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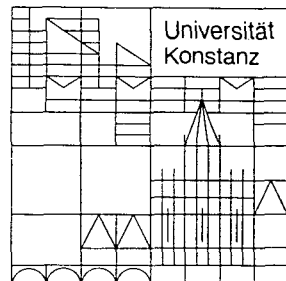
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**MICROECONOMETRIC MODELS OF  
TOURISTS' DESTINATION CHOICE**

**Angelika Eymann**  
**Gerd Ronning**

Serie II - Nr. 171

Februar 1992

# Microeconomic Models of Tourists' Destination Choice

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## Abstract

Within the framework of a microeconomic model of leisure demand, the determinants of German tourists' decisions whether to spend vacation at all, which activities to pursue, and which travel destination to choose are investigated empirically. Three-stage nested multinomial logit models are applied to data from three independent samples of persons interviewed for their vacation behaviour in 1975, 1980, and 1985. Implicit prices for the bundles of activities chosen at each of the various destinations are determined by hedonic regression of total expenditure per person and day on the characteristics of the vacation spent. The estimates of these prices, together with a number of socioeconomic variables and individual judgements on destination-specific characteristics are used to explain the individual decision between the alternatives in the choice set. Estimation results clearly reflect the relevance of individual-specific search costs as well as the costs of overcrowding for the tourists' destination choice. While the budget constraint seems to have been alleviated over time, the time constraint has never lost its binding effects on the decision whether to spend vacation at all.

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# 1 Introduction

International tourism expanding continuously, the tourist industry has become one of the leading industries in many developing countries. The supply of tourism-related commodities is increasing in terms of both (accommodation and transportation) capacity and regional availability. Equally increasing is the degree of product differentiation for these commodities. Although receipts from international tourism have augmented in countries like Japan, Germany, or the Netherlands, as well, their residents' growing propensity to spend their vacation abroad has counterbalanced their chronic trade surplus significantly. Not only the frequency of travelling and the mileage have augmented, however, yet also tourists' expenditure at a given destination.<sup>1</sup> This fact coincides with the evidence of rising expenditure for leisure-related commodities in the industrialized countries in general.<sup>2</sup>

The question arises how a rational individual allocates time and money between work and several non-work activities and — more specifically — what determines the individual decision to migrate with the aim of consumption rather than work and with the irrevocable intention to return after a short sojourn, the duration of which is fixed before departure. A number of macroeconomic and regional case studies exist that analyze the development of business- and leisure-induced tourism,<sup>3</sup> yet analyses of tourists' behaviour at a microlevel are surprisingly rare. Whereas the individual decision between work and leisure has been analyzed extensively,<sup>4</sup> Owen (1969) is among the few microeconomic studies to focus on the choice of leisure activities; the analyses by Van Soest and Kooreman (1987) and von Böventer (1989) concentrate on the investigation of tourists' demand, disregarding the long-term effects of vacation.

The present study tries to combine the latter two approaches: Tourism demand is interpreted as demand for non-tradable commodities the consumption of which is time-intensive and affects the individual's health, human capital, "pleasure", and social relations. Health and human capital are proposed to be positively related with income and with the efficiency of consumption; prices and qualities of differentiated non-tradable products are assumed to vary over time and space. A rational individual is therefore expected to firstly decide how to allocate time and money over lifetime and secondly to simultaneously choose the optimal bundle of tradable goods and the locations offering the utility-maximizing bundles of non-tradable goods for each given period. The existence of transaction and search costs may explain one of the charac-

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<sup>1</sup>Cf. OECD (1989).

<sup>2</sup>Cf. United Nations (1988).

<sup>3</sup>See e.g. Gray (1970) or Williams and Shaw (1988).

<sup>4</sup>See e.g. Gronau (1977).

teristics of tourists' destination choice: Rather than purchasing commodities in various qualities at several locations, the vast majority of tourists chooses to stay at one destination and consume the relatively small range of commodities there offered.

Assuming that the individual utility function is separable in tradables and non-tradables, the study focuses on the empirical analysis of the individual demand for non-tradables. Three-stage nested multinomial logit models have been chosen to analyze the (simultaneous) individual decision whether to spend vacation at all (i.e. whether to consume at a location different from the place of residence), which activities to pursue, and which travel destination to choose. The study focuses on tourists that spent leisure-induced vacation of more than four days in one of sixteen countries/ country groups including West Germany. The data used stem from three independent samples of Germans older than 14 years that have been interviewed for their vacation behaviour in 1975, 1980, and 1985, respectively. Hedonic price indices have been constructed for each destination in the choice set. Estimation results for each of the three years are compared. Special attention is paid to the extent to which the multitudinous destinations visited by tourists in each sample can be aggregated.

The paper is organized as follows: Whereas the economic reasoning for the empirically observable behaviour of tourists is sketched in section 2, the econometric modelling is described in section 3. Empirical results are presented in section 4, and section 5 concludes the paper.

## 2 The Choice of Leisure Activities

### 2.1 Intertemporal Aspects of Consumption

Suppose that wealth ( $W$ ) as well as human capital ( $E$ ) and a person's health ( $H$ ) deteriorate over lifetime and that they do so at constant rates ( $\rho^W$ ,  $\rho^E$ , and  $\rho^H$ ). Assume also that perfect credit markets exist and that both physical and financial wealth are a source of income. Following Becker's (1975) suggestion, consumption may be interpreted as a production process (with decreasing returns to scale) where input factors time ( $T^E$ ,  $T^H$ ,  $T^W$ ,  $T^A$ ) and market goods ( $X^E$ ,  $X^H$ ,  $X^W$ ,  $X^A$ ) are combined to aggregated commodities ( $C^E$ ,  $C^H$ ,  $C^W$ ,  $C^A$ ) the utilization of which yields pleasure,

$$U = U(C^E, C^H, C^W, C^A),$$

$$C^i = C^i(X^i, T^i; E, H), \quad i \in \{E, H, W, A\},$$

and, for the case of the commodities  $C^E$ ,  $C^H$ , and  $C^W$ , serves to increase the stocks of health, human capital, and wealth, as reflected by the (strictly concave) functions

$\epsilon$ ,  $h$ , and  $w$ :

$$\begin{aligned}\dot{E} &= e(C^E(X^E, T^E; E, H)) - \rho^E E, \\ \dot{H} &= h(C^H(X^H, T^H; E, H)) - \rho^H H, \\ \dot{W} &= w(C^W(X^W, T^W; E, H)) + rW + Y(T^{\max} - T^E - T^H - T^W - T^A; E, H) \\ &\quad - \rho^W W - (P^E X^E + P^H X^H + P^W X^W + P^A X^A),\end{aligned}$$

Superscripts  $E$ ,  $H$ ,  $W$ , and  $A$  indicate subgroups related to education, health care, administration of property including housework, and plain amusement,<sup>5</sup> respectively;  $U$  denotes the individual's direct utility function that is assumed to be strictly quasiconcave,  $Y$  stands for permanent income, the four subgroups of  $P$  represent price indices, and  $r$  reflects the interest rate which is assumed to be constant over time;  $\dot{E}$ ,  $\dot{H}$ , and  $\dot{W}$  denote the rates of increase or decrease corresponding to the three capital stocks  $E$ ,  $H$ , and  $W$ ;  $T^{\max}$ , the maximal time available per period, is set equal to one. All monetary variables are measured in real values. Evidently, there exists a recursive relation between consumption and the stocks of health and human capital: Illness or ignorance not only affect productivity of work — and thus permanent income — yet also reduce the efficiency of consumption. Decreasing returns to scale, however, seem to be realistic for all input factors, including health and human capital.

Assume that a rational individual is de facto "born" at the end of the compulsory school education and "inherits" non-zero stocks of health, human capital, and property. The individual then maximizes utility over the expected lifetime  $T$  subject to the constraints that total expenses must equal total income over lifetime and that the shadow prices of human capital, health, and property take zero-values at  $T$ . The allocation plans for the remaining lifetime may be revised whenever the individual acquires new information relevant for the decision of how to spend time and money for work and the diverse types of consumption. The optimal allocation path for the input factors time and money will then, of course, depend on the individual's endowments in period 0, prices, wage rates, the interest rate, the individual's time preference rate, the size of the depreciation rates  $\rho^E$ ,  $\rho^W$ , and  $\rho^H$ , and eventually the functional relations between consumption and the input factors, yet also between consumption and permanent income and the stocks of health and human capital. Equilibrium conditions<sup>6</sup> demand

<sup>5</sup>Social activities such as visiting family members or friends will be henceforth subsumed to the "consumption for pleasure" (A)-group. Family planning decisions will be discarded.

<sup>6</sup>Solutions to the control problem are yielded by maximization of the Hamiltonian function  $\mathcal{H}$ :

$$\begin{aligned}\mathcal{H} &= \int_{t=0}^T e^{-\delta t} U_t(C^E, C^H, C^W, C^A) \\ &\quad + \lambda^E (e(C^E(X^E, T^E; E, H)) - \rho^E E) + \lambda^H (h(C^H(X^H, T^H; E, H)) - \rho^H H) \\ &\quad + \lambda^W (w(C^W(X^W, T^W; E, H)) + rW + Y(T^{\max} - T^E - T^H - T^W - T^A; E, H) \\ &\quad - \rho^W W - (P^E X^E + P^H X^H + P^W X^W + P^A X^A))\end{aligned}$$

that *in each period* the shadow price of the three capital stocks must equal the ratio of the marginal utility of the input factors and their marginal costs, the latter costs being reduced by the marginal increase of the respective capital stocks implied by the input factors. It seems noteworthy, however, that, for the case of those input factors related to human capital and health, it is the ratio of the weighted difference of the marginal utilities, caused by market goods and time, and the corresponding marginal costs (also reduced by the marginal capital stock increase) that must equal the shadow prices of all three capital stocks. The weights consist of the marginal effects of the input factor's substitute good (i.e. time in the case of market goods and vice versa) on either of the capital stocks; they therefore mitigate the effects of changes in the relative factor costs.

