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**A MICRO-ANALYSIS OF DEMAND FOR TRAVEL GOODS: AN APPLICATION  
TO THE BUSINESS TRAVELER**

*University of Hawaii*

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**A MICRO-ANALYSIS OF DEMAND FOR TRAVEL GOODS:  
AN APPLICATION TO THE BUSINESS TRAVELER**

**A DISSERTATION SUBMITTED TO THE GRADUATE DIVISION OF THE  
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**By**

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## ABSTRACT

The purpose of this study is to test two hypotheses: (1) that tax deductibility and the joint benefit nature of goods on the business-pleasure borderline increases the demand for business travel and (2) that deductibility and jointness decreases price elasticity. The methodology of the study is a comparison of the expenditure behavior of business travelers with that of pleasure travelers. The Linear Expenditure System allocation model is applied to tourist expenditures on individual travel goods at a particular destination. Six different classes of goods are analyzed: (1) food, (2) lodging, (3) recreation, (4) local transportation, (5) clothing and (6) other. Budget data for tourist parties are from the Hawaii Visitors Bureau expenditure surveys for 1974, 1977, and 1980.

Business travelers are shown to have higher expenditures than pleasure travelers for food, lodging, and local transportation. The LES minimum demanded quantities also appear to be higher for business travelers. The uncompensated price elasticities of business travelers are significantly smaller than that of pleasure travelers for (1) local transportation, (2) clothing and (3) other, and appear to be smaller across all categories of goods. Compensated own and cross price elasticities are insignificant for the business traveler.



## TABLE OF CONTENTS

|   |     |
|---|-----|
| ACKNOWLEDGEMENTS .....  | iii |
| ABSTRACT .....  | v   |
| LIST OF TABLES .....  | vii |
| CHAPTER I INTRODUCTION .....  | 1   |
| CHAPTER II REVIEW OF THE LITERATURE   |     |
| Determinants of Demand for Tourism Travel .....   | 6   |
| Travel and Entertainment Expenditures: The Case<br>of the Business Traveler .....           | 14  |
| CHAPTER III THEORETICAL AND EMPIRICAL SPECIFICATION   |     |
| Theoretical Specification of Individual Demand<br>for Business Travel .....                 | 21  |
| Empirical Specification .....   | 38  |
| CHAPTER IV RESULTS  |     |
| Data .....  | 43  |
| Stochastic Specification and Method of Estimation   | 49  |
| Parameter and Elasticity Estimates for the<br>Business Visitor vs. the Pleasure Visitor.... | 51  |
| CHAPTER V CONCLUSION  |     |
| Summary of Findings .....   | 63  |
| Further Implications and Future Research .....  | 66  |
| APPENDIX .....  | 71  |
| BIBLIOGRAPHY .....  | 81  |

# LIST OF TABLES

| TABLE |   | PAGE |
|-------|---|------|
| 2-1   | Elasticity of Demand for Tourism Travel ...                           | 8    |
| 2-2   | Price Elasticities of Demand for<br>Fringe Benefits .....             | 15   |
| 3-1   | Effect of Price Changes on X .....                                    | 26   |
| 3-2   | Effect of Price Changes on Z .....                                    | 26   |
| 4-1   | Average Expenditures, 1980 .....                                      | 46   |
| 4-2   | Average Expenditure Shares .....                                      | 47   |
| 4-3   | LES Parameter Estimates .....   | 52   |
| 4-4   | Expenditure Elasticities .....  | 53   |
| 4-5   | Test for Differences in Expenditure<br>Elasticities .....             | 54   |
| 4-6   | Uncompensated Own Price Elasticities .....                            | 57   |
| 4-7   | Test for Differences in Uncompensated Own<br>Price Elasticities ..... | 58   |
| 4-8   | Compensated Price Elasticities .....                                  | 59   |

## CHAPTER I

### INTRODUCTION

Among the economic goods differentiated by tax law are the fringe benefits and executive perquisites which are deductible expenditures at the firm level but which escape taxation at the individual level. This tax preference has long been a source of debate over the equity issue of what constitutes income and of debate over the efficiency issue of resource allocation. Recently, this debate has gained increased relevance with the rapid growth in the proportion of the compensation package represented by fringe benefits. Under current United States tax laws, the price of fringe benefits is reduced by a factor equal to the individual's marginal tax rate. Indeed, work by Woodbury (1983) and Long and Scott (1982, 1984) indicates a significant relationship between rising tax rates and the increase in fringe benefits.

Business travel and entertainment is a classic example of expenditure which enjoys a tax preference. Analysis of the tax effect on these expenditures differs somewhat from the analysis of pure non wage compensation, because business travel is a significant factor of production in many businesses. However, many expenditures for business travel and entertainment have a personal component, and it is this component which is the analog of fringe benefit

compensation. For example, expenditures on first class air travel and luxury hotel accommodations, or business trips which include extensions for pleasure, clearly contain a personal component. This jointness of supply of production and personal benefits is recognized by the tax code's apportionment rule which attempts to isolate the business portion from the personal portion of expenditures.

As in the case of negotiated fringe benefits, increases in the marginal tax rate reduces the relative price of the personal component of business travel. Moreover, the joint supply of production and personal benefits in business travel reduces the price of travel in consumption by an amount equal to the marginal product of the trip. An expected consequence of tax deductibility and jointness is an increased level of business travel and entertainment expenditure. Clotfelter(1979, 1983) demonstrates such a relationship between marginal tax rates and the growth of expenditures on the business pleasure borderline.

The purpose of this paper is to test the hypotheses that joint supply of production and consumption benefits and tax preferences result in increased demand for business travel. In particular, this paper will examine the level of demand for components of the travel bundle for business travelers to Hawaii. These components include expenditures for lodging, food, entertainment, local transportation,

clothing and a miscellaneous category. No other work has examined the tax hypothesis at this level of disaggregation. Approximately three percent of all westbound visitors to Hawaii are on trips strictly for business, another three percent are on trips for convention purposes, and thirteen percent are on trips which mix business and pleasure (see Appendix B). The only group larger than that of the business-pleasure group is the group whose trip purpose is primarily pleasure. Thus, expenditure on business travel to Hawaii falls neatly into the framework of expenditures which are tax deductible and which yield personal benefits.

The methodology employed to test these hypotheses is a comparison of the expenditure behavior of business travelers with the expenditure behavior of pleasure travelers in the context of a complete demand system. The implicit assumption is that the business traveler and the pleasure traveler have the same preferences in consumption. Any observed difference in behavior can then be attributed to the difference in trip purpose. Observations of larger expenditures by business travelers would support the tax preference and joint supply hypotheses. Because of data limitations, the tax effect cannot be disentangled from the joint supply effect. Thus, the two hypotheses are tested simultaneously.

The comparison of business and pleasure travel in a demand system framework allows the testing of a secondary hypothesis. This paper hypothesizes that business travelers are less price sensitive than pleasure travelers in their demand for trips and goods comprising the trip bundle, and that this is due in large part to the joint supply of production and consumption benefits rather than tax deductibility. A common intuitive conclusion is that business travelers are less price sensitive than other groups of travelers. However, the few empirical results which exist are mixed. A test of this hypothesis is provided by estimating the price elasticities for both groups of visitors across the categories of travel goods.

This paper also investigates the strictly empirical question of the degree to which individuals who receive non wage benefits substitute among these benefits. Studies concerned with the composition of the fringe benefit package are hampered by the lack of a tax wedge between alternative forms of fringe benefits. This study uses explicit price information for components of the business travel bundle to estimate the degree of substitutability among components of the bundle.

The scale of the business travel phenomenon is by no means small. Business travel constitutes as much as \$280 billion out of an estimated \$1100 billion (1983) spent on global tourism travel.<sup>1</sup> Business travel originating from

the United States alone accounts for 25 to 30 percent of worldwide business travel. Moreover, business travel is estimated to make up half of the airlines revenue, over 60 percent of the lodging sector trade, and over 70 percent of car rental revenue. Many cities have or are in the planning process of developing convention centers. Honolulu is one of these cities. Thus, the results of this study are of broad interest for tax policy makers, for sectors of the travel industry, and for regional economies such as Hawaii.

The outline of the paper is as follows: Chapter II reviews the tourism travel literature and the literature on in-kind compensation. Chapter III presents the theoretical micro-analysis of business travel and the empirical specification for the problem. Results are presented in Chapter IV. The final chapter contains a summary of findings and a discussion of further implications of the study.

---

<sup>1</sup>Robert Cleverdon, International Business Travel, London: The Economist Publications Ltd., 1985.

