \lambda(\hat{p}vt) \quad (5)$$

$$U_t = \lambda(\hat{p}qv + wv) \quad (6)$$

$$U_z = \lambda \quad (7)$$

where λ is the Lagrangian multiplier associated with budget constraint or in economic terms, the marginal utility of income.

The budget constraint is not linear in *v*, *q* and *t* and thus an increase in *v* involves increases in *q* and *t* and their cost. The same is true for an increase in *q* and *t*, where an increase in one variable leads to increases in the other two. Therefore, the true cost, or shadow price, of *v*, *q* and *t* is derived as follows from equations (4)-(6):

$$p_v = \hat{p}qt + wt = (\hat{p}q + w)t \quad (8)$$

$$p_q = \hat{p}vt \quad (9)$$

$$p_t = \hat{p}qv + wv = (\hat{p}q + w)v \quad (10)$$

$$p_z = 1 \quad (11)$$

The true cost for one vacation for the household is p_v, where p_v includes the cost per day and the length of the vacation. Cost per day is determined by multiplying number of quality units (*q*) by the quality-adjusted price ($\hat{p}$) plus the time cost (*w*): $\hat{p}q + w$.

The total cost of a vacation is the product of the cost per day and the number of vacation days (*t*). p_t, the shadow price of the length of the vacation, is symmetric to p_v; however, the price per day is multiplied by the number of vacations (*v*). The shadow price of quality, p_q, includes *v* and *t*. Assuming the same level of quality for all vacations, this means that if the household desires to increase the quality of one day of vacation (*q*) it has to do it for every vacation day taken.

Using the shadow price we can calculate what Becker and Lewis (1973) called the total “expenditure” on *v, q* and *t*:

$$R = p_v v + p_q q + p_t t + p_z z = \frac{I}{1-k} \tag{12}$$

where

$$k = \frac{2\hat{p}qtv + wtv}{R} \tag{13}$$

R is larger than *I* since $0 < k < 1$.

Based on the above equations, there are two alternative ways of looking at the problem faced by the household in a vacation-taking decision. In the first, the household is maximizing its utility subject to a nonlinear budget constraint (Equation 3). Accordingly, the reduced form of the demand system as a function of the exogenous variables, *I*, *w* and $\hat{p}$, receives the following form:

$$d\ln(v) = \overline{\eta}_v d\ln(I) + \overline{\phi}_v d\ln(w) + \overline{\varepsilon}_v d\ln(\hat{p}) \tag{14}$$

$$d\ln(q) = \overline{\eta}_q d\ln(I) + \overline{\phi}_q d\ln(w) + \overline{\varepsilon}_q d\ln(\hat{p}) \tag{15}$$

$$d\ln(t) = \overline{\eta}_t d\ln(I) + \overline{\phi}_t d\ln(w) + \overline{\varepsilon}_t d\ln(\hat{p}) \tag{16}$$

where:

$\overline{\eta}_i = \dfrac{d\ln(i)}{d\ln(I)}, i = v,q,t$ are the observed income elasticities; $\hat{p}$ and *w* are constant.

$\overline{\phi}_i = \dfrac{d\ln(i)}{d\ln(w)}, i = v,q,t$ are the uncompensated time-cost elasticities; *I* and $\hat{p}$ are constant.

$\overline{\varepsilon}_i = \dfrac{d\ln(i)}{d\ln(\hat{p})}, i = v,q,t$ are the uncompensated quality-adjusted price elasticities; *w* and *I* are constant.