If the depreciation rate of health is assumed to be larger than the one of human capital, if education-related activities are similarly enjoyable as health-improving activities and if the effect of human capital on income is proposed to be higher than the one of health while the productivity effects on consumption are very small and symmetric it can be shown that for a young person the shadow price of human capital is higher than those of health and property. Not surprisingly, a rational individual will therefore spend more time and money for education than for health care and property administration when young and will reduce the proportion of all investment activities as compared to mere pleasure activities when getting older. Moreover, we can conclude that with rising income, the individual will increasingly substitute the input factor time by market goods. We can thus expect that expenditure for all types of leisure goods are particularly high for middle-aged persons that have accumulated health, property, and human capital, whereas the very young just as the very old will prefer time-intensive consumer goods. More importantly from a macroeconomic viewpoint, the hypothesis is supported by the empirical evidence of a significant increase both in leisure expenditure and real income for the period 1970 to 1990.<sup>7</sup>

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$$- \rho^W W - \left( P^E X^E + P^H X^H + P^W X^W + P^A X^A \right),$$

where  $\delta$  denotes the person's time preference rate,  $t$  indicates the period, and  $\lambda^E$ ,  $\lambda^H$ , and  $\lambda^W$  represent the shadow prices of the three capital stocks.

<sup>7</sup>West German private expenditure for recreational, entertainment, education, and cultural services almost doubled within the period 1970 to 1988, while (real) average gross hourly earnings of manual workers have increased by roughly 25%. Cf. United Nations (1988) and EUROSTAT (1989).



## 2.2 Regional Aspects of Consumption: Tourists' Destination Choice

To improve our reflection of reality, we will have to weaken our assumptions considerably: As perfect credit markets do not exist, not only a budget constraint over lifetime exists yet the individual's financial scope is more or less bound to the income per period. Furthermore, constraints binding for other household members may have spillover effects on the individual decision what to consume and when. For short-term considerations, a positive effect of working time on earned income may not even be established; while pensions are generally independent of changes in health, human capital, or even work time, the budget constraint of employees is kinked due to the existence of an institutionally guaranteed paid leave.<sup>8</sup>

Weakening the assumption of product homogeneity for each of the aggregated market goods  $X^E$ ,  $X^H$ ,  $X^W$ , and  $X^A$ , it will be henceforth assumed that these market goods are offered at various locations and in diverse qualities. Quality differentials will be measured by differences in the "output" (increase of utility or either of the three types of capital) of the consumption process for given amounts of the input factors (both time and market goods, health and human capital); different "brands" of the same product may be substituted by each other. Prices for the same brand will vary by regions, if search and transaction costs exist. Given the intertemporal allocation path for the diverse input factors, a rational individual will thus not only optimize the consumption of time and market goods per period yet also the the demand for the diverse brands of each product. If a subgroup of these market goods are non-tradable, it may be optimal to migrate to the place of production to purchase and consume these products.<sup>9</sup> Zero consumption will then be frequent with regard to the non-tradable products' brands, as the sum of the transaction costs, implied by the purchase of goods at differing locations, may well exceed the individual's budget constraint. The individual may thus be forced either to reduce the frequency of consumption of the respective activities yet increase

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<sup>8</sup>Leisure is institutionally guaranteed for most employees in Germany; its average length per year (29 days of vacation plus nine to fourteen official holidays and weekends in 1987) has substantially increased during the last twenty years. Wages and salaries are paid during sick-leave, including cures that are relatively frequently taken, and do not affect the institutionally fixed leisure-time. Cf. Lorenz (1991), p.78.

<sup>9</sup>Migration with the aim of consuming tradables can only be outruled if transportation costs are assumed to be lower (yet non-negligible) for products than for persons. Migrants may, however, gain by consuming both non-tradables and tradables at the site chosen. Positive as well as negative external effects of migration exist; whereas search and transaction costs can be expected to decrease with the number of migrants, quality may be reduced by the effects of overcrowding. The efficiency of search activities clearly depends on the individual's human capital, such as the knowledge of foreign languages.

the quality or quantity demanded or to substitute high-quality market goods by more time-intensive goods offered at a closer distance. The decision of how to alleviate the budget constraint will depend on the individual's marginal cost of time, the variety of brands offered as well as the elasticity of substitution between pairs of brands and market goods, and the producers' regional distribution. It can thus be expected that comparatively distant sites with a very specialized supply structure of high-quality goods (such as sports facilities, language courses, or cultural events) attract young, "ambitious" persons as well as middle-aged persons with comparatively high income and no or little paid leave. Elderly persons, however, with low marginal costs of time and low income, for whom investments may be less rewarding, as well as families with children are likely to prefer locations that are close to their place of residence, demand little search activities, and offer a relatively broad scope of medium-quality products (such as restaurants, swimming pools, walking tours, etc.).

### **3 The Empirical Analysis of Tourists' Demand**

#### **3.1 Random Utility Maximization and Discrete Choice Analysis**

The vast majority of tourists<sup>10</sup> seem to prefer one extended sojourn per year to several shorter visits at one or more sites. Apart from the reasons given above, this behaviour may result from the existence of increasing returns to scale for consumption. Indeed, it seems plausible that two weeks of vacation are more restful than two spells of one week each, as the efforts of adaption to a new environment are obvious. Without too much loss of generality, we therefore concentrate on the choice of mutually exclusive vacation activities and destinations for what tourists themselves considered as their "main vacation of the year" and leave other, shorter sojourns out of account.

The individual's utility function will henceforth be assumed to be separable with respect to tradable and non-tradable commodities. Disregarding the demand for tradables, a person can be expected to simultaneously determine the utility-maximizing bundle of input factors at each production site and the optimal location, i.e. travel destination. Prediction as to which of the given alternatives will yield maximal utility to the tourist clearly underly uncertainty, given the limited information on both

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<sup>10</sup>85.7, 83.6, and 86.1 percent of those who spent vacation of more than four days in 1985, 1980, and 1975 respectively, did so only once. The shares of those who spent vacation of more four days only once and made no short trips throughout the years in question shrink to 56.9%, 59.9%, and 68.8% for the respective years.

the individual's socioeconomic situation and the supply structure of the destinations. Manski's concept of (seemingly) random utility maximization<sup>11</sup> thus appears as a sound basis for the microeconomic analysis of individual travel behaviour. To gain empirical insights into the (observable) elements of the individual's indirect utility function, i.e. the factors motivating a person's choice whether or not to "migrate", which types of activities to pursue, and at which site to do so, each alternative's *choice probability* is estimated on the basis of both socioeconomic and alternative-specific variables. The probabilities' functional form is derived from the distributional assumption with regard to the additive random utility term reflecting unobservable elements of the utility function.

### 3.2 The Nested Multinomial Logit Model

For the case of many, mutually exclusive alternatives a tradeoff between computational tractability and flexibility of the correlation structure exists with regard to the distributional assumption for the random utility term. Utilization of the nested multinomial logit model, basing on McFadden's proposal to assume the Gumbel distribution of type B, is one way out of the dilemma.<sup>12</sup> Although the similarity structure of the alternatives and their (possibly nested) subgroups has to be assumed beforehand, elasticities of cross-substitution between pair alternatives of different subgroups (nodes) can be estimated freely. Dissimilarity parameters, ranging in the unit interval,<sup>13</sup> reflect the alternatives' degree of similarity within each of the assumed subgroups. Multinomial logit (MNL)-model and nested multinomial logit (NMNL)-model are equivalent if all dissimilarity parameters take the value of one; otherwise, the independence of irrelevant alternatives (IIA)-property, typical of the MNL-model, is valid for alternatives within subgroups only.

The computational ease of the NMNL-model is due to the fact that choice probabilities take closed form and that they can be further split up into the product of

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<sup>11</sup>Manski (1977) proposes that the empirically observed stochastic behaviour of test persons does not contradict the assumption of individual rationality but can be explained by information deficiency of external observers. Hence, he assumes that the indirect utility function of each individual is additively separable into a deterministic and a stochastic term, the latter one representing unobserved socioeconomic and commodity-specific characteristics.

<sup>12</sup>Assumption of the Gaussian distribution allows for a flexible correlation structure of the random terms, yet estimation of the corresponding multinomial probit model is hardly feasible for large choice sets. Simulation methods mitigating the computational problems have been suggested e.g. by McFadden (1989) or Pakes and Pollard (1989).