## CHAPTER II

### REVIEW OF THE LITERATURE

In recent years, there has been increased interest in the determinants of business travel as the travel account has grown in importance as a component of invisible trade. This review will survey the literature in two general areas. The first area comprises general price and income findings in tourism travel, and the second considers the micro behavior of the business tourist.<sup>1</sup>

#### 2.1 Determinants of Demand for Tourism Travel

The general literature on demand for tourism travel is primarily divided by form of empirical implementation. It consists of two major categories. One category analyzes travel as an aggregate good and examines the determinants of the level of travel. The other category analyzes travel as a bundle of goods.

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<sup>1</sup>The business tourist is defined to be a visitor staying a minimum of 24 hours and a maximum of twelve months in the country visited and whose trip purpose is business, conference or other meeting. This definition is the one accepted by the United Nations, the International Monetary Fund, and the World Tourism Organization, as reported in Kenneth J. White and Mary Beth Walker, "Trouble in the Travel Account," Annals of Tourism Research, Vol. 9 (1982), p. 43.



### 2.1.1 Demand for Tourism Travel as an Aggregate Good

Analysis of tourism travel as an aggregate good can be categorized by definition of the level of travel. This level is defined in terms of expenditure by Gerakis(1965), Gray(1966), Kwack(1972), Artus(1972), Bond(1978), Sunday (1978), Little(1980), Schulmeister(1979), Loeb(1982), and Stronge and Redman(1982). Travel demand is defined in terms of the number of passenger trips by Newman(1971), Bechdolt(1973), Jud and Joseph(1974), Mutti and Murai (1977), Parskevopoulos(1977), Strazsheim(1978), Smith and Toms(1978), Kushman, Groth and Childs(1980), and Kliman(1980). Analysis of travel demand in terms of length of stay is more limited (Mak and Nishimura, 1979; Mak, Moncur and Yonamine, 1977).<sup>2</sup>

Typically, explanatory variables include income, relative price, transportation price, destination accommodation price, and some measure of exchange rate. Studies indicate a wide range of income and price responses (see Table 2-1), most likely reflecting underlying differences among different groups of travelers.

One general finding for both expenditure and trip studies is an income elasticity greater than one. Thus,

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<sup>2</sup>See Archer(1976) for a review of other models of tourism travel, notably gravity and trip generation models and linear systems analysis models.

TABLE 2-1  
Elasticity of Demand for Tourism Travel

|                                    | Income        | Relative<br>Price | Exchange<br>Rate | Airfare                 |
|------------------------------------|---------------|-------------------|------------------|-------------------------|
| Dependent variable: Expenditure    |               |                   |                  |                         |
| Gray, 1966                         | 0.8 to<br>3.3 | -1.2 to<br>-2.6   | -<br>-           | -.04 to<br>.25          |
| Kwack, 1972                        | 1.2 to<br>1.3 | -1.4 to<br>-1.6   | -                | -                       |
| Artus, 1972                        | 0.8 to<br>3.8 | -1.0 to<br>-5.1   | -1.2 to<br>-7.6  | -                       |
| Jud &<br>Joseph, 1974              | -             | -0.9 to<br>-2.7   | -                | -                       |
| Dependent variable: Trips          |               |                   |                  |                         |
| Newman, 1971                       | 2.2           | -                 | -                | -1.4 to<br>-1.7         |
| Bechdolt, 1973                     | 1.07          | -                 | -                | -3.07                   |
| Rugg, 1973                         | 2.0 to<br>3.9 | 1.5 to<br>2.0     | -                | -1.2 to<br>-1.4         |
| Mutti & Murai,<br>1977             | 1.8 to<br>4.4 |                   | -0.2 to<br>0.5   | -.1 to<br>-1.0          |
| Smith & Toms,<br>1978              | 1.1 to<br>2.6 | -                 | -                | -1.8 to<br>-1.9         |
| Straszheim,<br>1978                | -<br>1.1      | -                 | -                | -0.8<br>-1.8 to<br>-2.7 |
| Dependent variable: Length of Stay |               |                   |                  |                         |
| Mak, Moncur &<br>Yonamine, 1977    | +             |                   |                  |                         |
| Mak & Nishimura,<br>1979           | -.03          |                   |                  | -                       |
| Mak & Moncur, 1980                 | .15           |                   |                  |                         |

tourism travel can be classified as a "luxury" good. Exceptions are Gray(1966) for Canadian travel to the United States (.84) and Artus(1972) for Canadian travel to the United States (.83).

In contrast, price elasticities show greater variation, depending on the particular dependent variable. Most trip and expenditure studies find that own price elasticities are generally larger than one. Exceptions are Straszheim, who identifies an airfare inelastic business travel group (-.76), and Mutti and Murai(1977) who find elasticities less than one for both airfare and an inflation-exchange rate. Length of stay analyses, on the other hand, indicate little response to changes in income and a generally inelastic response to changes in accommodation price (-.03 to -.27). Interestingly, Sunday(1978) finds a positive relation between expenditure level and airfare. Mak et al.(1977) also find a small positive relationship between length of stay and airfare.

A comparison study of business and personal domestic (U.S.) air travel by Gronau(1970) indicates that both business and personal travel is income elastic and price inelastic. However, the study has the puzzling result that the airfare elasticity of business travelers is higher than that of personal travelers (-.8 compared to -.3, respectively). Gronau suggests deficiencies in a proxy for one of the explanatory variables. Another possible

explanation, as cited in the work of Jung and Fujii(1976) is the lack of variation in price and multicollinearity of price with distance in cross section models. Their work demonstrates a fare elasticity averaging -2.7.

A limitation of the studies treating travel as an aggregate good is that relationships between the components of travel can only be analyzed to a limited extent. Cross elasticity estimates, for example, are meager. An approach which addresses this problem is a more disaggregate analysis of tourism travel demand.

#### 2.1.2 Demand for Tourism Travel as a Bundle of Goods

Preliminary work which explicitly recognizes travel as a bundle of commodities can be found in the studies of Rugg (1973) and Mak and Moncur(1980). Rugg develops an interesting allocation model based on a Lancasterian approach to consumption in which goods are defined as the "being" at a particular destination for a defined period of time. Destinalional characteristics are interpreted as the Lancasterian characteristics of consumption. He estimates a passenger trip demand model with income, airfare, relative prices, and various destinalional characteristic dummies. Mak and Moncur estimate a length of stay model with basically the same explanatory variables. Results parallel the findings reported above, where travel is treated as an

aggregate good. When the number of passenger trips is the dependent variable, travel demand is income elastic and price elastic. When length of stay is the dependent variable, travel demand is relatively insensitive to income and price. This may primarily be attributed to the use of empirical forms which are the same as those used for models which treat travel as an aggregate good. Still, these papers are of interest because they demonstrate that destination and individual traveler characteristics are important determinants of tourism travel demand.

Analysis of tourism travel as a bundle of goods requires at a minimum a model which allows for examination of possible substitution relationships among components of the bundle. Single equation analysis can examine these relationships to only a limited degree. Taplin(1980), for example, argues for the use of a systems approach with his "coherence" estimation of price elasticities in the Australian vacation travel market. This estimation is indirect and calculates elasticities by using the results of previous single equation studies and Australian expenditure survey data.

Expenditure allocation models appear to be more fruitful, however, in uncovering relationships among the components of travel. A travel allocation model shows how an individual will allocate a given level of expenditure among alternative travel goods. Such a model assumes that

a portion of the total budget has been allocated to a particular consumption branch, such as travel and recreation. Allocation models are commonly estimated using complete systems of demand equations, and applications are far ranging. Leser(1963) and Sanz-Ferrer(1972), for example, treat travel and recreation as one of the major goods in their studies of total consumption allocation.

Of particular interest are the recent work of Walker and White(1980), White(1982) and Fujii, Khaled and Mak (1984; 1985a,b) which take a disaggregated approach to tourism travel. A major contribution of these studies is the demonstration that additional information can be gained by examining tourism travel as a bundle of commodities in a complete demand system framework.

Walker and White(1980) examine the allocation of travel expenditure of U.S. residents abroad to alternate world wide destinations. They find significantly different expenditure and own price responses in travel to different destinations. They also find evidence of some substitution responses and some complementary responses between destinations. In this case, the disaggregate approach reveals differences not observable when all travel abroad is treated as an aggregate good.

Extending this work, White(1982) models the allocation of travel expenditure to transportation and various European countries. In particular, he finds that increases

in country prices do not seem to cause much substitution toward transportation, while increases in transport prices have large differential responses in terms of the substitutability toward alternative destinations. There is also evidence of both unit complementary and substitution price responses among the destinations.