The nonlinearity of the budget constraint causes the true costs of *v*, *q* and *t* to be endogenous and thus, as pointed out by Becker and Lewis (1973), the observed elasticities in equations (14)-(16) are not the true elasticities. To obtain the true elasticities, we have to present the demand system as a function of the shadow prices and total expenditure, *R*. In this case, the expenditure equation is linear in *v*, *q*, and *t*. This leads to the second, structural, demand system:

$$d\ln(v) = \eta_v d\ln(R/\overline{p}) + k_q\sigma_{qv} d\ln(p_q) + k_t\sigma_{vt} d\ln(p_t) + k_v\sigma_{vv} d\ln(p_v) \tag{17}$$

$$d\ln(q) = \eta_q d\ln(R/\overline{p}) + k_q\sigma_{qq} d\ln(p_q) + k_t\sigma_{qt} d\ln(p_t) + k_v\sigma_{vq} d\ln(p_v) \tag{18}$$

$$d\ln(t) = \eta_t d\ln(R/\overline{p}) + k_q\sigma_{tq} d\ln(p_q) + k_t\sigma_{tt} d\ln(p_t) + k_v\sigma_{tv} d\ln(p_v) \tag{19}$$

where:

$\eta_i = \dfrac{d\ln(i)}{d\ln(R/\overline{p})}, i = v,q,t$ are the true income elasticities while p_v, p_q and p_t are held constant. $\overline{p}$ is defined in the Mathematical Appendix,

σ_{ij} $(i, j = v,q,t)$ are Allen's partial elasticities of substitution in the utility function (see Allen, 1964),

$k_i = \dfrac{ip_i}{R}, i = v,q,t$ i.e., the share of *R* spent on *i*.

The shadow prices in this system are endogenous, thus, to estimate the true elasticities: $\eta_i, \phi_i, \varepsilon_i$ (where: $\phi_i = \dfrac{d\ln(i)}{d\ln(w)}, i = v,q,t$ are the compensated time-cost elasticity of *i* while $R/\overline{p}$ and $\hat{p}$ are held constant, $\varepsilon_i = \dfrac{d\ln(i)}{d\ln(\hat{p})}, i = v,q,t$ are the compensated quality-adjusted price elasticity of *i* while $R/\overline{p}$ and *w* are held constant), we would have to estimate the reduced-form system (equations. 14-16) and find the relationship between the true and observed elasticities, as presented in the next section.

Investigating the Relationship between True and Observed Elasticities

In this section, we conduct a comparative static analysis in which we investigate the relationship between the true and observed elasticities while distinguishing between income and price effects.

Income Effect

Assuming constant shadow prices, households maximize their utility subject to linear budget constraints. Being a homogeneous demand system, the weighted average of the true income elasticities equals one (Equation 20). This result is obtained by taking the full derivative of *R* in equation (12) and further manipulating it.

$$k_v\eta_v + k_q\eta_q + k_t\eta_t + k_z\eta_z = 1 \tag{20}$$

The weighted average of the observed income elasticities is less than one since the budget constraint is not linear in its arguments. Taking the full derivative of *I* and by further manipulation we get the following result:

$$k_v\overline{\eta}_v + k_q\overline{\eta}_q + k_t\overline{\eta}_t + k_z\overline{\eta}_z = 1 - k \tag{21}$$

From equations (20) and (21) we can say that the weighted average of the true income elasticities is larger than the observed (assuming *v*,*q*,*t*,z are normal goods). This means that on the average, consumption of one of the goods is more sensitive to an increase in *R* than to an increase in *I*. The economic explanation for this is that an increase in *I* leads to an increase in one of the components, *v*, *q* or *t*, of vacation expenditures; we know that an increase in one of the components leads to increases in the other two. That is, we have a "spin-off" effect of the increase in *I* that is account for in the true elasticities. The higher the difference between *R* and *I* (the nominator in Equation 13), the bigger the disparity between the weighted average of the true and observed elasticities.