<sup>13</sup>Börsch-Supan (1987, 1990) and Koning and Ridder (1991) state that dissimilarity parameters greater than one may be compatible with random utility maximization, whereas values lower than zero unambiguously indicate misspecification of the model.

conditional choice probabilities for each node of the "decision tree". (For illustrative purposes the alternatives' similarity structure is henceforth depicted as the nesting structure of a multilevel decision tree that is identical for all individuals.) The loglikelihood function  $L$  for a three-level NMNL-model is given as follows:

$$L = \sum_{t=1}^T \sum_l \sum_{s \in B_l} \sum_{j \in B_s} \delta_{tj|sl} \ln P_{tj|sl}, \quad (3-1)$$

$$P_{tj|sl} = P_{tj|sl} \cdot P_{ts|l} \cdot P_{tl},$$

where  $P_{tj|sl}$  represents individual  $t$ 's unconditional choice probability for alternative  $j$ , while  $P_{tj|sl}$ ,  $P_{ts|l}$ , and  $P_{tl}$  denote individual  $t$ 's conditional choice probabilities for upper-level nodes  $l$ , medium-level nodes  $s \in B_l$ , and alternatives  $j \in B_s$ , respectively.  $B_l$  and  $B_s$  represent all subsequent nodes of "branches"  $l$  and  $s$ . The indicator variable  $\delta_{tj|sl}$  reflects whether or not individual  $t$  chose alternative  $j$ . Conditional choice probabilities are of logit-type each; additional to alternative- or node-specific ( $u_{tj|sl}$ ,  $v_{ts|l}$ ,  $w_{tl}$ ) and socioeconomic ( $x_t$ ,  $y_t$ ,  $z_t$ ) variables, the informational content (*inclusive value*) of subsequent nodes is utilized to explain the individual's conditional choice of a certain node:

$$P_{tj|sl} = \frac{\exp\left(u'_{tj|sl} \frac{\alpha}{\theta_{sl}} + x'_t \frac{\alpha_{j|sl}}{\theta_{sl}}\right)}{\sum_{i \in B_s} \exp\left(u'_{ti|sl} \frac{\alpha}{\theta_{sl}} + x'_t \frac{\alpha_{i|sl}}{\theta_{sl}}\right)}, \quad (3-2)$$

$$P_{ts|l} = \frac{\exp\left(v'_{ts|l} \frac{\beta}{\rho_l} + y'_t \frac{\beta_{sl}}{\rho_l} + \frac{\theta_{sl}}{\rho_l} I_{sl}\right)}{\sum_{q \in B_l} \exp\left(v'_{tq|l} \frac{\beta}{\rho_l} + y'_t \frac{\beta_{ql}}{\rho_l} + \frac{\theta_{ql}}{\rho_l} I_{ql}\right)}, \quad (3-3)$$

$$P_{tl} = \frac{\exp\left(w'_{tl} \gamma + z'_t \gamma_l + \rho_l I_l\right)}{\sum_m \exp\left(w'_{tm} \gamma + z'_t \gamma_m + \rho_m I_m\right)}, \quad (3-4)$$

$$I_{sl} = \ln \left( \sum_{j \in B_s} \exp\left(u'_{tj|sl} \frac{\alpha}{\theta_{sl}} + x'_t \frac{\alpha_{j|sl}}{\theta_{sl}}\right) \right),$$

$$I_l = \ln \sum_{s \in B_l} \exp\left(v'_{ts|l} \frac{\beta}{\rho_l} + y'_t \frac{\beta_{sl}}{\rho_l} + \frac{\theta_{sl}}{\rho_l} I_{sl}\right),$$

where  $\alpha_{j|sl}$ ,  $\beta_{sl}$ ,  $\gamma_l$ ,  $\alpha$ ,  $\beta$ , and  $\gamma$  denote vectors of coefficients for explanatory variables other than inclusive values ( $I_{sl}$ ,  $I_l$ ), while  $\theta_{sl}$  and  $\rho_l$  represent dissimilarity parameters. Socioeconomic variables impacting the choice of each alternative differently, a major problem of model specification arises with regard to the assignment of socioeconomic explanatory variables to the different stages of decision. The problem of finding the most adequate specification is further aggravated by the fact that the number of coefficients to be estimated varies by the number of alternatives that are comprised in the node affected.

Elasticities of choice probabilities with respect to explanatory variables directly reflect the assumed nesting structure of the decision tree. If the estimates of dissimilarity

parameters range in the unit interval, elasticities take larger values within than between nodes. The reverse is true if these estimates take values larger than one.

The elasticities' structure depends on the type of the corresponding variable: Socioeconomic variables, taking values that do not differ across alternatives, show different impact on each of the alternatives of a node; the respective elasticities therefore vary within and between nodes. Elasticities of individual  $t$ 's probability  $P_{tir k}$  of choosing alternative  $i \in B_r, r \in B_k$  with regard to socioeconomic exogenous variables  $z_t, y_t,$  and  $x_t$  of a three-level NMNL-model are obtained as follows:

$$\begin{aligned} \frac{\partial P_{tir k}}{\partial x_t} \frac{x_t}{P_{tir k}} &= x_t \left( \rho_k \sum_{q \in B_k} P_{tq|k} \frac{\theta_{qk}}{\rho_k} \sum_{h \in B_q} P_{th|qk} \frac{\alpha_{hqk}}{\theta_{qk}} \right. \\ &\quad - \sum_m P_{tm} \rho_m \sum_{q \in B_m} P_{tq|m} \frac{\theta_{qm}}{\rho_m} \sum_{h \in B_q} P_{th|qm} \frac{\alpha_{hqm}}{\theta_{qm}} \\ &\quad + \frac{\theta_{rq}}{\rho_q} \sum_{h \in B_r} P_{th|rk} \frac{\alpha_{hrk}}{\theta_{rk}} - \sum_{q \in B_k} P_{tq|k} \frac{\theta_{qk}}{\rho_k} \sum_{h \in B_q} P_{th|qk} \frac{\alpha_{hqk}}{\theta_{qk}} \\ &\quad \left. + \frac{\alpha_{irk}}{\theta_{rk}} - \sum_{h \in B_r} P_{th|rk} \frac{\alpha_{hrk}}{\theta_{rk}} \right), \end{aligned} \quad (3-5)$$

$$\begin{aligned} \frac{\partial P_{tir k}}{\partial y_t} \frac{y_t}{P_{tir k}} &= y_t \left( \rho_k \sum_{q \in B_k} P_{tq|k} \frac{\beta_{qk}}{\rho_k} - \sum_m P_{tm} \rho_m \sum_{q \in B_m} P_{tq|m} \frac{\beta_{qm}}{\rho_m} \right. \\ &\quad \left. + \frac{\beta_{rk}}{\rho_k} - \sum_{q \in B_k} P_{tq|k} \frac{\beta_{qk}}{\rho_k} \right), \end{aligned} \quad (3-6)$$

$$\frac{\partial P_{tir k}}{\partial z_t} \frac{z_t}{P_{tir k}} = z_t \left( \gamma_k - \sum_m P_{tm} \gamma_m \right). \quad (3-7)$$

If socioeconomic variables are assumed to impact the choice of alternatives *and* nodes, i.e. if exogenous variables are included in  $x_t$  as well as  $y_t$  or  $z_t$ , the respective elasticities equal the sum over the alternative- or node-specific elasticities obtained from (3-5), (3-6), and (3-7).

A marginal change in an alternative-specific variable's outcome for a particular alternative equally affects the choice probabilities for all other alternatives of the same node. The latter fact thus mirrors the assumption of independence from irrelevant alternatives for each node that underlies the NMNL-model. Elasticities of choice probabilities with respect to alternative-specific and node-specific variables are determined as follows:<sup>14</sup>

$$\frac{\partial P_{tir k}}{\partial u_{tj s l}} \frac{u_{tj s l}}{P_{tir k}} = u_{tj s l} \frac{\alpha}{\theta_{s l}} \left( \rho_l \frac{\theta_{s l}}{\rho_l} P_{t s | l} P_{t j s | l} (\delta_{k l} - P_{t l}) \right)$$

<sup>14</sup>Restriction of the parameters across nodes implies summation of the respective terms across nodes. The formula used to compute the elasticities' values shown in table 4 thus differs slightly from the formula presented here.

$$+ \frac{\theta_{sl}}{\rho_l} P_{tj|l} (\delta_{rs} \delta_{kl} - P_{ts|l} \delta_{kl}) + \delta_{ij} \delta_{rs} \delta_{kl} - P_{tj|sl} \delta_{rs} \delta_{kl} \Big), \quad (3-8)$$

$$\frac{\partial P_{tir k}}{\partial v_{tsl}} \frac{v_{tsl}}{P_{tir k}} = v_{tsl} \frac{\beta}{\rho_l} \left( \rho_l P_{ts|l} (\delta_{kl} - P_{tl}) + \delta_{rs} \delta_{kl} - P_{ts|l} \delta_{kl} \right), \quad (3-9)$$

$$\frac{\partial P_{tir k}}{\partial w_{tl}} \frac{w_{tl}}{\partial P_{tir k}} = w_{tl} \gamma (\delta_{kl} - P_{tl}). \quad (3-10)$$

Indicator variables  $\delta_{kl}$ ,  $\delta_{rs}$ , and  $\delta_{ij}$  reflect whether or not alternatives  $k$  and  $l$  or nodes  $r$  and  $s$  or  $i$  and  $j$  coincide.

Elasticity values shown in tables 4 and 5 represent the averages of all individual-specific elasticity values rather than elasticities that have been determined from average values of each variable. The concept of elasticities is clearly meaningless for socioeconomic dummy variables. Individual choice probabilities are therefore determined for both possible outcomes of the particular dummy variable. Relative deviations ( $D_{rel}$ ) of the respective probability values are obtained as follows:

$$D_{rel} = \frac{P_{tir k}(1) - P_{tir k}(0)}{P_{tir k}(0)}. \quad (3-11)$$

Average deviations across all individuals are given in tables 6a, 6b, and 6c, reflecting the *combined* effect of a switch in the outcome of the particular variable at *all* decision levels to which the variable is assigned.