In contrast to these demand system models, Fujii, Khaled and Mak (1984; 1985a,b) conceptualize travel as a bundle of vacation goods and investigate tourist expenditure allocation at a particular resort destination. An assumption of this series of studies is that travel expenditure allocated to an Hawaiian vacation is further allocated among food, lodging, recreation, local transport, clothing and a miscellaneous category. They estimate alternate empirical specifications of the demand system<sup>3</sup> and find general evidence of unitary expenditure elasticities for all goods and unitary own price elasticities for food, lodging and clothing. Cross price elasticity estimates indicate that none of the goods are significant complements. These studies also show that the economic behavior of tourists at a particular destination are different from that of residents and warrants its own investigation.<sup>4</sup>

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<sup>3</sup>They estimate (1984) the linear expenditure system, the almost ideal demand system and the Rotterdam system.

Complete demand system analyses of travel expenditure have demonstrated the information that can be gained from disaggregation across goods. Previous demand system analyses, however, have used time series data with the accompanying aggregation across individuals. Individual differences in behavior cannot be investigated in such a case. A more complete investigation which unravels the decision making of individuals requires an analysis of micro-behavior. One such individual of interest is the business visitor.

## 2.2 Travel and Entertainment Expenditures: The Case of the Business Traveler

Under U.S. law, "ordinary and necessary" expenditures incurred in the process of doing business are deductible from revenues in the definition of business income. Moreover, certain business expenditures have a consumption component as well as a productive component, which escapes taxation. Most significant of these are the in-kind compensation provided by fringe benefits and executive perquisites. Indeed, the growth of in-kind compensation

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<sup>4</sup>See M. Khaled, Discussion Paper, Department of Economics, University of Hawaii at Manoa, 1983.



within the past decade has prompted much debate over its equity and efficiency.<sup>5</sup>

The tax preference accorded fringe benefits is a major determinant in their growth as a proportion of the total compensation package (Long and Scott 1982, 1984; Woodbury, 1983; see also Table 2-2). Elasticity estimates of response to change in the marginal tax rate from cross section data are generally high, while elasticity estimates from time series data are smaller.

TABLE 2-2  
Price Elasticities of Demand for Fringe Benefits

---

|                    |                                  |   |
|--------------------|----------------------------------|---|
| Long & Scott, 1982 | -0.75<br>-2.97                   | time series, 1947-79<br>cross section, 1978 |
| Long & Scott, 1984 | -0.74 to -1.59<br>-4.39          | time series, 1947-81<br>cross section, 1978 |
| Woodbury, 1983     | -1.66 to -1.75<br>-5.18 to -7.23 | time series, 1966-74<br>cross section, 1977 |

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Source: Long & Scott(1984)

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<sup>5</sup>Harvard Law Review, "Federal Income Taxation of Employee Fringe Benefits," 1976; John S. Nolan, "Taxation of Fringe Benefits," 1977; Charles T. Clotfelter, "Equity, Efficiency, and the Tax Treatment of In-Kind Compensation," 1979. Boris Bittker(1973) also notes the difficulty in allocating expenditure proportions to business and personal consumption.

Long and Scott(1982), in particular, provide an interesting characterization of the types of fringe benefits that arise from this tax treatment. Employees prefer benefits which are never taxed to benefits on which taxes are deferred, while employers prefer benefits which can be deducted immediately. The benefits most preferred by both employees and employers are then 1) group life and health insurance, 2) meals and lodging, travel and entertainment, transportation, and 3) employee discounts or interest free loans. None of these benefits are taxable as income to the employee. Benefits on which employees can defer their tax include pension, profit sharing and stock bonus plans. Finally, benefits which are taxed immediately include wages, salaries, and non-qualified stock plans.

Because the price of fringe benefits is reduced by an amount proportional to the marginal tax rate of the employee, the relative price of fringe benefits is lower than it would be in the absence of preferred tax treatment. Employees substitute non wage benefits for wage benefits, which can result in a distortion in the allocation of resources (Clotfelter, 1979). Empirical estimates of the Allen elasticity of substitution in Woodbury's complete demand system estimation provide evidence that the rate of substitution is high (1.674 to 1.762). In particular, when health and life insurance are disaggregated from pension funds, retirement income is

demonstrated to be a better substitute for current wages than insurance.

Evidence on the income response of fringe benefits is less clear. Woodbury finds that the income elasticity for fringes is greater than unity (1.49 to 1.55), contributed primarily by the high income response of demand for pension benefits. The primary effect of rising incomes on the wage fringe mix thus appears to be the substitution of deferred income for current income rather than current benefits for current income. On the other hand, Long and Scott find no significant income effect for any of the pension, health insurance and combined benefits.

In contrast to the more recent interest in fringe benefits as alternate forms of compensation, deductions falling on the business pleasure borderline have long been a source of concern for both equity considerations and potential abuse. Up until the mid 1970's, more detailed regulations existed for business deductions than for income exclusions.<sup>6</sup> The particular case of travel and entertainment is a classic example of expenditures undertaken for both production and consumption benefits. Travel is indeed necessary for some businesses and entails expenditure on transportation, meals and lodging. However, additional expenditure on first class fare or luxury hotel

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<sup>6</sup>Harvard Law Review, *ibid.*

accommodations clearly involve a personal consumption component.

Because these consumption benefits escape taxation, there have been several attempts to limit the deductibility of travel and entertainment expenditures, although success has been limited to disallowing expenditures for company yachts and lodges and limiting foreign travel. The current administrative (1985) tax proposal, for example, includes limited deductibility of business meals and the elimination of deductions for professional sporting events, country club dues and fishing trips among others.

The consumption component of travel and entertainment expenditures is analytically identical with the consumption benefits arising from the fringe benefits discussed above. Of particular interest is the evidence Clotfelter (1983) provides supporting the hypothesis that preferred tax treatment has contributed to the growth of expenditures on the business pleasure borderline. Expenditures on entertainment, travel, and gifts are each positively related to income and negatively related to price,<sup>7</sup> while expenditures on rent, insurance, and depreciation are not significantly related. Response to price changes are inelastic (-.62 for entertainment, -.76 for travel,

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<sup>7</sup>Price is defined as  $1-t$ , where  $t$  is the marginal tax rate, because Clotfelter empirically estimates demand for expenditures on travel, entertainment and gifts.

-.26 for gifts). Income responses are also less than unity (.51 for entertainment, .91 for travel, .11 for gifts). These results indicate that, other things equal, travel expenditures are the most responsive to changes in the marginal tax rate and income. Interestingly, Clotfelter finds that travel expenditures are the least responsive to changes in the proportion of deductibility.

Clearly, the size of fringe benefits and travel and entertainment expenditures, in particular, are determined by other factors in addition to the marginal tax rate and income. Clotfelter finds, for example, higher travel and entertainment expenditures associated with particular industries--professional services, finance, insurance, and real estate, and retail trade. Moreover, spending for entertainment and gifts are higher in metropolitan areas, while spending for travel does not vary by area. Entertainment and travel expenditures decline with age. Finally, singles or individuals with children at home are more likely to make expenditures in all categories.

No study to date has ascertained whether the fringe benefit nature of business travel and tax deductibility has the same demand effect at the disaggregate level as at the aggregate level. Moreover, no study has examined the substitution possibilities for the business traveler on a business trip. These elasticities would provide some indication of the degree of trade offs within the fringe

benefit mix defined by the trip. Studies of trade offs within the pension-health insurance mix, for example, have been hampered by the lack of a tax wedge between the two forms of benefits. For studies concerned with expenditures on the business pleasure borderline, elasticities of substitution such as that between travel, entertainment and gifts is of interest. An analysis of the expenditure behavior of the business traveler can reveal such information. That is precisely what this study will undertake.

CHAPTER III  
THEORETICAL AND EMPIRICAL SPECIFICATION

3.1 Theoretical Specification of Individual Demand for  
Business Travel

The motivations of business tourists and pleasure tourists differ. Business tourists use the business trip as a factor input into the production of business output. Pleasure tourists, on the other hand, consume the leisure trip as a good in the production of utility. Recently,<sup>1</sup> it has been suggested that business travelers not only use the trip in business output but also gain utility from its consumption. Moreover, business travelers face a lower effective price than pleasure travelers because of the deductibility of business trip expenditures. How does this affect the expenditure behavior of business travelers relative to pleasure travelers? Can any hypotheses concerning their sensitivity to price change be predicted?

---

<sup>1</sup>Charles T. Clotfelter, "Tax-Induced Distortions and the Business-Pleasure Borderline: The Case of Travel and Entertainment," American Economic Review, Vol. 73, No. 5 (1983), 1053-1065. See also by the same author, "Equity, Efficiency, and the Tax Treatment of In-Kind Compensation," National Tax Journal, Vol. 32, No. 1 (1979), 51-60.