The true elasticities can be expressed as a function of the observed elasticities as follows (see Mathematical Appendix):

$$\eta_v(1-k) = (1-k_q\sigma_{qv} - k_t\sigma_{vt})\overline{\eta}_v - (k_q\sigma_{vt} + k_q\sigma_{vv})\overline{\eta}_q - (k_q\sigma_{qv} + k_t\sigma_{vv})\overline{\eta}_t \quad (22)$$

$$\eta_q(1-k) = -(k_q\sigma_{qq} + k_t\sigma_{qt})\overline{\eta}_v + (1-k_q\sigma_{qt} - k_q\sigma_{vq})\overline{\eta}_q - (k_q\sigma_{qq} + k_t\sigma_{vq})\overline{\eta}_t \quad (23)$$

$$\eta_t(1-k) = -(k_q\sigma_{tq} + k_t\sigma_{tt})\overline{\eta}_v - (k_q\sigma_{tt} + k_q\sigma_{tv})\overline{\eta}_q + (1-k_q\sigma_{qt} - k_t\sigma_{tv})\overline{\eta}_t \quad (24)$$

Each one of the true income elasticities is a function of all three observed elasticities. To evaluate the relationship between the η 's and $\overline{\eta}$'s, we assume that own price effect is bigger than cross price effect and that *v, q,* and *t* are competitive in consumption. This leads to positive values of σ_{ij} and to $|\sigma_{ii}| > |\sigma_{ij}|$ for all *ij*. For simplicity, we also assume that all own elasticities are equal and that all cross elasticities are equal. Under these assumptions, and by noting the coefficients of the $\overline{\eta}$'s by *a, b* and *c*, equations (22)-(24) can be rewritten as follows:

$$\eta_v(1-k) = a_1\overline{\eta}_v + b_1\overline{\eta}_q + c_1\overline{\eta}_t \quad (25)$$

$$\eta_q(1-k) = a_2\overline{\eta}_v + b_2\overline{\eta}_q + a_2\overline{\eta}_t \quad (26)$$

$$\eta_t(1-k) = c_1\overline{\eta}_v + b_1\overline{\eta}_q + a_1\overline{\eta}_t \quad (27)$$

$a_1, b_{1,} c_1$ and b_2 are positive (see Mathematical Appendix), while the sign of a_2 depends on the ratio $\frac{k_j / k_i}{\sigma_{ii} / \sigma_{ij}}, i = v, q, t$. From the relationship between the observed and true income elasticities, we can infer that an increases in the sensitivity of *v, q,* and *t* to changes in *I* will cause an increase in the sensitivity of *v* and *t* to changes in *R*. An increase in the sensitivity of *q* to *I* will increase the sensitivity of *q* to *R* while the impact of a change in the sensitivity of v and t to I on the sensitivity of q to R cannot be determined. That is, when a change in the true income elasticity occurs in one of the vacation expenditure elements, it might be a result of a change in the observed elasticities of the other two elements.

Price Effect

To evaluate the impact of changes in quality-adjusted price variables $\hat{p}$ and time-cost w on v, q and t, we will analyze the following shadow-price ratios:

$$\frac{p_v}{p_q} = \frac{\hat{p}qt + wt}{\hat{p}vt} = \frac{q + w/\hat{p}}{v} \tag{28}$$

$$\frac{p_t}{p_q} = \frac{\hat{p}qv + wv}{\hat{p}vt} = \frac{q + w/\hat{p}}{t} \tag{29}$$

$$\frac{p_v}{p_t} = \frac{\hat{p}qt + wt}{\hat{p}qv + wv} = \frac{t}{v} \tag{30}$$

From equations (28) and (29) it can be seen that w and $\hat{p}$ affect the price ratios in opposite directions. An increase in w and a decrease in $\hat{p}$, which are trends that have been prevailing in recent years in the western world, cause v and t to be relatively more expensive than q.

With the vast improvements in communications, infrastructure and transportation, the quality-adjusted price $\hat{p}$ is going down and is expected to decrease further. As a result, the price ratio between q and v and between q and t will rise. This makes q relatively cheaper than v and t, and thus, households are expected to increase the quality of their vacations faster than their quantity and length, if the decrease in $\hat{p}$ continues.

Another exogenous variable that has undergone a change in recent years is the time-cost. Salary has been increasing steadily in many industrialized countries. Similar to a decrease in $\hat{p}$, an increase in *w* leads to an increase in *q* relative to *v* and *t*.

Continuous changes in these two exogenous variables lead to changes in the makeup of vacation expenditures. Even if the total expenditure on vacations stays the same, the quality component is becoming more prominent than the other two.