### 3.3 Computational Aspects

Whereas, due to the global concavity of the loglikelihood function, ML-estimation of MNL-models is computationally easy even for a large number of alternatives, ML-estimation of NMNL-models causes diverse problems. Full information ML-estimation leads to both consistent and efficient estimators, yet computations prove to be almost intractable for large data sets and many alternatives: Multiple maxima of the loglikelihood function exist, numerical overflow problems occur frequently, and estimations are extremely time-consuming. Utilization of the recursive structure of NMNL-models by sequential estimation of MNL-models for each single node, resulting in consistent estimators, seems advisable, therefore. This method's major disadvantage, inefficiency of the estimators, is caused by the asymmetric utilization of information at different "decision stages" — the number of data points involved in the estimation rises from the lowest to the highest level of the decision tree — and by neglect of proportionality restrictions across nodes. The additional problem of downwardly biased standard errors can be overcome, however, by correcting the estimators' covariance matrix as suggested by McFadden (1981).<sup>15</sup> To achieve efficiency of the estimators yet avoid computational

<sup>15</sup>Cf. McFadden (1981, pp. 252-260). The correction formula can only be applied if the dissimilarity parameters of all nodes of the same level are constrained to be equal. Brownstone and Small (1989,

errants, Brownstone and Small (1989) propose the utilization of estimators obtained from sequential estimation as starting values for a single FIML-iteration step. As has been shown by Hensher (1986), one FIML-step is rarely sufficient, though. On the contrary, the number of iterations steps needed to reach convergence is frequently higher for FIML-estimations that start from sequential estimation results than for those that use arbitrary starting values.

As numerical problems turned out to be immense for full information ML-estimations of the NMNL-models presented here, and Brownstone/Small's method proved to be as disadvantageous as described by Hensher (1986), the sequential technique has been chosen for all estimations.<sup>16</sup> Results shown in tables 2 and 3 have been determined recursively from estimated parameters.<sup>17</sup> The correction of all *t*-ratios as suggested by McFadden (1981) implies that coefficients assigned to the choice of single alternatives have to be constrained to be equal across nodes.

## 4 Empirical Results

### 4.1 The Data

Data are drawn from three independent samples of West German consumers that were interviewed on their vacation behaviour in 1975, 1980, and 1985.<sup>18</sup> These samples include both tourists (persons that spent more than four days of leisure-induced vacation at any place other than their domicile during the year in question) and persons who did not spend vacation as defined above.

Although very detailed information on the interviewees' recreational activities, travel preparations etc. is provided in the datasets, only a minor part thereof has been useful for the present analysis.<sup>19</sup> Moreover, the three questionnaires focus on different topics, so questions vary considerably and, even if repeated, can hardly be compared. Variables that have been extracted refer to the individuals' socioeconomic situation, characteristics of their vacation such as destination, organizational form, transporta-

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p. 70) state, however, that the corrected standard errors are still downwardly biased if some of the nodes are degenerate, i.e. consist of a single alternative.

<sup>16</sup>All programs have been written in SAS-IML.

<sup>17</sup>The sequential estimation technique only permits to maximize the conditional loglikelihood of each node with respect to the ratios of coefficients and dissimilarity parameters.

<sup>18</sup>The three data sets used stem from independent surveys of tourism demand by German tourists older than fourteen years ("Reiseanalyse"). Cf. the data source in the reference list.

<sup>19</sup>The majority of the questions were induced by commercial interests of the tourist industry and are too detailed to explain the choice of a certain country.

tion, accomodation, and total expenditure, as well as their a priori-judgements on the destination chosen.

All persons interviewed have been asked for the type of activities predominant during their vacation. As the categories offered varied slightly between the questionnaires, we chose to further aggregate the given categories to the five groups of vacation purposes shown in table 1a. Sightseeing tours, education-related sojourns, adventure tours as well as "amusement tours" have been united to the group of "active vacation", while vacation with the purpose of health care exclude cures that are supported by health insurances and do not reduce a person's paid leave. The aggregation scheme was motivated by the pattern of the information on single activities chosen (persons who wished to relax were indeed strikingly inactive) and implications on the choice of travel destinations (there is no further choice if relatives are to be visited).

Travel destinations defined as sites where tourists spent the major part of their vacation<sup>20</sup> have been grouped by countries. The results of a cluster analysis have provided some indications of how to differentiate among those countries rarely visited at the time.<sup>21</sup> The similarity of the countries' supply structure and the state of development of their tourism industry have thus served as guidelines for the formation of country groups. South Tyrolia<sup>22</sup> as well as the Spanish Isles are treated as separate destinations owing to their different supply structure, transportation facilities, and, in the case of South Tyrolia, language requirements.

## 4.2 Computation of Implicit Prices

The relative prices of all "brands" of products that are offered at diverse sites are rarely, if ever, evident to an external observer. Tourists' expenditure per person and day could serve as a price index; still, this index reflects the prices of those goods that have been determined as utility-maximizing (as well as the transaction costs implied by their consumption) rather than representing the prices of all goods available. Personal expenditure clearly depend on both the individuals' socioeconomic status and the supply structure of the destination chosen and provide no information on the price of vacation at other destinations or the price of other types of vacation.

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<sup>20</sup>In case of multiple trips during the year in question, the person interviewed was asked to decide which of these could be considered as the "main vacation" of the year.

<sup>21</sup>As shown in table 1b, groups have been formed of the Netherlands and Belgium, the United Kingdom, Ireland, Sweden, Norway, and Finland, and the Eastern European countries apart from Bulgaria and Rumania that have been added to the group of Southern Mediterranean states, Turkey, and Portugal. All other non-European destinations have been united as "other destinations".

<sup>22</sup>Visitors to South Tyrolia cannot be differentiated from those to the rest of Italy in 1980.



To overcome this obstacle, implicit prices can be computed on the basis of those factors that prove to cause major travel expenses: In a first step, the shadow prices of the relevant input factors are determined by the method of hedonic regression,<sup>23</sup> i.e. for each separate subsample of tourists that chose the same alternative, the regression coefficients of the respective explanatory variables are estimated.

The estimates of the (destination-specific) shadow prices are then used to predict each individual's per capita expenditure for all given alternatives. To reflect the effects of a destination-specific supply structure, the individual-specific values of all explanatory variables apart from those reflecting personal characteristics (such as accompanying children) or vacation activities (such as sightseeing) are substituted by average values that have been computed on the basis of the destination-specific subsample.<sup>24</sup> The implicit price of vacation at the place of residence is set equal to zero as no information on the expenditure for leisure goods at home is provided.

For the present application, the price of vacation as measured by total expenditure per capita divided by the number of vacation days serves as the dependent variable of the hedonic regression model. Explanatory variables have been chosen to reflect travel components that account for the major part of the costs of vacation: Dummy variables indicate whether the tourist used any type of public transportation (plane, ferryboat, train, or coach, all considered to be relatively expensive), whether this person joined a package tour, whether he or she chose one of the following comparatively cheap forms of accommodation (camping, privately owned vacation home, or the home of friends or relatives), or whether he or she travelled extensively within the vacation area.<sup>25</sup>

To reflect an expected decrease in the ratio of transportation costs and total expenditure for increasing length of sojourn, a variable measuring the number of vacation days has been added to the set of exogenous variables. The number of accompanying persons as well as a dummy variable that indicates whether or not non-adult persons joined the travel group have been chosen to mirror the effects of differing rebate systems for children or groups.

Dummy variables representing activities that are typically pursued by tourists (at almost all destinations) and that seemed to be either particularly time-intensive (sunbathing and walking/hiking) or expensive (excursions, shopping sprees and visits to bars/restaurants/discotheques, sightseeing, or sports activities) have been eventually added to the set of explanatory variables to reflect the bundle of commodities chosen

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<sup>23</sup>For the problems of identification see e.g. Arguea and Hsiao (1991).

<sup>24</sup>Average values are used for all variables if individuals chose to stay at home.

<sup>25</sup>The dummy variable indicating extensive travelling activities is included in the 1985 sample only, indications on the organizational form have been excluded from the 1975 sample.

by the tourist.

To achieve comparability of the results, implicit prices for each travel destination have been determined on the basis of (almost) identical sets of exogenous variables for years 1975, 1980, and 1985.<sup>26</sup> Sixteen (fifteen in 1980) separate samples were formed of tourists that had either spent "active" or "restful" vacation at one of the travel destinations in the choice set of the year in question. Estimation results corresponding to the regression models for each year are not presented here, yet generally show that the direction of the explanatory variables' impact is as expected. The (relative) shadow prices of activities differ remarkably between destinations indicating both major differences in the supply structure and (possibly) price differentials. The explanatory value of the models as indicated by the adjusted  $R^2$ -measure varies strongly between destinations and years, yet ranges between 0.25 and 0.45 in most cases. Given the effects of personal idiosyncracies, it does not seem too surprising that a semi-logarithmic structure of the models proved to be most appropriate for all subsamples.<sup>27</sup>

### 4.3 Model Specification

Specification of NMNL-models is a threefold problem: Assumptions have to be made — and tested — as to the alternatives' similarity structure, the set of exogenous variables, and the structure of these variables' impact on the individual decision. Given the large number of thirty-six alternatives, independence from irrelevant alternatives as postulated by the MNL-model seems to be fairly unrealistic. Economic analysis may give hints, however, with regard to the similarity structure and the possible set of explanatory variables:

For the present application, it seems realistic to assume that brands of the same type of good (such as health-related input factors) are closer substitutes than brands of differing types of goods (such as health-related and education-related input factors) even if these are offered within a smaller radius. Moreover, the elasticity of substitution among non-tradable goods is likely to be considerably higher than the one between tradables and non-tradables. As no information on the purchase of non-tradables is provided for those who remained at their place of residence, we have to assume that at least some of the interviewees did not consume leisure-related non-tradable goods throughout the year in question. We therefore propose a three-level structure of the "decision tree" as depicted in figure 1, where alternative "no vacation" comprises the

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<sup>26</sup>The provided information on vacation activities varies among the samples. For some destinations, the sample size proved to be too small to include the full set of explanatory variables.