As in Clotfelter's model of discretionary managerial behavior, assume that market conditions allow deviation from the profit maximization goal (see also Williamson, 1967). This assumption allows preferences for inputs in the production process to affect quantity decisions. Assume now, that goods yielding both production and personal benefits are determined by a utility maximizing manager. The manager's problem becomes the maximization of utility  $U(X,Z)$ , where  $X$  is the input with joint benefits and  $Z$  is all other consumption goods, subject to the income relation

$$(3.1.1) \quad M(X,Y) = P_X X + P_Y Y + P_Z Z.$$

The left hand side of this expression describes the revenue function determined by product price and the production relation, where  $X$  and  $Y$  are inputs in the production process. If product price is held constant, we may assume without loss of generality that it is equal to one. Then  $M(X,Y)$  is identical to the production function. The right hand side of (3.1.1) describes the allocation of expenditure among the production inputs and consumption.

To focus on the substitution possibilities in consumption, assume that the factor input  $Y$  is constant,  $Y=Y^0$ . Then  $X$  and  $Z$  are the only choice variables and the income constraint reduces to

$$(3.1.2) \quad M(X) = P_X X + P_Y Y^0 + P_Z Z.$$



Utility maximization yields the first order relations

$$(3.1.3) \quad U_X = -k(M_X - P_X) = k(P_X - M_X)$$

$$U_Z = kP_Z$$

$$M(X) = P_X X + P_Y Y^0 + P_Z Z.$$

At equilibrium,

$$(3.1.4) \quad (U_X/U_Z)P_Z + M_X = P_X.$$

In this study, X is assumed to have positive marginal utility. If X has no consumption value then the marginal rate of substitution between X and Z,  $U_X/U_Z$ , equals zero, and (3.1.4) implies that the only component of demand for X is the value of its marginal product in production. When X has consumption value, the demand for X may be viewed as the vertical summation of consumption and production demand.

Ordinary income constant demand functions can be derived for the utility maximization problem if (3.1.3) holds and if the matrix of first partials of the Lagrangean with respect to the choice variables X, Z, and k has nonzero determinant. A sufficient condition for utility maximization is that this determinant be greater than zero and insures that the income constant demands are well defined.

To investigate the comparative static effects of changes in the price of X and Z, consider the following derivation of the Slutsky relation. Maximization of utility subject to an income constraint yields the ordinary

income constant demand relations for the choice variables  $X$  and  $Z$ . The dual problem of minimizing the expenditure needed to obtain a given level of utility yields utility constant demand relations. That is, minimizing  $M(X) = P_X X + P_Y Y^0 + P_Z Z$  subject to  $U(X, Z) = U^0$  yields the utility constant demands

$$(3.1.5) \quad X^u(P_X, P_Z, U^0) \\ Z^u(P_X, P_Z, U^0).$$

Now, if we define the maximum achievable utility for a given income level by  $U^0 = U^*(P_X, P_Z, M(X))$ , then

$$(3.1.6) \quad X^m(P_X, P_Z, M(X)) = X^u(P_X, P_Z, U^*(P_X, P_Z, M(X))) \\ Z^m(P_X, P_Z, M(X)) = Z^u(P_X, P_Z, U^*(P_X, P_Z, M(X))).$$

Differentiating both sides of (3.1.6) with respect to  $P_X$  and  $P_Z$  we get,

$$(3.1.7) \quad \frac{dX^m}{dP_X} = \frac{\frac{dX^u}{dP_X} + \frac{dX^m}{dM} \left[ \frac{(-kX^m)}{(dU^*/dM)} + \frac{dM}{dX} \frac{dX^u}{dP_X} \right]}{1 + \frac{dX^m}{dM} \frac{dM}{dX}}$$

$$\frac{dZ^m}{dP_X} = \frac{dZ^u}{dP_X} + \frac{dZ^m}{dM} \left[ \frac{(-kX^m)}{(dU^*/dM)} + \frac{dM}{dX} \frac{dX^u}{dP_X} \right] - \frac{dZ^m}{dM} \frac{dM}{dX} \frac{dX^m}{dP_X}$$

$$\frac{dX^m}{dP_Z} = \frac{\frac{dX^u}{dP_Z} + \frac{dX^m}{dM} \left[ \frac{(-kX^m)}{(dU^*/dM)} + \frac{dM}{dX} \frac{dX^u}{dP_Z} \right]}{1 + \frac{dX^m}{dM} \frac{dM}{dX}}$$

$$\frac{dz^m}{dP_z} = \frac{dz^u}{dP_z} + \frac{dz^m}{dM} \frac{[(-kx^m)]}{(dU^*/dM)} + \frac{dM}{dX} \frac{dx^u}{dP_z} - \frac{dz^m}{dM} \frac{dM}{dX} \frac{dx^m}{dP_z}$$

where  $k$  is the LaGrangean multiplier in utility maximization and  $dU^*/dM = k(1 - M_X(dX/dM))$ .

Tables 3-1 and 3-2 show the resulting signs for the derivatives under alternative assumptions about the normality of  $X$  in consumption. Normality in production cannot be examined in this model because  $Y$  is constrained to be constant. Since only two consumption goods are arguments of the utility function, they are assumed to be net substitutes. The sign of  $dU^*/dM$  is also strictly positive when the marginal utility of  $X$  is positive. Note that when  $X$  is normal in consumption,  $(dx^m/dP_X) < 0$ , as in the usual consumption problem. In all other cases the sign of the derivative cannot be determined.

When taxes and full deductibility of expenditure are introduced, the first order conditions become

$$(3.1.8) \quad (1-t)M_X = (1-t)(P_X X + P_Y Y^0) + P_Z Z$$

$$U_X/U_Z = (1-t)(P_X - M_X)/P_Z.$$

Deductibility reduces the relative price of  $X$  in consumption by a factor of  $(1-t)$ . As a result, the nonlinear income constraint shifts such that more  $X$  is consumed at equilibrium.

TABLE 3-1

## Effect of Price Changes on X

---

| X     | Consumption |          |
|-------|-------------|----------|
|       | Normal      | Inferior |
| $P_X$ | (-)         | ?        |
| $P_Z$ | ?           | ?        |

---

Assume: X, Z net substitutes

---

TABLE 3-2

## Effect of Price Changes on Z

---

| Z     | Consumption |          |
|-------|-------------|----------|
|       | Normal      | Inferior |
| $P_X$ | ?           | ?        |
| $P_Z$ | ?           | ?        |

---

Assume: (1) X, Z net substitutes  
(2) X is normal in consumption

---

With full deductibility of X ( $h=1$ ), the price derivatives are

$$(3.1.9) \quad \frac{\frac{dx^m}{dp_x}}{\frac{dx^m}{dp_x}} = \frac{\frac{dx^u}{dp_x} + \frac{dx^m}{dM} \frac{[(-kx^m)(1-t)]}{(dU^*/dM)} + \frac{dM}{dx} \frac{dx^u}{dp_x}}{1 + \frac{dx^m}{dM} \frac{dM}{dx}}$$

$$\frac{dz^m}{dp_x} = \frac{dz^u}{dp_x} + \frac{dz^m}{dM} \frac{[(-kx^m)(1-t)]}{(dU^*/dM)} + \frac{dM}{dx} \frac{dx^u}{dp_x} - \frac{dz^m}{dM} \frac{dM}{dx} \frac{dx^m}{dp_x}$$

$$\frac{dx^m}{dp_z} = \frac{\frac{dx^u}{dp_z} + \frac{dx^m}{dM} \frac{[(-kz^m)]}{(dU^*/dM)} + \frac{dM}{dx} \frac{dx^u}{dp_z}}{1 + \frac{dx^m}{dM} \frac{dM}{dx}}$$

$$\frac{dz^m}{dp_z} = \frac{dz^u}{dp_z} + \frac{dz^m}{dM} \frac{[(-kz^m)]}{(dU^*/dM)} + \frac{dM}{dx} \frac{dx^u}{dp_z} - \frac{dz^m}{dM} \frac{dM}{dx} \frac{dx^m}{dp_z}$$

The income constant demand relations are all defined at the level of after tax income  $(1-t)M(X)$ . To avoid notational complications, all references to income in the equations above are with respect to after tax income. In this case  $dU^*/dM$  also equals  $k(1 - M_x(dX/dM))$ , where  $M$  is after tax income. Notice that the primary effect of tax deductibility on the price derivatives is to decrease the income effect of normality and inferiority for both X and Z

when  $P_x$  changes. The predicted signs of the derivatives remain as in Tables 3-1 and 3-2.

In this study, business travel is the good yielding both production and consumption benefits. To analyze disaggregated expenditures on meals, lodging, local transportation, gifts and entertainment by business travelers, and to compare this with the bundle selected by pleasure travelers, it is necessary to make some assumptions about their consumption behavior.

First define the individual unit of observation to be the tourist party. In the case of business travel, this unit is likely to be an individual. Even when the business party is larger than one, the individuals are likely to be friends, or in some instances, members of a family. Similarly, pleasure travelers who travel in a group are likely to family members or friends. The preference functions of friends and family are expected to be similar. Thus, there is a reasonable amount of justification for this definition.