In our model, a change in $\hat{p}$ and *w* does not change the price ratio between *v* and *t* (Equation 30). One of the reasons is that we do not account explicitly for travel cost. An added constant travel cost for each vacation would have made the ratio between *t* and *v* a function of the exogenous variables. The reason we did not do this is that expenditures on vacations abroad in our data set include travel cost and we could not disengage them from the rest of the expenditures. Travel costs within Israel are insignificant due to the fact that Israel is a very small country. Thus, in our estimated model, travel costs are reflected in quality consumption, i.e., a household that traveled further than the others is considered to have consumed a high-quality vacation.

The relationships between the true and observed quality-adjusted price elasticities and time-cost are as follows:

$$\bar{\phi}_v = \phi_v - \frac{wtv}{I}\bar{\eta}_v \tag{31}$$

$$\bar{\phi}_q = \phi_q - \frac{wtv}{I}\bar{\eta}_q \tag{32}$$

$$\bar{\phi}_t = \phi_t - \frac{wtv}{I}\bar{\eta}_t \tag{33}$$

$$\bar{\varepsilon}_v = \varepsilon_v - \frac{\hat{p}qvt}{I}\bar{\eta}_v \tag{34}$$

$$\bar{\varepsilon}_q = \varepsilon_q - \frac{\hat{p}qvt}{I}\bar{\eta}_q \tag{35}$$

$$\bar{\varepsilon}_t = \varepsilon_t - \frac{\hat{p}qvt}{I}\bar{\eta}_t \tag{36}$$

For negative values of the uncompensated elasticities (ε and ϕ) in equations (31)-(36) and a positive value for income elasticities, the absolute values of the compansated elasticities ($\bar{\varepsilon}$ and $\bar{\phi}$) are larger than those observed.

Application

Data

The model was applied to data from the 1999 household expenditures survey of Israel. The survey was conducted during a 13-month period starting in January of 1999 and ending in January of 2000. Investigation of the sample was spread across the survey period so that all weeks in the investigation period would be represented. For some of the expenditure items, the households had to fill in a two-week diary while for items such as vacations and durables, they were requested to report expenditures in the three months preceding the survey. The survey includes 5,921 households out of which we use only those reporting expenditures on travels abroad and vacations in Israel. Additional and detailed information for each of the vacations and trips was provided upon special request by the Central Bureau of Statistics. This information includes expenditures for each trip, who paid for the trip (for instance the employer or the household), the length of the vacation, and number of household members participating in the trip. As we have information for each trip, we can obtain the number of trips taken in Israel and abroad during the three months.

The fact that the households were asked about their trip expenditures during the three months preceding the survey is an advantage because they could better recall the expenditures. In the case of tourism-related expenditures, this presents a disadvantage because of the seasonality effect. Households tend to take more vacations during the summer. A typical household that takes its vacation during the summer would report zero expenses on vacations if they were asked about it during the winter months. In view of this problem, we had to account for seasonality in our estimates. Another problem in the data is that the head of the household does not participate in each trip. Since we use the characteristics of the head of household as explanatory variables, we include data only for trips in which the head of the household participated. Also, trips that were mostly financed by the employer were considered work and not a vacation, and thus were not included. The latter exclusion of data overlooks cases of incentive tourism, where employers take the workers on pleasure trips as a form of payment. We also excluded from the data about 2% of the observations corresponding to vacation expenditures that were more than five standard deviations from the average observed value. A total of 763 observations comprise the final sample used for our estimates.

Estimated Model

In the above theoretical model, $\hat{p}$ and q are two distinct variables. In the reduced-form equation system, $\hat{p}$ is exogenous while q is endogenous. Households participating in the household consumption survey reported their total expenditures on vacations during the survey period. By dividing this by the number of vacations and the number of household members taking the vacations, we receive expenditures per day per person, $p = \hat{p}q$. To estimate the reduced-form equation system, we had to obtain estimates for $\hat{p}$ and q.