<sup>27</sup>Cf. Arguea and Hsiao (1991).

highly heterogeneous group of persons who either spent no vacation at all, or spent vacation at home consuming an unknown bundle of tradable and possibly non-tradable goods.<sup>28</sup> The assumption of independence from irrelevant alternatives may be breathtaking, given the number of sixteen destinations, yet was "by and large" supported by the Hausman-McFadden test statistic<sup>29</sup> and by the estimates of the dissimilarity parameters obtained by the estimation of more disaggregated models.<sup>30</sup>

The results of the economic analysis sketched in sections 2.1 and 2.2 suggest that age, per capita income, as well as the number and age of dependents are major determinants of the decision *which type of good to purchase*.<sup>31</sup> The set of explanatory variables assigned to this "decision stage" therefore include the dummy variables AGE1 to AGE4, allowing for a non-linear impact of age,<sup>32</sup> HHS1, reflecting one-person households, and CHIL18, indicating that minors joined the travel group. The person's per capita income, IPC, as well as the dummy variables SCHOOL, indicating the person's level of secondary education,<sup>33</sup> and MALE, indicating the tourist's gender but also the positive income differential of males, have been added to this group. In 1980, additional information has been provided as to whether interviewees agreed to general statements with regard to the relevance of the quality of vacation. The two dummy variables QUALITY and COMFSAVE are to reflect whether the person interviewed favours expensive vacation of high quality or whether he or she is willing to accept products of comparatively low quality.

The choice of *destinations* clearly depends on the price and quality of the goods there offered, yet also on the person's appreciation of the diverse dimensions of quality; as discussed earlier, quality will be esteemed most by those for whom the shadow prices of time, human capital, or health are highest. Variables reflecting per capita income, age, and education have thus been included into the set of socioeconomic exogenous variables as well as dummy variables indicating those (destination-specific) characteristics that tourists themselves mentioned to be of particular relevance for their

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<sup>28</sup>The "no vacation"-group may also include persons who pursued wealth-related activities (such as gardening) that were neglected so far, yet can be considered as primarily time-consuming.

<sup>29</sup>Cf. Hausman and McFadden (1984).

<sup>30</sup>Cf. Eymann and Ronning (1992).

<sup>31</sup>The sequence of the exogenous variables' description follows the presentation of the economic analysis. As depicted in figure 1, alternative "vacation" branches into the nodes comprising the types of commodities purchased, while alternative "no vacation" is a degenerate. Each of the alternatives "active vacation" and "relaxation" is further split up into sixteen destinations.

<sup>32</sup>AGE1: age < 25 years, AGE2: 25 ≤ age < 40, AGE3: 58 ≤ age ≤ 70, AGE4: age > 70. The latter two categories have been combined for the 1975 and 1980 samples. Variable AGE measures the tourists' age in years.

<sup>33</sup>SCHOOL: Person left school at the end of the compulsory schooltime with or without a certificate of secondary education—and, typically, with little language skills.

decision: SCENERY (beauty of the landscape), NATURE (intact nature), LEISURE (recreational facilities), SUNNY (climate), and CLANG (language).<sup>34</sup> Tourists' sensitivity to the effects of overcrowding is to be reflected by the dummy variables WATER (clean water), FRESHAIR (air quality), QUIET (noise), and NOCONCR (no concrete hotel buildings) indicating that the destination was chosen due to its environmental qualities.<sup>35</sup> The formation of habits is represented by the dummy variable NEWDEST that reflects whether the area has been visited before. The implicit price indices, obtained as described above, serve as the only alternative-specific variable to explain the tourists' destination choice (PCDCOST).

*Vacation behaviour* is likely to vary between groups of persons the earned income of which is either fixed (pensioners, unemployed persons) or independent of work time within a certain range (employees and their dependents) or fully dependent on the work effort (self-employed persons). Dummy variables have therefore been chosen to reflect whether the person interviewed is entitled to paid leave (PAIDLEAVE), is self-employed (SELF), or was temporarily unemployed at the time (UNEMP). Zero consumption occurring if the good's price is higher than the person's reservation price with respect to this good,<sup>36</sup> it can be expected that persons who are confronted with very narrow time or budget constraints due to a bad health status or extremely little income or persons whose elasticity of income with respect to time is extremely high are less inclined to spend vacation. Variables measuring per capita income, age, and family size have therefore again been included to the set of variables explaining the person's decision whether or not to spend vacation. Search costs, that may be particularly relevant for destinations remote or rarely visited, can be expected to be inversely related to the person's human capital as well as to the accessibility of information provided by the tourism industry or other tourists. The variable SCHOOL, together with two dummy variables indicating city size (CITY1, CITY2) have thus been added to the respective set of exogenous variables.<sup>37</sup> To differentiate between frequent travellers and those who do not regularly spend vacation at a site different from their place of residence, variable RAREMORE, indicating whether the person interviewed agrees to the statement that infrequent vacation of high quality are favourable to the reverse, has eventually been included into the 1980 set.

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<sup>34</sup>Whereas the respective questions are comparatively vague in 1975, no information on individual judgements is provided in 1980.

<sup>35</sup>Information on the tourists' concern for environmental issues is provided in 1985 only.

<sup>36</sup>See e.g. Lee and Pitt (1986).

<sup>37</sup>CITY1: city size < 5000 residents, CITY2: 5000 residents ≤ city size < 100000 residents.

## 4.4 Estimation Results

Estimation results for 1975 and 1985 confirm that the assumed nesting structure is appropriate with regard to the diverse destinations and vacation purposes.<sup>38</sup> The estimate measuring the degree of dissimilarity between the subset of vacation purposes and the alternative "no vacation", however, indicates misspecification of the upper "decision level". This result prevailed for various model specifications and for each of the three years and suggests further disaggregation of the no purchase-alternative which, unfortunately, is not possible for the given information base.

Estimation results with regard to the similarity structure of destinations and activities in 1980 confirm our general impression that 1980 model specifications are of relatively poor explanatory quality, which could be explained by the obvious differences in the structure of the information provided. Comparison of the model specifications for each of the three years shows that 1975 estimations yield by far the best results in terms of goodness of fit,<sup>39</sup> while 1985 results are clearly superior with regard to prediction quality. Whereas the percentage of correct predictions is fairly good for all models, the predicted number of persons choosing each single alternative is clearly biased in favour of those alternatives that are revealed preferred by the (relative) majority of interviewees.

Estimation results prove to be surprisingly stable if the dissimilarity parameters, corresponding to the two subsets of travel destinations for active or restful vacation, are estimated freely, i.e. if their estimates are not constrained to be equal as is the case for the model specifications presented in tables 2 and 3. Still, the likelihood ratio test statistic proposed by Cramer and Ridder (1991) did not confirm our hypothesis that the differentiation between active and restful vacation might be redundant.

Comparison of the diverse model specifications over time, shows that the development of the tourism industry within the period in question is much less clearly portrayed than expected. This fact may be explained by the relatively coarse grid

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<sup>38</sup>The estimates presented in the tables 2 and 3 reflect estimates of coefficients rather than the estimates of the ratios of the respective parameters and the dissimilarity parameters; the given estimates have been recursively determined from the actual estimation results. McFadden's correction formula has been applied to correct the  $t$ -ratios of all estimates; corrected  $t$ -ratios refer to the ratios of coefficients and dissimilarity parameters. Three (two, one) star(s) indicate that the  $H_0$  is rejected at a significance level of 1% (5%, 10%).  $t$ -ratios corresponding to the dissimilarity parameters indicate whether the respective estimates are significantly different from one.