Next assume that preferences are weakly separable to define utility over an aggregate group of goods.<sup>2</sup> Goods

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<sup>2</sup>Preferences are defined as weakly separable if and only if there exist subutility functions  $v_1, \dots, v_m$  such that the utility function can be expressed

$$U(x_1, \dots, x_m) = F(v_1(x_1), \dots, v_m(x_m))$$
for commodity vectors  $x_i$  and any monotone increasing function  $F(\cdot)$ .

can be partitioned into groups where within group preferences are independent of goods in other groups. So, for example, the traveler can rank different bundles of travel or recreation goods independently of his consumption of food or housing. This is preferable to invoking Hicks (1936) composite function theorem, where aggregates are defined by relative price movements rather than by preferences.

Weak separability is also a necessary condition for consistency of the two stage maximization procedure.<sup>3</sup> This concept is normally applied within the context of consumer budget allocation. Because a consumption component to business travel behavior is hypothesized, the two stage maximization concept is applied to the business traveler as well. Under the two stage budgeting process, the consumer optimally allocates total expenditure among broadly defined groups, where group price indexes serve as prices. A second stage allocation occurs in which group expenditure is optimally allocated among the goods in the group.

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<sup>3</sup>Strotz(1957) first discusses the notion of a utility tree and two stage budgeting. Weak separability is also a sufficient condition for consistency only in the final stage. Deaton and Muellbauer(1980) and Green(1964) point out that consistency in the first stage is problematical, requiring more stringent conditions on the form of preferences.

In this study, the pleasure traveler is assumed to engage in a multi-stage budgeting process, where allocation to travel and recreation is made in the first stage, allocation to trips to a particular destination is made in the second stage, and allocation to individual vacation goods is made in the third stage. The business traveler also goes through a multi-stage budgeting process. Allocation between business trips and other consumption goods is made in the first stage, allocation to destinations in the second, and allocation to individual goods in the third. The primary difference between business and the pleasure travelers is that the income of the business traveler is also determined by the level of travel.

The major implication of weak separability for the final stage of the budgeting process is that subutility, defined only on group elements, is maximized subject to group prices and group expenditure alone. This yields demand functions which are expressed as functions solely of group prices and expenditure. Moreover, the marginal rate of substitution between goods in the group is independent of quantities consumed in other branches. Note that this does not imply independence from price or expenditure changes outside the group. Rather, the effects of external price or expenditure change affect quantities in the given group through change in allotment to that branch.



To compare the demand of business travelers for trips with the demand of pleasure travelers for trips, consider the following functional form for  $U(X,Z)$ .

$$(3.1.10) \quad U(X,Z) = a \ln(X) + b \ln(Z)$$

In the business travel case, suppose in addition that

$$(3.1.11) \quad M(X) = AX^c(Y^0)^d$$

Solving for  $X$  explicitly in the maximization problem yields the income constant demand for  $X$  by the business traveler

$$(3.1.12) \quad X_b = ((M - P_Y Y^0) + Mbc/a) / (P_X(1 + b/a)).$$

Let the corresponding maximization problem for the pleasure traveler be to maximize  $U(X,Z) = a \ln(X) + b \ln(Z)$  subject to  $M = P_X X + P_Z Z$ . The income constant demand by the pleasure traveler is given by

$$(3.1.13) \quad X_p = M / (P_X(1 + b/a)).$$

Since the first term in the numerator of (3.1.12) represents what the business traveler has left for expenditure on  $X$  and  $Z$  after expenditure on  $Y$ , business demand for trips is larger than pleasure demand for trips, holding total expenditure for  $X$  and  $Z$  constant. With tax deductibility of expenditures on  $X$ , business travel demand becomes

$$(3.1.14) \quad X_b = (M/(1-t) - P_Y Y^0) / (P_X(1 + b/a)).$$

Note that tax deductibility increases the business traveler's demand for trips.

Thus, two effects characterize the response of business tourists. First, the demand curve for trips by

business travelers shifts up relative to that of pleasure travelers. Under the joint production hypothesis, the marginal valuation of each trip is greater for the business tourist. This implies that more trips are taken, holding prices and the underlying consumption bundle constant. Alternatively, more of the underlying goods are purchased, holding prices and the number of trips per time period constant. The latter implies that business tourists spend more on travel goods than pleasure tourists. Thus, one testable outcome is that expenditures for those components of the travel bundle which are used for business and pleasure should be greater for the business traveler than for the pleasure traveler. This is an income held constant prediction. If income levels of pleasure travelers are sufficiently high, they can purchase the same equilibrium bundle as that purchased by business travelers.

The second effect arises from the deductibility of business expenditures. Deductibility decreases the effective price faced by the business tourist. Thus, even if demand functions were identical, business tourists are expected to purchase larger quantities. Deductibility is expected to make increased demand for trips and travel goods more pronounced.

Other factors potentially contribute to differential spending patterns between business and pleasure travelers. First, age differences in the two groups would yield

differences in behavior. Older individuals have different tastes than younger individuals and probably engage in fewer, more expensive activities.<sup>4</sup>

Second, expenditure levels are affected by party size. Party sizes of business travelers are expected to be smaller than that of pleasure travelers, because additional non-business members are unlikely to add to output. Children, for example, would contribute little to the signing of a contract. Smaller party size would tend to increase the per person per day expenditure for those items which are subject to economies of scale. Examples are lodging and local transport.

Third, business travelers are expected to take shorter, more frequent trips than pleasure travelers. The relative price of their travel time is higher than that of pleasure travelers (Gronau, 1970; Louikas, 1982), and they would therefore tend to use less of this factor input. This is especially so if only a limited amount of business can be concluded on any one trip. An outcome of shorter trips is a larger per person per day expenditure on items which are not purchased on a daily basis, such as entertainment or gifts.

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<sup>4</sup>Industry differences affect the demand for trips among business travelers as well. One expects larger travel for those industries in which the marginal product of travel is greater, such as in financial, insurance or real estate services.

What can be said about the structure of preferences and the degree of price sensitivity within the consumption bundle? Business tourists are expected to be less sensitive to price changes than pleasure tourists. When prices at the destination change, pleasure tourists can substitute other destinations. Business tourists, on the other hand, can at most substitute other means of communication. The ease with which these other forms of communication can substitute for the business trip will determine the degree of price elasticity. Note, however, that business trips are undertaken to accomplish particular goals. Oftentimes these goals require face-to-face meeting to develop the rapport and trust that may precede the signing of an agreement. Thus, the degree of substitution for the business trip may be limited.

Note that not all forms of travel classified as business travel have this degree of substitution limitation. Convention travel, for one, is not tied to any particular destination and should be responsive to price changes. Even here, however, response occurs with a lag, as convention plans and reservations are required up to a year and a half in advance. Business travel of an educational nature is probably more price responsive. Travel which combines business and pleasure clearly allows for more substitution possibilities in the pleasure

component, but this is just as clearly tied to substitution possibilities in the business component.

If the business tourist is an employee and has no discretion in the allocation of travel expenditure, then the appropriate unit of study is the employing firm. Clotfelter(1983) argues that as long as business travel has positive marginal utility to the employee, then wages in that firm or industry will be lower, with the non-wage benefits substituting for wages. Thus, demand for goods on the business pleasure borderline will still be higher for business travelers. If the business tourist is an employee and has discretion in the allocation of travel expenditure, then higher consumption of goods providing utility is expected. In either case, the firm has an incentive to send employees on business trips only if substitution for the trip is difficult. Thus, one still expects to observe price inelasticity.

Some indication of the price sensitivity of the business traveler as compared to the pleasure traveler can be derived from the simple model in (3.1.12) and 3.1.13). Price elasticities for the Cobb-Douglas type functional form are well known. Thus, the pleasure traveler has a price elasticity of -1. For the business traveler, trip demand is inelastic if the production parameter

$$c \geq 1,$$

elastic if

$$c \leq 0$$

and indeterminate otherwise (see Appendix A). Values of this parameter less than or equal to zero correspond to a negative marginal product of travel. Since this is unlikely, business travelers are expected to have lower price sensitivity.

Inelasticity with respect to the price of the aggregate good represented by the business trip is not a sufficient condition for price inelasticity of the individual components. However, there are other reasons for expecting price insensitivity among these components. Purchase of goods at the destination may be dictated by industry practice. Business lunch at restaurants of a particular quality may be standard procedure, or previous experience may have indicated a larger marginal product for the purchase of goods of a particular quality. Thus, even if business tourists and pleasure tourists have identical tastes in consumption, substitution possibilities become more limited for the business tourist.