Following Goldman and Grossman (1978), we estimate the reduced-form system in two stages. In the first stage, we estimate quality and quality-adjusted price. We assume that the level of quality of the vacation is strongly determined by the level of accommodations. Five dummy variables for each level of accommodation were constructed. An additional sixth variable for traveling abroad was added. Quality can be described as follows:

$$\ln q = aX \tag{37}$$

where X is a vector of dummy variables describing the level of accommodations. By substituting equation (2) into equation (37), we receive the following:

$$\ln p = aX + \ln \hat{p} \tag{38}$$

By estimating the expenditures per vacation day per person as a function of the dummy variables describing the level of accommodations, we can use the predicted value as q while the error term can be used as an estimate for $\hat{p}$. Since the predicted value of $\hat{p}$ is endogenous and it is used as an explanatory variable in the reduced-form equation system, we use instrument variables in the estimation of the reduced form. The instrument variables describe price discrimination in the tourism market and skills in obtaining information. Price discrimination is ubiquitous in the tourism market; for example, prices of the same facilities differ among seasons. Also, people equipped with better searching skills and accessibility to information can obtain lower prices for the same tourism services. Thus the instruments for $\hat{p}$ include the season during which the vacation was taken. The prices are lower in the off season for the same quality of facilities. We also assume that a person with a higher level of education has better access to information than others.

In the second stage, the reduced-form equations are estimated by a three-stage least-square procedure using the computed q and $\hat{p}$ from the first stage and the instruments for $\hat{p}$.

Empirical Estimates

A description of the variables used in both stages of the analysis and their descriptive statistics appears in Table 1.

In the first stage of the analysis, we estimated expenditures per day per person on vacation as a function of the level of accommodations used during the domestic vacations. A vacation abroad was considered the highest level of vacation quality and it is the omitted variable in the regression. The other quality variables range in ranking from a hotel in Israel to a guest house, field school, rented apartment (including B&B) and the last category, youth hostels. The coefficients presented in Table 2 are all negative and significant; they decrease monotonically with a decrease in the level of quality. The computed predicted value of the expenditures per day per person is used for the variable ln(q) in the second stage. The error term of the regression is used to represent the variable ln($\hat{p}$). The error term is endogenous; thus, to estimate the second-stage regressions, we use a three-stage least-square procedure with the aforementioned instrument variables correlated with $\hat{p}$ but not with the other endogenous variables.

In the second stage, v, q and t were estimated as a function of I, w and $\hat{p}$. Dummies for three seasons were added to account for seasonality. Likewise, the average number of household members participating in the vacations was added to the estimated equations. We expect the size of the household to have a negative effect on all three dependent variables because the larger the household, the higher the total expense. Two functional forms were considered for the estimations, linear and log-log. The latter was chosen since it has higher goodness-of-fit values.

Due to the chosen functional form, the estimated coefficients, presented in Table 3, are the observed elasticities of the demand system. Income elasticities for the number, quality and length of the vacation are all positive, less than one and significant. These results show that each of the components of vacation expenditures, number, quality and length of vacation, is normal but, unlike other studies explaining total expenditures, not a luxury good. By summing up all three elasticities, it is seen that the elasticity of total expenditures equals 0.6. Although it is still smaller than one, it should be noted that in our estimations, prices were not assumed constant and that these are the observed elasticities which on average are smaller than the true elasticities. The income elasticity of quality seems the least sensitive to changes in income. Intuitively, we expected the reverse but again, we should note that these are the observed and not true income elasticities. According to equations (22)-(24) and the following analysis, the true income elasticities are larger than the observed ones. If *z* is a basic good then on average, *v*, *q*, and *t* are luxury goods but we cannot determine which one is the largest.