<sup>39</sup>The adjusted goodness of fit-index  $\rho_{\text{adj}}^2$ , proposed by Horowitz (1983) has been chosen as a measure of the model's explanatory value, whereas the percentage of correct predictions (PCP) and a standardized version of McFadden's prediction success index  $\sigma$  are to reflect prediction quality. For a discussion of the latter index see e.g. Hensher and Johnson (1981, pp. 52-55).

of aggregation for the diverse destinations, uniting a variety of sites under the heading of "other destinations", yet could also reflect that the relative positions of the destinations remained by and large unchanged as is shown in table 1b. Estimation results in fact show that the influence of those factors affecting a person's choice of vacation activities and destinations have undergone little changes: While the impact of destination-specific prices is unambiguously reflected for 1985 only,<sup>40</sup> the pattern of the socioeconomic variables' influence is well-portrayed and stable over time:<sup>41</sup> The tourists' per capita income clearly curtails the radius of their activities and may also account for the reduced frequency of visits to distant destinations, reflected by the estimates of the coefficients corresponding to NEWDEST. The latter effect is possibly reinforced by the comparatively young age of those travelling to the Spanish Isles, the Southern Mediterranean destinations, or Greece—and most likely by the relative novelty of these sites, that could also explain the "trendiness" of Scandinavia in 1980 or the Eastern European states in 1980 and 1985. Their generally superior knowledge of foreign languages and better health status, implying lower adaptation efforts, could well explain the younger generation's evident curiosity with regard to destinations that are comparatively distant and offer a less standardized range of products. The revealed preference of the very young for Germany's neighbour states Belgium, the Netherlands, and Denmark may indicate, however, that their budget reserved for "pleasure-related" goods is particularly tight, or, equivalently, that their shadow-price for these commodities is comparatively low. Language "barriers" seem to exist in reality, as is reflected by the fact that in 1975, 1980, and 1985 persons with lower secondary education revealed their preference for both German-speaking regions and well-organized or well-known destinations such as Spain. The estimates of the coefficients corresponding to variables that reflect personal judgements unambiguously mirror that beaches (of any quality) and sunshine are the two "pleasure- and health-related" non-tradable commodities that mainly induce short-term migration of German consumers, while the opportunity to practise a foreign language seems to be the dominant motive to spend extended "human capital-related" vacation. Persons revealing their preference for highly developed recreational facilities seem to be more willing to tolerate the negative external effects resulting from this specific supply structure. Still, the estimation results suggest that those who can afford it tend to the comparatively new vacation sites in Greece, France, or at "other destinations", which are not yet harmed by the environmental effects of mass tourism. This result together with the decrease of transportation costs could well explain the major increase of the number of tourists visiting non-traditional vacation

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<sup>40</sup>*t*-ratios corresponding to the coefficients of the implicit price indices are upwardly biased. Coefficient estimates can thus be expected to be not significantly different from zero for 1975, 1980, and possibly 1985, suggesting that the sixteen price indices might have been poorly predicted.

<sup>41</sup>Germany has been chosen as the base category of the lowest decision level. All corresponding coefficients are set equal to zero.

areas as reflected in table 1b.

Estimation results generally support our hypotheses on the choice of activities. Whereas the restoration of their health<sup>42</sup> seems to dominate the decision of the elderly, the young and the rich evidently prefer cost-intensive activities of high quality that permit to increase either health or human capital. Still, comparison of the 1975, 1980, and 1985 results reveals a trend towards more active vacation of the elderly. The estimates corresponding to per capita income indicate that all types of non-sportive vacation have become achievable for the not-so-well-to-do and could suggest that the demand for cost-intensive sports has risen over time. Both the income and age effects may have led to the obvious increase in the popularity of human-capital or health-related commodities as reflected by table 1a. It is not too surprising that accompanying children seem to attract the adults' full attention and are neither able to pursue particularly demanding activities nor interested in them. The estimation results for 1980 and 1985 indeed suggest that parents visit their relatives to "share the burden" of childcare. The estimates corresponding to those variables reflecting the tourist's occupational status and education level convey a rather diffuse image of the structure of impact, yet could be correlated with per capita income. Estimation results for the 1980 sample eventually confirm our hypothesis that the choice of activities related to human capital or sports reveal a person's preference for higher quality. As expected, the higher costs of these types of vacation may be outweighed by a reduction in the frequency of travelling.

The pattern of impact is most surprising with regard to those variables directing the decision whether or not to spend vacation at a site different from the place of residence. Still, the results are interesting and yield considerable insights in the individual travel behaviour for each of the three years: Whereas income evidently confined persons to stay at home in 1975, and less so in 1980, this effect is not significantly different from zero in 1985. Moreover, if at all, it is permanent income that seems to matter rather than the individual's transitory income, as is reflected by the observation that persons unemployed are no less likely to travel than others. While the budget constraint must have been alleviated considerably over time, the time constraint proves to be particularly binding. Whereas persons retired seem to be significantly more inclined to travel than younger persons, the reservation price of vacation and thus the frequency of vacation might be comparatively low for self-employed persons as is indicated by some of our estimation results. Family status evidently does not affect a person's decision in favour or against vacation. The fact that the less educated as well as those living in villages or smaller cities show a significantly lower propensity to spend vacation at a place other than at home eventually suggests the major relevance of search costs.

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<sup>42</sup>Activities related to health care form the base category of the medium "decision level"; all respective coefficients are constrained to the value of zero.

## 5 Concluding Remarks

Estimation results for three-level nested multinomial logit models confirm that vacation behaviour can be interpreted as the individual demand for a utility-maximizing bundle of non-tradable products that may affect future income. While the elasticity of permanent (rather than transitory) income with regard to time seems to be one of the major determinants of the individual's choice of activities and the frequency of vacation, per capita income evidently determines the maximal distance of vacation sites. The reservation price for human capital and thus the demand for related goods evidently decrease over time, whereas the effects of age are obvious with regard to the structure of the demand for health-related goods—health-supporting activities are more and more substituted by health-restoring commodities—but less so with respect to the level of demand.

By and large, it can thus be stated that the predictions of a household production model of the individual demand for leisure are surprisingly well reflected by the empirical results for the travel behaviour of German tourists in 1975, 1980, and 1985. Comparison of the results over time clearly indicates the gradual alleviation of the budget constraint; the less well-to-do could not only afford to spend vacation in 1985, yet also to consume relatively cost-intensive leisure commodities. Of practical relevance may be the result that considerable search costs seem to exist for persons who have little knowledge of foreign languages or who have little access to information on the changing supply structure of the tourist industry. The environmental effects of mass tourism at traditional sites clearly induce a diversion of tourists' migration to newly developed vacation areas while little evidence exists for a diversification of the tourists' demand structure towards commodities less harmful to the environment.



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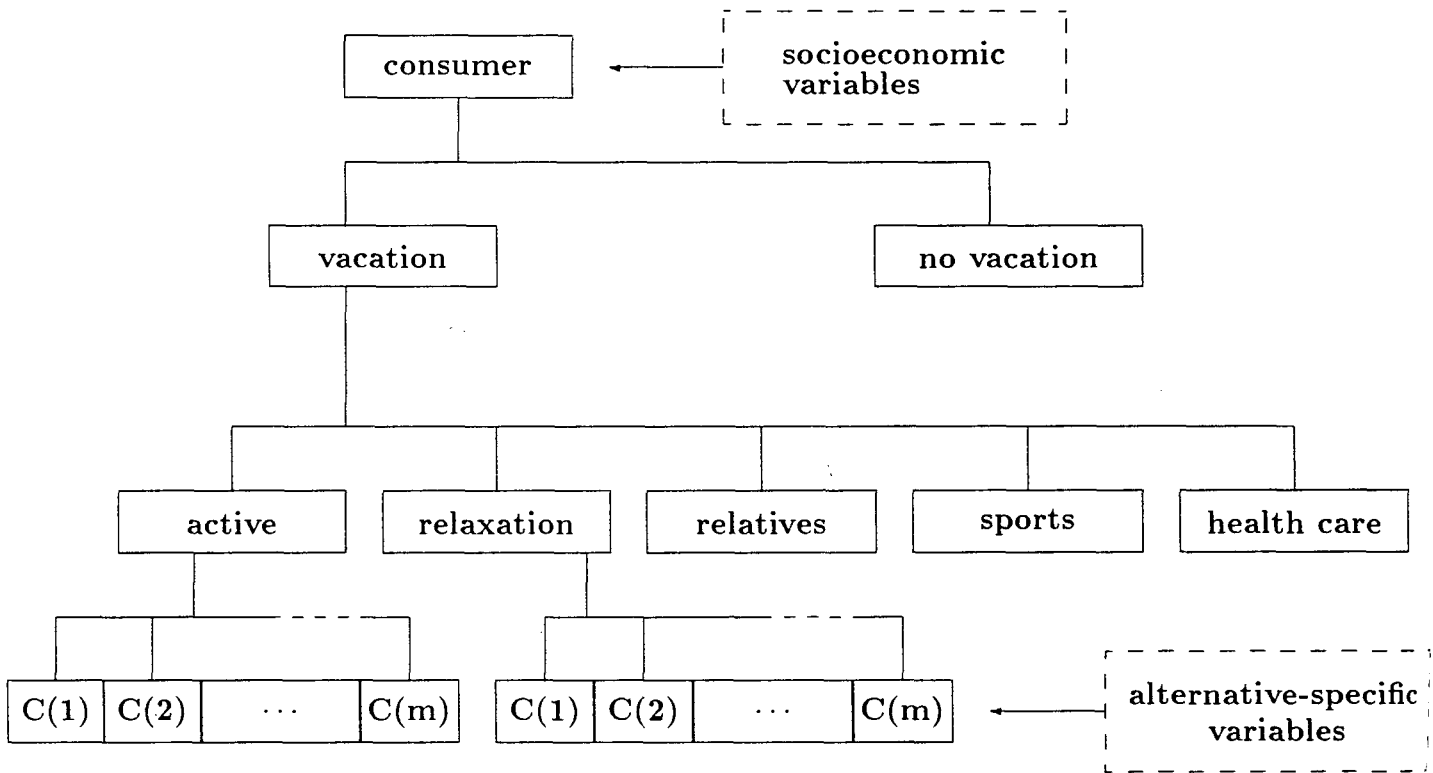
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*Data source:*

Zentralarchiv für empirische Sozialforschung, Universität Köln, *Reiseanalysen* 1975, 1980, 1985.