Finally, business travelers are expected to search less than pleasure tourists. The information search literature (Nelson, 1970) indicates that search is associated with larger price elasticities. This follows from the larger sample of brands and greater substitution possibilities that occurs with search. Even if trip

lengths were the same, business tourists have less time to search for alternative brands and prices of goods because of the time already committed to production. Furthermore, incentive to search over price is reduced, because any price savings are smaller by a factor  $t$ , the marginal tax rate. Sectors of the travel industry, moreover, actively encourage repeat patronage with purchasing schemes which allow patrons to accumulate credits toward gifts and services. Notable among these are the airlines' frequent flyer programs and car rental mileage accumulation programs.

In summary, this section hypothesizes that the business traveler's demand for business trips and their component goods is a vertical sum of the marginal utility and marginal product of the trip. With the plausible assumption that many business trips have no good substitutes, two general effects are expected. First, business travelers are expected to have a higher demand for travel and travel goods than pleasure travelers. Second, business travel demand is expected to be more inelastic than pleasure travel demand.

### 3.2 Empirical Specification

The theory of consumer behavior examines the conditions under which demand functions are well defined. Given a direct utility function  $U(x_1, x_2, \dots, x_n)$  with positive first order derivatives, concavity to the origin, and continuous second order derivatives, maximization of  $U(X)$  subject to a budget constraint will result in a set of ordinary demand equations. These demand equations satisfy the budget constraint, homogeneity of degree zero in prices and income, and symmetry and negative semidefiniteness of the Slutsky substitution matrix. Such demand equations are called theoretically plausible.<sup>5</sup> When the consumption problem is executed in the context of complete allocation of expenditure among mutually exclusive and exhaustive categories of goods, the set of demand equations become a complete system of theoretically plausible functions.

The linear expenditure system<sup>6</sup> (LES) is a demand system model which automatically satisfies the restrictions of additivity, homogeneity, symmetry, and negativity. It is derived from maximization of the Klein-Rubin utility

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<sup>5</sup>The term "theoretically plausible" system of demand equations is first used in a paper by Robert A. Pollak and Terence J. Wales, "Estimation of the Linear Expenditure System," *Econometrica*, Vol. 37 (1969), 611-628.



function

$$(3.2.1) \quad U(x) = \sum b_i \log(x_i - g_i) \text{ such that}$$

$$(3.2.1a) \quad \sum b_i = 1,$$

$$(3.2.1b) \quad 0 < b_i < 1, \quad x_i - g_i > 0.$$

(3.2.1a) imposes additivity and (3.2.1b) imposes negative semidefiniteness of the Slutsky matrix. Homogeneity and symmetry are incorporated by the structure of the LES model. The individual demand equations are commonly expressed expenditure form

$$(3.2.2) \quad p_i x_i = p_i g_i + b_i (m - \sum p_k g_k)$$

where  $p_i$  is the price of good  $i$ ,  $x_i$  is the per capita quantity of good  $i$ ,  $m$  is per capita total expenditure,  $b_i$  is the marginal propensity to consume good  $i$ , and  $g_i$  and  $g_j$ 's reflect own and cross price effects on expenditure of the  $i$ th good.

In the LES, there is no particular reason for the  $g$ 's to be positive. However, if they are positive and total expenditure is greater than  $\sum p_k g_k$ , we may interpret the  $g$ 's as subsistence quantities and the  $b$ 's as marginal propensities to consume out of supernumerary income  $(m - \sum p_k g_k)$ . The consumer is thus described as first buying the subsistence amount  $g_i$  and dividing remaining

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<sup>6</sup>The well known linear expenditure system has its roots in the paper by Richard A. Stone, "Linear Expenditure Systems and Demand Analysis: An Application to the Pattern of British Demand," Economic Journal, Vol. 64 (1954), 511-527.

income in the fixed proportions. Note that the marginal propensity to consume is strictly proportional to income and remains the same over all income levels.<sup>7</sup>

Expressions for uncompensated price and income elasticities are

$$(3.2.3) \quad E_{iy} = b_i/S_i, \quad S_i = \text{share of } i\text{th good}$$

$$(3.2.4) \quad E_{ii} = -1 + (g_i/x_i)(1-b_i)$$

$$(3.2.5) \quad E_{ij} = -b_i(p_j g_j / p_i x_i).$$

It can be seen that positive  $g_i$ 's imply inelastic demand. The admission of negative  $g_i$ 's permits price elastic goods.

For any demand system, budget data for a single period identifies the income-consumption curve, or expansion path, associated with that period's prices. Additional budget studies identify additional income-consumption curves. Thus, two budget studies are sufficient to identify the parameters of a system which are completely determined by two income-consumption curves. The LES is such a system, and herein lies its attraction. The income-consumption curve for any given period is a straight line originating at the point  $(g_1, g_2, \dots, g_n)$ . Two such curves, corresponding to two period's prices, identify the  $g$ 's by

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<sup>7</sup>Howe, Pollak and Wales(1979) develop a generalization of the linear expenditure model in which demand functions are quadratic in total expenditure. This form allows variation in the marginal propensity to consume with total expenditure.

their intersection. Pollack and Wales(1978) use this argument and estimate the LES for British household budget data over three goods and two years. Moreover, in the LES two budget studies are sufficient, regardless of the number of goods. In contrast, two cross sections only provide enough information for estimating a translog system with at most  $(n+1) + 2(n-1)$  parameters, while the nonhomothetic translog system contains  $(n_2+3n-2)/2$  independent parameters. This limits the number of allowable goods in a translog system to three.<sup>8</sup>

The parameters of the LES can also be completely identified with a single cross section if one of the subsistence  $g_i$ 's is known. Geometrically, the known quantity  $g_j$  defines a hyperplane normal to the  $j$  axis at  $g_j$ . The intersection of this hyperplane and the income-consumption curve defined by the period's prices identifies the remaining  $g_i$ 's. Betancourt(1971) estimates such an LES system using an estimate of the minimum amount of leisure, where leisure is one of the  $n$  goods. Howe(1974) also estimate a LES with a single cross section for Colombia using an estimate of the minimum cost diet as the subsistence expenditure for food.<sup>9</sup>

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<sup>8</sup>Lau, Lin and Yotopoulos(1978) estimate a translog system derived from the indirect utility function using three goods and two years of budget data for Taiwan agricultural households.

Use of the LES has some theoretical restrictions, the primary one of which is additivity of underlying preferences.<sup>10</sup> Implications for the LES are that there can be no inferior goods, nor any net complements. This is clearly a limitation on the flexibility of cross price effects. However, additivity may be a plausible assumption when choice is exercised over very broadly defined goods, such as food, housing and clothing. Indeed, Fujii, Khaled and Mak(1984) find no inferior goods and no significant complementary relationships for non-additive systems defined on travel goods for visitors to Hawaii. Their results suggest that the assumption of additivity for broadly defined vacation goods is plausible.

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<sup>9</sup>The extended linear expenditure system (ELES) developed by Lluch is also used to estimate elasticities for single cross sections (see Howe(1977) for a survey of these studies). Howe(1975) has also shown that the ELES can be reduced to the LES with saving as the  $(n+1)$ st good and minimum quantity  $g_{n+1}=0$ .

<sup>10</sup>Many empirical studies reject the additivity hypothesis (Barten, 1977). However, a comparative review by Klevmarken(1979) indicates that the additive LES with habit formation did as well as the nonadditive Rotterdam and indirect translog models, using fit, predictive ability, and signs and magnitudes of estimated elasticities as criteria. Thus, it would appear that the static model of behavior is rejected rather than the specific additivity hypothesis. Anderson and Blundell(1983) make a similar suggestion for the symmetry and homogeneity hypotheses.

## CHAPTER IV

### ESTIMATION AND RESULTS

#### 4.1 Data

For the purpose of estimating a complete system of demand equations, the required data are per visitor expenditure by commodity groups and their corresponding prices. Expenditure data is from the Hawaii Visitors Bureau (HVB) expenditure surveys and price data is from the State of Hawaii, Department of Planning and Economic Development (DPED).

The Hawaii Visitors Bureau, an organization funded by both government and private industry, conducts an expenditure survey every three years in which visitors to Hawaii are asked to record daily expenditures in each of fifteen categories of goods. These surveys are known as the Hawaii Visitor Expenditure Surveys. These categories include expenditures for restaurants, dinner shows, night clubs, groceries, attractions, other entertainment, ground transportation, auto rental, interisland transportation, sightseeing transportation, clothing, gifts and souvenirs, lodging, miscellaneous items, and an adjustment factor provided by the individual for otherwise unaccounted expenditure during the day. Expenditure data is then expressed in per visitor per day terms.

A unique feature of the surveys is the availability of detailed characteristics data of the travel party. These include number of trips to the destination, purpose of trip, age, occupation, length of stay, and party size. Characteristics data are collected from the Passenger Information Forms appended to the State of Hawaii Agricultural Declaration form required of all westbound visitors. Parties who complete this form are contacted upon arrival in Hawaii, and those who agree to participate constitute the data base for the budget survey.