Elasticity of quality-adjusted price in the quality equation ($\bar{\varepsilon}_q$) is, as expected, negative and significant. In the number (*v*) and length (*t*) of vacations, the quality-adjusted price elasticities are negative but only significant for (*t*). The significant quality-adjusted compensated price elasticities calculated in Table 4, where *R* is held constant, do not differ by much from the uncompensated elasticities where *I* is held constant. The significant compensated elasticities of *q* and *t* are smaller in absolute terms than their uncompensated counterparts but still negative and significant, while the compensated elasticity of *v* is now positive but not significant. According to these results, the decrease in quality-adjusted price in recent years can lead to an increase in the quality and length of vacations, while it does not seem to have much effect on the number of vacations taken by the households. However, the full impact on the variables can be determined only by taking into consideration all the changes.

From equations (8)-(10), time-cost, *w*, is expected to have a negative impact on *v* and *t* and no effect on *q*. In the estimation results of the uncompensated elasticities of *w*, only $\bar{\phi}_t$, the time-cost elasticity of *t*, is significant and negative. The other two elasticities are not significantly different from zero. The same is true for the compensated elasticities. That is, in our data, a rise in *w* leads to a decrease in *t*, the length of the vacation, while the number of vacations is not affected by a change in *w*. Based on the estimated and calculated elasticities in Table 4 and equations (20)-(21), it can be said that the income elasticities in the linear demand system with *R* as the true income variable are larger than the estimated elasticities while the reverse is true for the price elasticities.

In recent years, household income and daily wage have been on the rise in western countries while quality-adjusted price is constantly declining. These variables affect *v*, *q* and *t* differently and sometimes in different directions. According to our estimations an increase in income causes households to take more, longer and higher-quality vacations. The decrease in quality-adjusted price leads to higher quality and longer vacations, while an increase in time-cost causes households to take shorter vacations. The seasonal variables are important. In the summer and fall, households take higher-quality and longer vacations than in the winter. In the spring they take the same quality vacation but longer than in the winter. It should be noted that the winter is the low season for tourism in Israel.

The number of household members participating in the vacations has a negative and significant effect on quality and length of the vacation. This means that larger households will not take fewer vacations than smaller ones but will adjust for larger expenses by taking shorter and lower-quality vacations.

Conclusions

In this paper, we model the household demand for vacations by distinguishing between the components of the vacation expenditures: number, quality and length of vacation. The model and its application enable us to identify the source of the observed trend of households taking more but shorter vacations and the increase in high-quality facilities. We show that an increase in income leads to increases in the number, quality and length of vacations while a decrease in quality-adjusted price leads to an increase in both the quality and length of vacations. Moreover, an increase in the alternative cost of time affects vacation length negatively. The observed decrease in vacation length in recent years infers that the increase in cost of time has a more dominant impact than the increase in income and decrease in quality-adjusted price. Households with high time-cost probably tend to combine their vacations with weekends or holidays in order to save time. Thus, instead of taking one long vacation, they take a few long weekends. This change in the composition of the total expenditures cannot be identified if one does not distinguish between the components. In the relevant literature, income elasticities of tourism expenditures are found to be larger than one. In our estimation, when prices and the three components comprising expenditures were explicitly taken into consideration, the observed elasticities show them to be basic goods. Nevertheless, this is not necessarily the case for the true elasticities which take into consideration the full impact of the changes. We could not calculate the value of the true income elasticities but we know that on average they are larger than the observed ones.

The increase in vacation quality is explained by an increase in income and a decrease in quality-adjusted prices. This means that tourists are looking for something more than the low-quality 'Sun, Sand and Sea' resorts that cater to mass tourism. It can explain the emergence of boutique hotels and other high-level tourism facilities in recent years. If these trends will continue to prevail, we can expect a continuous increase in the demand for tourism with an emphasis on high-quality mini-breaks.

Transportation infrastructure to tourism resorts is also gaining in importance: since households are taking shorter vacations they will prefer closer, time-wise, sites.

Bibliography

Allen, R.G.D. (1964). *Mathematical Analysis for Economists*. New York: St. Martin's.

Becker, G.S. and Lewis, H.G. (1973). On the interaction between the quantity and quality of children. *The Journal of Political Economy* 81(2):S279-S288.