Figure 1: Destination Choice



**Table 1a: No. of interviewees who chose either vacation purpose**

Year	Active		Relaxation		Relatives/Friends		Sports		Health care	
	abs.	%	abs.	%	abs.	%	abs.	%	abs.	%
1975	559	18.9	1924	64.9	335	11.3	50	1.7	96	3.2
1980	580	18.8	2069	67.0	299	9.7	66	2.1	74	2.4
1985	839	30.8	1382	50.7	241	8.8	117	4.3	147	5.4

**Table 1b: No. of interviewees who chose either travel destination**

Acronym	Country (Group)	1975		1980		1985	
		abs.	%	abs.	%	abs.	%
FRG	West Germany	1353	45.6	1192	39.2	866	31.8
A	Austria	440	14.8	338	11.1	254	9.3
IT	Italy excl. South Tyrolia	207	7.0	309	10.2	226	8.3
M C.I.	Mallorca and Canary Islands	130	4.4	151	5.0	177	6.5
E	Spain excl. Spanish Isles	120	4.0	138	4.5	155	5.7
YUG	Yugoslavia	95	3.2	137	4.5	154	5.6
FR	France	93	3.1	129	4.2	152	5.6
SM P BU R	Morocco, Algeria, Tunesia, Israel, Portugal, Rumania, and Bulgaria	74	2.5	98	3.2	112	4.1
G	Greece	42	1.4	69	2.3	106	3.9
GDR H SU	East Germany, Hungary, and USSR	100	3.4	100	3.3	104	3.8
ST	South Tyrolia	48	1.6			95	3.5
Other	Other destinations	45	1.5	106	3.5	85	3.1
DK	Denmark	54	1.8	67	2.2	67	2.5
CH	Switzerland	57	1.9	79	2.6	61	2.2
UK I S N F	United Kingdom, Ireland, Sweden, Norway, and Finland	53	1.8	70	2.3	61	2.2
NL B	Netherlands and Belgium	53	1.8	55	1.8	51	1.9

Table 2: Estimation results for a three-level NMNL-model (1985, model I)<sup>43</sup>

A. Decision Level: Vacation/No Vacation

Alternative	Vacation	
CONST	-25.21	(-1.78*)
AGE1	-29.14	(-1.74*)
AGE2	-19.29	(-1.79*)
AGE3	4.33	(1.20)
AGE4	11.52	(1.66*)
MALE	-1.36	(-0.63)
IPC	0.01	(0.01)
CITY1	-0.65	(-4.81***)
CITY2	-0.44	(-4.28***)
HHS1	-3.74	(-1.20)
UNEMP	2.28	(0.19)
SELF	1.81	(0.57)
SCHOOL	-6.27	(-1.94*)
Incl. Val.	11.94	(1.84*)

B. Decision Level: Purpose of Vacation

Alternative	Active		Relaxation		Relatives		Sports	
CONST	9.04	(2.06**)	13.42	(3.15***)	-3.29	(-0.66)	-15.44	(-2.79***)
AGE1	30.64	(3.46***)	20.87	(2.36**)	26.96	(2.93***)	35.71	(3.85***)
AGE2	20.33	(4.39***)	15.49	(3.40***)	18.89	(3.81***)	19.59	(3.72***)
AGE3	-1.05	(-0.35)	-4.38	(-1.54)	-2.59	(-0.73)	-14.65	(-2.87***)
AGE4	-13.48	(-3.80***)	-11.68	(-3.62***)	-6.45	(-1.63)	-24.30	(-3.47***)
MALE	1.84	(0.78)	1.71	(0.75)	-0.64	(-0.24)	5.73	(1.81*)
IPC	-1.71	(-0.85)	-0.02	(-0.01)	-0.80	(-0.35)	6.41	(2.69***)
HHS1	3.60	(1.17)	2.40	(0.81)	9.32	(2.67***)	-1.22	(-0.28)
CHIL18	-1.89	(-0.55)	5.37	(1.62)	8.71	(2.31**)	5.55	(1.33)
UNEMP	-0.92	(-0.07)	-5.15	(-0.40)	-7.48	(-0.50)	8.75	(0.61)
SELF	-2.39	(-0.63)	-3.46	(-0.96)	0.72	(0.17)	-1.93	(-0.36)
SCHOOL	5.11	(2.11**)	7.41	(3.16***)	7.10	(2.55**)	-3.84	(-1.11)
Incl. Val.	7.58	(-4.51***)						

<sup>43</sup>The estimates of the coefficients rather than the estimates of the ratios of the respective parameters and the dissimilarity parameters are presented; the given estimates have been recursively determined from the actual estimation results. McFadden's correction formula has been applied to correct the *t*-ratios of all estimates; corrected *t*-ratios refer to the ratios of coefficients and dissimilarity parameters. Three (two, one) star(s) indicate that the  $H_0$  is rejected at a significance level of 1% (5%, 10%). *t*-ratios corresponding to the dissimilarity parameters indicate whether the respective estimates are significantly different from one.

Table 2, cont.

## C. Decision Level: Destinations

PCDCOST	-4.46 (-3.25***)
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	CONST	AGE	IPC	NEWDEST	SUNNY	NATURE
Other	-18.56 (-4.41***)	-2.83 (-4.24***)	5.89 (4.63***)	11.61 (5.05***)	13.66 (6.04***)	2.52 (1.10)
SM P BU R	-22.02 (-6.10***)	-2.70 (-4.93***)	6.15 (5.53***)	14.46 (7.09***)	20.43 (10.57***)	-3.45 (-1.56)
M C.I.	-17.76 (-5.78***)	-2.36 (-5.04***)	5.86 (5.78***)	3.66 (2.41**)	29.52 (15.22***)	-11.83 (-5.21***)
E	-15.19 (-5.14***)	-2.66 (-5.41***)	4.49 (4.07***)	3.29 (2.09**)	27.36 (14.41***)	-12.70 (-5.04***)
G	-20.13 (-5.67***)	-3.44 (-5.98***)	6.15 (5.46***)	10.14 (5.48***)	24.87 (12.02***)	-1.15 (-0.57)
YUG	-9.43 (-3.37***)	-3.32 (-6.66***)	3.51 (3.14***)	1.70 (1.08)	23.29 (13.20***)	-3.95 (-2.12**)
IT	-4.97 (-2.02**)	-3.04 (-6.96***)	2.26 (2.15**)	2.06 (1.47)	22.64 (14.41***)	-7.25 (-3.98***)
FR	-1.14 (-0.43)	-4.76 (-8.95***)	3.46 (3.09***)	3.01 (1.94*)	16.77 (9.94***)	-4.72 (-2.38**)
UK I S N F	-9.61 (-2.38**)	-4.27 (-5.59***)	4.63 (3.23***)	5.92 (2.51**)	-3.25 (-0.79)	6.43 (2.68***)
GDR H SU	-21.97 (-5.15***)	-1.29 (-1.91*)	3.58 (2.30**)	10.34 (4.18***)	7.98 (2.91***)	-0.63 (-1.26)
DK	1.49 (0.44)	-4.19 (-5.90***)	-0.02 (-0.01)	-5.19 (-2.16**)	-2.20 (-0.64)	3.67 (1.65*)
NL B	-5.99 (-1.55)	-3.49 (-4.48***)	2.38 (1.36)	-0.66 (-0.27)	4.80 (1.59)	-6.31 (-1.84*)
CH	-21.20 (-4.82***)	0.19 (0.17)	-0.20 (-0.10)	2.79 (1.18)	3.15 (0.97)	1.14 (0.45)
ST	-24.46 (-6.52***)	0.35 (0.61)	0.96 (0.64)	2.84 (1.45)	13.96 (6.86***)	2.80 (1.40)
A	-8.07 (-3.51***)	-0.29 (-0.78)	-0.63 (-0.61)	-1.31 (-0.98)	7.40 (4.77***)	3.88 (2.98***)
$\rho_{adj}^2$	0.30					
PCP	0.53					
$\sigma$	0.07					
No. obs.	5283					

Table 3: Estimation results for a three-level NMNL-model (1985, model II)<sup>44</sup>

*A. Decision Level: Vacation/No Vacation*

Alternative	Vacation	
CONST	-24.84	(-1.78*)
AGE1	-28.27	(-1.72*)
AGE2	-18.68	(1.78*)
AGE3	4.10	(1.17)
AGE4	11.10	(1.64)
MALE	-1.30	(-0.61)
IPC	0.11	(0.07)
CITY1	-0.66	(-4.88***)
CITY2	-0.45	(-4.29***)
HHS1	-3.69	(-1.20)
UNEMP	2.24	(0.19)
SELF	1.74	(0.55)
SCHOOL	-6.11	(-1.91*)
Incl. Val.	11.72	(1.83*)