The 1974, 1977, and 1980 Expenditure Surveys form the basic data set for this paper. Classification of expenditures is constant over the three survey dates except for the following: (1) Prior to 1980, dinner shows are included with restaurant expenditures; (2) prior to 1977, automobile rentals are included with ground transportation expenditures. For the purposes of this paper, the fifteen categories are aggregated into the broad commodity groups food, lodging, recreation, local transportation, clothing, and a miscellaneous group according to Table 4-1.

Gross sample sizes for 1974, 1977 and 1980 are 1669, 1582, and 1774 tourist parties, respectively. These samples are pooled, and only those tourist parties traveling to Hawaii from the U.S. mainland and who have indicated that they are not traveling as part of a tour package are retained.<sup>1</sup> The edited data set is

partitioned into subsamples reflecting the characteristics of primary interest.<sup>2</sup> In particular, the data set is divided according to business or pleasure trip purpose. Business travel is defined to be travel explicitly for business, travel for business and pleasure, and convention travel. Average expenditures and expenditure shares are presented in Tables 4-1 and 4-2 (see also Appendix C).

Prices, except for lodging, are obtained from Hawaii's Income and Expenditure Accounts: 1958-1980 (HIE), published by the State of Hawaii, Department of Planning and Economic Development (see Appendix D). They are derived from the relevant components of the Honolulu Consumer Price Index for urban consumers and match the components of the urban consumer price index of the U.S. National Income and Product Accounts. Aggregation of some categories of expenditure to form one broader category (Other) and noncorrespondence between HVB expenditure categories and HIE price indices (Clothing) required the

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<sup>1</sup>Sheldon(1984) has examined the price and income responsiveness of package tour travelers in the context of a modal choice model.

<sup>2</sup>In general, partitioning, or the use of unpooled data, yield results with higher values of the likelihood function than the use of pooled data with incorporated descriptive variables. In the context of the effects of demographic variables on demand, translating has been consistently rejected for the generalized CES, the LES, and the quadratic expenditure system (QES). See work by Pollak and Wales(1981), Derrick and Wolken(1982), and Barnes and Gillingham(1984).

TABLE 4-1  
Average Expenditures, 1980\*  
(Per Visitor Per Day in Current Dollars)

| Commodity             | Business<br>n=182 | Pleasure<br>n=750 |
|-----------------------|-------------------|-------------------|
| Restaurant            | 15.53             | 13.05             |
| Night Club            | 2.14              | 1.93              |
| Dinner Show           | .82               | 1.34              |
| Groceries             | 2.35              | 2.16              |
| Total Food            | 20.83             | 18.48             |
| Lodging               | 27.25             | 23.99             |
| Attractions           | 1.59              | 1.97              |
| Other Entertainment   | .94               | 1.21              |
| Total Recreation      | 2.53              | 3.17              |
| Ground Transport      | 1.04              | 1.10              |
| Auto Rental           | 5.40              | 3.32              |
| Interisland Transport | 2.34              | 2.40              |
| Sightseeing           | .39               | .58               |
| Total Transport       | 9.17              | 7.39              |
| Clothing              | 4.21              | 5.41              |
| Gifts & Souvenirs     | 5.28              | 6.15              |
| Other                 | 3.84              | 3.29              |
| Adjustment            | 1.28              | 1.21              |
| Total Miscellaneous   | 10.40             | 10.65             |
| TOTAL EXPENDITURE     | 74.40             | 69.11             |

\*Average expenditures for 1974 and 1977 can be found in Appendix C.

Source: Hawaii Visitors Bureau 1980 Expenditure Survey.



TABLE 4-2  
Average Expenditure Shares  
(1974, 1977, 1980)

| Commodity         | Business | Pleasure |
|-------------------|----------|----------|
| FOOD              | 28.75    | 28.72    |
| LODGING           | 33.56    | 32.82    |
| RECREATION        | 3.72     | 4.49     |
| TRANSPORTATION    | 11.80    | 10.64    |
| CLOTHING          | 8.00     | 8.13     |
| OTHER             | 14.16    | 15.20    |
| TOTAL EXPENDITURE | 100.00   | 100.00   |

Source: Hawaii Visitors Bureau 1974, 1977, 1980  
Expenditure Surveys.

construction of two new price indices. A Laspeyres price index was calculated, using 1977 as the base year and 1977 expenditures for westbound visitors to Hawaii as base year quantities.<sup>3</sup> In particular, the new indices have the form

$$(4.1.1) \quad L = p^1 x^0 / p^0 x^0,$$

for vectors  $p^1$  current year prices,  $p^0$  base year prices, and  $x^0$  base year quantities. When prices are expressed in terms of the base year,  $p^0=1$ , and base year expenditures become base year quantities  $x^0$ . The clothing category price index is constructed from price indices corresponding to (1) clothing and accessories and (2) footwear. The miscellaneous category price index is constructed from price indices corresponding to (1) tobacco, (2) jewelry, (3) laundry, (4) personal care, (5) medical care, and (6) household operation.<sup>4</sup>

A lodging price index is from the work of Fujii, Khaled and Mak(1985a). They construct this index for the period 1961-1980 by splicing together two separate weighted

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<sup>3</sup>Category expenditures for westbound visitors to Hawaii is from unpublished data from the State of Hawaii, Department of Planning and Economic Development.

<sup>4</sup>The simple correlation coefficient between clothing and footwear for the time period 1970-1980 is .99452. Correlation coefficients among the components of the miscellaneous price index ranged from .92224 to 1.000, the lowest being between tobacco and household operation and the highest being between laundry and jewelry.

averages of posted room rates (double occupancy) for a selected number of Hawaii hotels, where room totals at each hotel are used as weights.

Table 4-1 indicates that business travelers do indeed demand larger quantities of travel goods when it is assumed that both sets of travelers face the same prices. It is notable that this relationship holds precisely for those goods which have production and consumption components and excludes recreation and clothing.

Given this observation, the next step is to determine the price responsiveness of business travelers and pleasure travelers. In the context of full allocation among the travel goods, this requires empirical implementation of the selected model.

#### 4.2 Stochastic Specification and Method of Estimation

For purposes of estimation, the LES is expressed as a set of share equations with additive disturbance terms  $e_i$  which represents random elements in the observed shares.

$$(4.2.1) \quad S_i = g_i p_i^* + b_i (1 - \sum g_k p_k^*) + e_i$$

where  $p_i^* = p_i/m$  are income normalized prices and  $S_i$  is the T-vector of observations on expenditure shares for the  $i$ th commodity. The  $g_i$  and  $b_i$  are unknown parameters to be estimated subject to the constraint  $\sum b_i = 1$ . Elements of

the vector of random disturbances for observation  $t$  are assumed to come from a multivariate normally distributed with zero mean vector and constant covariance matrix. Disturbances for different observations are assumed to be uncorrelated.

The general method of estimation is that of the seemingly unrelated regression, where error terms are related across equations. However, since the shares are constrained to sum to one, the error covariance matrix is singular. Estimation requires that one of the share equations be deleted. Barten(1969) proves that maximum likelihood estimates for the full system ( $n$  goods) reduces to maximum likelihood estimates for the reduced system ( $n-1$  goods) and, therefore, that parameter estimates are invariant to the equation deleted. In light of this finding, the selection of the deleted equation is immaterial, and the share equation for the miscellaneous category is deleted. A modified Gauss-Newton method of iterative search which yields maximum likelihood estimates is used because the share equations for the LES are nonlinear in parameters.<sup>5</sup> The particular program used in estimation is the SAS nonlinear systems procedure.

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<sup>5</sup>See Richard Parks, "Maximum Likelihood Estimation of the Linear Expenditure System," Journal of the American Statistical Association, Vol. 66, No. 336 (December, 1971), 900-903 for a complete discussion.

#### 4.3 Parameter and Elasticity Estimates for the Business Visitor vs. the Pleasure Visitor

The parameter estimates of the linear expenditure system for the business and pleasure groups are reported in Table 4-3. The marginal budget shares  $b_i$  are significantly positive for all goods in both visitor groups. They are also significantly less than one, thus satisfying one of the concavity requirements of underlying preferences.