Callan, R.J. and Fearon, R. (1997). Town house hotels—an emerging sector. *International Journal of Contemporary Hospitality Management* 9(4):168-175.

CENDANT (2005). *The World Travel in 2020: an Insight into the Drivers that Will Change End-Travelers Behavior and Shape the Future of the Travel Industry*. Report created by the Future Foundation on behalf of Cendant Travel Distribution Services. http://www.futurefoundation.net/publications.php?disp=166.

Costa, D.L. (1997). Less of a Luxury: the Rise of Recreation Since 1888. Working Paper 6054, National Bureau of Economic Research.

Costa, D.L. (1999). American Living Standards: Evidence from Recreational Expenditures. Working Paper 7148, National Bureau of Economic Research

Cox, T.L. and Wohlgenant, M.K. (1986). Prices and quality effects in cross-sectional demand analysis. *American Journal of Agricultural Economics* 68(2):908-919.

Dong, D., Shonkwiler, J.S. and Capps, O. (1998). Estimation of demand functions using cross-sectional household data: the problem revisited. *American Journal of Agricultural Economics* 80(5):466-473.

Goldman, F. and Grossman, M. (1978). The demand for pediatric care: an hedonic approach. *The Journal of Political Economy* 86(2):259-280.

Marder, M. (2004). Expenditures of Israeli Households on Recreational Goods- Changes over Time. Unpublished Masters Thesis, Hebrew University of Jerusalem.

Melenberg, B. and Van Soest, A. (1996). Parametric and semi-parametric modelling of vacation expenditures. *Journal of Applied Economics* 11(1):59-76.

OECD (2002). *Household Tourism Travel: Trends, Environmental Impacts and Policy Responses.* Paris: OECD. http://www.olis.oecd.org/olis/2001doc.nsf/43bb6130e5e86e5fc12569fa005d004c/1df9e50b1b092650c1256b9f0034b213/$FILE/JT00124673.PDF.

Van Soest, A. and Kooreman, P. (1987). A micro-econometric analysis of vacation behaviour. *Journal of Applied Econometrics* 2(3):215-226.

Mathematical Appendix

To analyze the relationship between the true and observed income elasticities, we define the following price indices:

$$d\ln(\overline{p}) = k_v d\ln p_v + k_q d\ln p_q + k_t d\ln p_t \quad \text{(A1)}$$

$$d\ln\overline{\pi} = \frac{tvw}{I} d\ln w + \frac{\hat{p}qvt}{I} d\ln\hat{p} \quad \text{(A2)}$$

Using equations (8)-(10) in the text and:

$$d\ln R = (1-k)d\ln I + kd\ln(2\hat{p}vqt + wvt) \quad \text{(A3)}$$

we get the following:

$$d\ln(R/\overline{p}) = (1-k)d\ln(I/\overline{\pi}) \quad \text{(A4)}$$

From A4 and equations (17)-(19) in the text we get equations (22)-(24).

In order to define the sign of the coefficients in equations (22)-(24), they were rewritten as follows:

$$\eta_v(1-k) = a_1\overline{\eta}_v + b_1\overline{\eta}_q + c_1\overline{\eta}_t \quad \text{(A5)}$$

$$\eta_q(1-k) = a_2\overline{\eta}_v + b_2\overline{\eta}_q + c_2\overline{\eta}_t \quad \text{(A6)}$$

$$\eta_t(1-k) = a_3\overline{\eta}_v + b_3\overline{\eta}_q + c_3\overline{\eta}_t \quad \text{(A7)}$$

where a_i, b_i, c_i $i = 1,2,3$ represent the coefficients of the observed income elasticities in equations (22)-(24).

We assume that $\sigma_{qq} = \sigma_{tt} = \sigma_{vv} = \sigma^*$; we also know they are all negative.