*B. Decision Level: Purpose of Vacation*

Alternative	Active		Relaxation		Relatives		Sports	
CONST	6.71	(1.53)	11.02	(2.60***)	-2.85	(-0.59)	-14.72	(-2.71***)
AGE1	30.26	(3.48***)	20.66	(2.38**)	26.20	(2.90***)	34.94	(3.84***)
AGE2	20.05	(4.42***)	15.31	(3.43***)	18.41	(3.78***)	19.18	(3.71***)
AGE3	-1.11	(-0.38)	-4.39	(-1.57)	-2.47	(-0.71)	-14.38	(-2.87***)
AGE4	-13.35	(-3.83***)	-11.59	(-3.66***)	-6.17	(-1.59)	-23.94	(-3.48***)
MALE	1.81	(0.78)	1.69	(0.75)	-0.62	(-0.23)	5.70	(1.83*)
IPC	-1.27	(-0.65)	0.39	(0.20)	-0.90	(-0.40)	6.21	(2.67***)
HHS1	3.41	(1.13)	2.23	(0.76)	9.13	(2.67***)	-1.33	(-0.31)
CHILD18	-1.74	(-0.52)	5.39	(1.65*)	8.48	(2.29**)	5.32	(1.30)
UNEMP	-0.80	(-0.06)	-4.97	(-0.40)	-7.32	(-0.50)	8.66	(0.61)
SELF	-2.27	(-0.61)	-3.31	(-0.93)	0.70	(0.16)	-1.97	(-0.38)
SCHOOL	5.11	(2.85***)	9.23	(3.89***)	6.56	(2.41**)	-4.41	(-1.30)
Incl. Val.	7.63	(-4.25***)						

<sup>44</sup>The estimates of the coefficients rather than the estimates of the ratios of the respective parameters and the dissimilarity parameters are presented; the given estimates have been recursively determined from the actual estimation results. McFadden's correction formula has been applied to correct the *t*-ratios of all estimates; corrected *t*-ratios refer to the ratios of coefficients and dissimilarity parameters. Three (two, one) star(s) indicate that the  $H_0$  is rejected at a significance level of 1% (5%, 10%). *t*-ratios corresponding to the dissimilarity parameters indicate whether the respective estimates are significantly different from one.

Table 3, cont.

C. Decision Level: Destinations

PCDCOST	-4.12 (-3.00***)
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	CONST	AGE	IPC	NEWDEST	SUNNY	SCHOOL
Other	-16.03 (-3.85***)	-2.32 (-3.36***)	4.96 (3.74***)	11.85 (5.15***)	14.26 (6.29***)	-7.13 (-3.09***)
SM P BU R	-20.72 (-5.68***)	-2.26 (-3.96***)	5.15 (4.50***)	15.23 (7.43***)	20.43 (10.51***)	-6.60 (-3.45***)
M C.I.	-17.71 (-5.66***)	-2.36 (-4.88***)	5.11 (4.99***)	4.73 (3.12***)	29.11 (15.04***)	-2.78 (-1.77*)
E	-15.88 (-5.21***)	-2.95 (-5.75***)	4.08 (3.68***)	4.33 (2.75***)	26.82 (14.17***)	0.10 (0.06)
G	-18.81 (-5.26***)	-3.10 (-5.20***)	5.39 (4.70***)	10.65 (5.74***)	25.11 (12.08***)	-5.02 (-2.65***)
YUG	-9.09 (-3.16***)	-3.30 (-6.37***)	3.03 (2.66***)	2.28 (1.45)	23.23 (13.15***)	-1.78 (-1.11)
IT	-3.59 (-1.43)	-2.67 (-5.88***)	1.06 (0.98)	2.92 (2.08**)	22.49 (14.27***)	-6.41 (-4.38***)
FR	-0.94 (0.35)	-4.01 (-7.28***)	1.92 (1.67*)	3.85 (2.46**)	16.72 (9.78***)	-10.47 (-5.87***)
UK I S N F	-5.83 (-1.47)	-3.53 (-4.55***)	3.66 (2.45**)	5.89 (2.50**)	-2.37 (-0.57)	-8.32 (-3.17***)
GDR H SU	-20.86 (-4.81***)	-0.96 (-1.36)	2.67 (1.65*)	11.12 (4.47***)	7.89 (2.87***)	-5.31 (-2.17**)
DK	4.13 (1.21)	-3.61 (-4.97***)	-0.95 (-0.54)	-5.01 (-2.12**)	-1.75 (-0.51)	-5.88 (-2.63***)
NL B	-6.11 (-1.51)	-3.57 (-4.41***)	1.99 (1.11)	-0.16 (-0.06)	4.45 (1.47)	-1.03 (-0.42)
CH	-18.51 (-4.18***)	0.68 (0.92)	-1.57 (-0.76)	3.06 (1.28)	3.54 (1.07)	-6.64 (-2.65***)
ST	-23.96 (-6.20***)	0.38 (0.64)	1.00 (0.65)	2.46 (1.26)	14.35 (7.04***)	0.17 (0.08)
A	-7.99 (-3.32***)	-0.29 (-0.76)	-0.32 (-0.30)	-1.79 (-1.34)	7.82 (5.04***)	1.26 (0.90)
$\rho^2_{adj.}$	0.30					
PCP	0.53					
$\sigma$	0.08					
No. obs.	5283					



Table 4: Elasticities of choice probabilities with respect to price (1985, model I)

Alternative	Own-price	Cross-price		
		Active/ Relaxation	Relatives/Sports/ Health	No Vacation
Other	-1.079	-0.018	-0.024	0.079
SM P BU R	-0.759	-0.007	-0.014	0.100
M C.I.	-0.723	-0.006	-0.018	0.181
E	-0.522	-0.010	-0.018	0.110
G	-0.654	-0.002	-0.008	0.093
YUG	-0.444	-0.017	-0.024	0.089
IT	-0.512	-0.034	-0.046	0.139
FR	-0.426	-0.030	-0.037	0.079
UK I S N F	-0.674	-0.024	-0.028	0.039
GDR H SU	-0.625	-0.021	-0.025	0.038
DK	-0.454	-0.042	-0.047	0.036
NL B	-0.503	-0.032	-0.036	0.032
CH	-0.478	-0.028	-0.046	0.139
ST	-0.418	-0.024	-0.029	0.038
A	-0.497	-0.104	-0.120	0.111
FRG	-0.736	-0.380	-0.433	0.315

Table 5: Elasticities of choice probabilities with respect to socioeconomic variables  
(1985, model I)

Node	Alternative	AGE	IPC
Active	Other	-2.712	0.779
	SM P BU R	-2.629	0.821
	M C.I.	-2.416	0.773
	E	-2.602	0.545
	G	-3.089	0.823
	YUG	-3.015	0.381
	IT	-2.841	0.172
	FR	-3.921	0.372
	UK I S N F	-3.613	0.568
	GDR H SU	-1.744	0.393
	DK	-3.562	-0.209
	NL B	-3.123	0.192
	CH	-0.860	-0.239
	ST	-0.714	-0.045
	A	-1.117	-0.311
FRG	-0.934	-0.206	
Relaxation	Other	-2.712	0.959
	SM P BU R	-2.629	1.001
	M C.I.	-2.416	0.953
	E	-2.602	0.725
	G	-3.089	1.003
	YUG	-3.015	0.561
	IT	-2.841	0.352
	FR	-3.921	0.551
	UK I S N F	-3.613	0.747
	GDR H SU	-1.744	0.573
	DK	-3.562	-0.029
	NL B	-3.123	0.372
	CH	-0.860	-0.059
	ST	-0.714	0.135
	A	-1.117	-0.132
FRG	-0.934	-0.026	
Relatives		-1.198	0.000
Sports		-1.198	0.765
Health		-1.198	0.085
No Vacation		2.887	-1.300

**Table 6a: Relative deviations of choice probabilities with respect to socioeconomic dummy variables (1985, model I)**

Node	Alternative	NEWDEST	SUNNY	NATURE
Active/ Relaxation	Other	5.382	4.575	0.694
	SM P BU R	8.289	12.623	-0.229
	M C.I.	1.235	44.164	-0.745
	E	1.130	32.983	-0.772
	G	4.259	23.455	0.044
	YUG	0.728	18.865	-0.278
	IT	0.810	17.233	-0.533
	FR	1.052	7.407	-0.348
	UK I S N F	2.013	-0.400	1.837
	GDR H SU	4.393	1.637	-0.269
	DK	-0.304	-0.311	0.971
	NL B	0.265	0.733	-0.471
	CH	0.995	0.399	0.413
	ST	1.007	4.801	0.757
	A	0.161	1.443	1.026
FRG	0.380	-0.079	0.215	
Relatives/Sports/Health		0.504	0.617	0.159
No Vacation		-0.506	-0.998	12.547

**Table 6b: Relative deviations of choice probabilities with respect to socioeconomic dummy variables (1985, model I)**

Variable	Active	Relaxation	Relatives	Sports	Health	No Vacation
AGE1	-0.516	-0.787	-0.645	-0.260	-0.963	15.013
AGE2	-0.432	-0.621	-0.496	-0.466	-0.896	3.085
AGE3	1.315	0.751	1.035	-0.259	1.527	-0.433
AGE4	0.305	0.517	1.351	-0.473	3.036	-0.019
MALE	0.097	0.086	-0.109	0.519	-0.060	-0.115
HHS1	-0.135	-0.218	0.395	-0.423	-0.360	0.392
CHILD18	1.048	2.761	3.972	2.817	1.398	-0.903
UNEMP	-0.026	-0.317	-0.438	1.189	0.052	0.330
SELF	-0.165	-0.236	0.085	-0.131	0.021	0.473
SCHOOL	-0.311	-0.164	-0.186	-0.674	-0.551	0.356

**Table 6c: Relative deviations of choice probabilities with respect to socioeconomic dummy variables (1985, model I)**

Variable	Vacation	No Vacation
CITY1	-0.266	0.411
CITY2	-0.188	0.265