We also assume $\sigma_{qv} = \sigma_{qt} = \sigma_{vt} = \sigma$. As we know that for at least one of the σ_{ij}'s must be positive, assuming equality between them means that they are all positive. From these assumptions and from second-order conditions we know that: $a_1 > 0, b_2 > 0, c_3 > 0$ and $a_2 = c_2$, $a_3 = c_1$, $a_1 = c_3$, $b_1 = b_3$. As $k_q < k_v = k_t$, we get that all coefficients excluding a_2 and c_2 are positive. a_2 and c_2 can be either positive or negative.

Table 1: Description and Descriptive Statistics of Variables

Variables	**Description**	**Average**	**S.D.**
Hotel in Israel	=1 if household stayed in such a facility during the vacation	0.019	
Guest house	=1 if household stayed in such a facility during the vacation	0.004	
Field school	=1 if household stayed in such a facility during the vacation	0.016	
Youth hostel	=1 if household stayed in such a facility during the vacation	0.043	
Rented apartment	=1 if household stayed in such a facility during the vacation	0.350	
Vacation abroad	=1 if household stayed in such a facility during the vacation	0.636	
v	Number of vacations taken in the 3 months preceding the survey	1.306	0.623
q	Average quality of vacations	388.8	138.8
t	Average length of vacation in days	5.958	4.706
I	Net household income	16,103.9	11,697.8
w	Wage per day of the head of the household	289.7	502.5
$\hat{p}$	Quality-adjusted price	1.121	0.633
np	Average number of persons taking vacations	2.326	1.276
Spring	Dummy = 1 if vacation was taken during the	0.217	

	spring months		
Summer	Dummy = 1 if vacation was taken during the summer months	0.284	
Fall	Dummy = 1 if vacation was taken during the fall months	0.353	
Instruments			
No. yrs. education	Number of years of education	13.958	3.527
Low season	Dummy = 1 if the vacation was taken during the low season	0.281	

Table 2: Regression Estimates for Level of Quality of Vacation

Variable	**Coefficients**	**S.D.**
Constant	6.24*	0.31
Hotel in Israel[1] = 1	-0.78*	0.04
Guest house[1] = 1	-0.95*	0.09
Field school[1] = 1	-1.12*	0.16
Rented apartment[1] = 1	-1.29*	0.14
Youth hostel[1] = 1	-1.27*	0.23
R^2	0.40	
N	763	

*Significant at 5%.

[1]Omitted variable is vacation abroad.

Table 3: Three-Stage Least-Square Estimates of Number, Quality and Length of Vacation

Variables	**ln(*v*)**	**ln(*q*)**	**ln(*t*)**
Constant	-1.5803* (0.22)	4.910* (0.2)	-0.717 (0.413)
ln(*I*)	0.1916* (0.02)	0.135* (0.022)	0.275* (0.044)
ln(*w*)	-0.0024 (0.004)	-0.003 (0.004)	-0.032* (0.009)
ln($\hat{p}$)	-0.0026 (0.028)	-0.238* (0.027)	-0.618* (0.054)
ln(*np*)	-0.0399 (0.028)	-0.520* (0.026)	-0.804* (0.052)
Spring	-0.0615 (0.041)	0.018 (0.038)	0.155* (0.077)
Summer	-0.0001 (0.039)	0.095* (0.036)	0.370* (0.073)
Fall	-0.0015 (0.038)	0.081* (0.036)	0.319* (0.072)
R^2	0.3	0.51	0.45
N	764	764	764

Note: Standard deviations are in parentheses.

*Significant at 5%.

Table 4: Observed and True Elasticities of Number, Quality and Length of Vacations

Elasticities	**Uncompensated**	**Compensated**
Income elasticity of *v*	0.191*	
Income elasticity of *q*	0.135*	
Income elasticity of *t*	0.275*	
Quality-adjusted price elasticity of *v*	-0.0026	0.026
Quality-adjusted price elasticity of *q*	-0.23*	-0.22*
Quality-adjusted price elasticity of *t*	-0.61*	-0.57*
Time-cost elasticity of *v*	-0.0024	0.008
Time-cost elasticity of *q*	-0.003	0.004
Time-cost elasticity of *t*	-0.032*	-0.018*

*Significant at 5%.

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