Expenditure elasticities, evaluated at mean budget shares, are reported in Table 4-4. If goods are classified as "luxuries" or "necessities" according to the size of their expenditure elasticities, different patterns are observed for both groups of visitors. For business travelers, all goods except lodging have unitary expenditure elasticity. Lodging is indicated to be a "luxury" good. For pleasure travelers, only clothing and the miscellaneous category have unit expenditure elasticity. Lodging and transportation are "luxury" goods, while food and recreation are "necessities." These are plausible results. Lodging is expected to be income sensitive for both groups of visitors. In addition, business traveler expenditures on food is expected to vary more with income. It is surprising, however, that recreation has the lowest expenditure elasticity for both groups (.855 for business and .867 for pleasure). Notably, the share of total

TABLE 4-3  
LES Parameter Estimates  
(Asymptotic t-values in parentheses)

| Commodity  | Business<br>n=431 |                  | Pleasure<br>n=1992 |                 |
|------------|-------------------|------------------|--------------------|-----------------|
|            | b <sub>i</sub>    | g <sub>i</sub>   | b <sub>i</sub>     | g <sub>i</sub>  |
| FOOD       | .282*<br>(31.96)  | 10.41*<br>(3.09) | .244*<br>(58.49)   | 4.73*<br>(3.61) |
| LODGING    | .367*<br>(31.53)  | 11.74*<br>(2.65) | .372*<br>(65.83)   | 2.54<br>(1.29)  |
| RECREATION | .032*<br>(8.96)   | 1.49*<br>(3.53)  | .039*<br>(18.38)   | 0.75*<br>(3.30) |
| TRANSPORT  | .116*<br>(15.68)  | 4.03*<br>(3.05)  | .119*<br>(32.48)   | 0.83<br>(1.36)  |
| CLOTHING   | .070*<br>(9.19)   | 3.05*<br>(3.62)  | .076*<br>(21.43)   | 1.12*<br>(2.68) |
| OTHER      | .192*<br>(19.67)  | 5.33*<br>(3.28)  | .150*<br>(31.55)   | 1.90*<br>(2.29) |

\*Parameter estimate is significantly different from zero  
at the 95% confidence level.

TABLE 4-4  
Expenditure Elasticities  
(Standard errors in parentheses)\*

| Commodity  | Business<br>n=431           | Pleasure<br>n=1992          |
|------------|-----------------------------|-----------------------------|
| FOOD       | .983<br>(.033)              | .850 <sup>+</sup><br>(.015) |
| LODGING    | 1.10 <sup>+</sup><br>(.038) | 1.13 <sup>+</sup><br>(.017) |
| RECREATION | .855<br>(.105)              | .867 <sup>+</sup><br>(.047) |
| TRANSPORT  | .971<br>(.067)              | 1.12 <sup>+</sup><br>(.034) |
| CLOTHING   | .871<br>(.104)              | .936<br>(.044)              |
| OTHER      | .930<br>(.070)              | .986<br>(.031)              |

\*Standard error calculations are due to a method by Kmenta(1971). See Appendix A for specific formulae.

<sup>+</sup>Elasticity estimate is significantly different from one at the 95% confidence level.

TABLE 4-5

## Test for Differences in Expenditure Elasticities

| Commodity  | SE*  | Z-value |
|------------|------|---------|
| FOOD       | .036 | 3.69**  |
| LODGING    | .042 | -0.71   |
| PECREATION | .115 | -0.10   |
| TRANSPORT  | .075 | -1.99** |
| CLOTHING   | .113 | -0.58   |
| OTHER      | .077 | -0.73   |

\*The standard error of the difference of elasticities (SE) is calculated as follows

$$SE = (\text{Var}(E_b) + \text{Var}(E_p))^{1/2}$$

where  $E_b$ =expenditure elasticity for the business visitor and  $E_p$ =expenditure elasticity for the pleasure visitor.

\*\*Difference between elasticities is significantly different from zero at the 95% confidence level.



expenditure allocated to recreation is the smallest for both groups of visitors. One explanation for this observation arises from the nature of the data. The recreation component of an Hawaiian trip is not entirely captured in recreation expenditures. Recreation in Hawaii consists primarily of relaxation in the sun on the beach. Recreation of this type does not require the levels of expenditure for recreation at destinations such as Las Vegas or New York. Instead, the price of beach recreation is captured in other components of the travel bundle. Hotel rooms on the beach, for example, are priced higher than those which are not.

Table 4-5 contains the results of tests for differences in the estimated expenditure elasticities.<sup>6</sup> The business traveler has a significantly higher expenditure elasticity for food than the pleasure traveler. This is a reasonable result. The business lunch is an expenditure that can be directly tied to the level of business income, while the relative non-response of food to

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<sup>6</sup>The standard error of the difference of the elasticities can be approximated by

$$\begin{aligned} & SE(E_b - E_p) \\ &= (\text{Var}(E_b) + \text{Var}(E_p) - 2\text{Cov}(E_b, E_p))^{1/2} \\ &= (\text{Var}(E_b) + \text{Var}(E_p) - 2rSE(E_b)SE(E_p))^{1/2} \end{aligned}$$

where  $r$  is the correlation coefficient. Assume that the elasticities are either positively correlated or uncorrelated, with  $0 < r < 1$ . In this case, an upper bound on the standard error of the difference is given by

$$SE(E_b - E_p) = (\text{Var}(E_b) + \text{Var}(E_p))^{1/2}.$$

expenditure in the pleasure travel case is a commonly reported finding in household budget studies.

The business traveler also has a lower expenditure elasticity for local transportation than the pleasure traveler. This is in accord with the notion that a business trip is normally made to a specific destination. Hawaii is composed of a set of separate islands, with the main business center located in a small area on one island. The business traveler uses only a limited amount of transportation services once he has reached his primary destination.

The data does not reveal any other significant differences in the expenditure elasticities. This may be due to the relatively small business travel sample. Note, for example, the larger standard errors of the business group for the recreation, clothing, and miscellaneous categories.

The  $g_i$ 's are all positive and significantly different from zero for both groups of visitors except for the pleasure traveler's lodging and transportation. It is interesting to note that these "subsistence quantities" are all larger for the business traveler. A comparison of the uncompensated own price elasticities across categories yield the expected result that business travelers are less price sensitive than pleasure travelers (see Table 4-6).

TABLE 4-6  
Uncompensated Own Price Elasticities\*\*  
(Standard errors in parentheses)\*

| Commodity  | Business<br>n=431 | Pleasure<br>n=1992 |
|------------|-------------------|--------------------|
| FOOD       | -.539+<br>(.158)  | -.709+<br>(.068)   |
| LODGING    | -.622+<br>(.156)  | -.887<br>(.071)    |
| RECREATION | -.332+<br>(.199)  | -.642+<br>(.091)   |
| TRANSPORT  | -.428+<br>(.197)  | -.832<br>(.100)    |
| CLOTHING   | -.364+<br>(.173)  | -.702+<br>(.087)   |
| OTHER      | -.423+<br>(.173)  | -.757+<br>(.083)   |

\*Standard error calculations are due to a method by Kmenta(1971). See Appendix A for specific formulae.

\*\*See Appendix F for a complete table of substitution effects.

+Elasticity estimate is significantly different from one.

TABLE 4-7  
Test for Differences  
in Uncompensated Own Price Elasticities

| Commodity  | SE*  | Z-value |
|------------|------|---------|
| FOOD       | .172 | 0.99    |
| LODGING    | .171 | 1.55    |
| RECREATION | .219 | 1.42    |
| TRANSPORT  | .221 | 1.83**  |
| CLOTHING   | .194 | 1.75**  |
| OTHER      | .192 | 1.74**  |

\*The standard error of the difference of elasticities (SE) is calculated as follows  

$$SE = (\text{Var}(E_b) + \text{Var}(E_p))^{1/2}$$
where  $E_b$ =own price elasticity for the business visitor and  $E_p$ =own price elasticity for the pleasure visitor.

\*\*Difference between elasticities is significantly different from zero at the 90% confidence level.

TABLE 4-8

Compensated Price Elasticities  
(Standard errors in parentheses)

| Commodity                  | FOOD            | LODG            | RECR            | TRANS           | CLOTH           | OTHER           |
|----------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Business Visitors (n=431)  |                 |                 |                 |                 |                 |                 |
| FOOD                       | -.256<br>(.159) | .132<br>(.083)  | .011<br>(.007)  | .041<br>(.026)  | .025<br>(.015)  | .046<br>(.029)  |
| LODG                       | .113<br>(.069)  | -.252<br>(.153) | .013<br>(.008)  | .046<br>(.029)  | .028<br>(.017)  | .052<br>(.032)  |
| RECR                       | .088<br>(.058)  | .115<br>(.078)  | -.300<br>(.199) | .036<br>(.024)  | .022<br>(.014)  | .040<br>(.027)  |
| TRANS                      | .100<br>(.063)  | .130<br>(.084)  | .011<br>(.007)  | -.312<br>(.197) | .025<br>(.015)  | .046<br>(.029)  |
| CLOTH                      | .090<br>(.052)  | .117<br>(.071)  | .010<br>(.006)  | .037<br>(.022)  | -.294<br>(.174) | .041<br>(.024)  |
| OTHER                      | .096<br>(.056)  | .125<br>(.075)  | .011<br>(.006)  | .039<br>(.023)  | .023<br>(.014)  | -.294<br>(.173) |
| Pleasure Visitors (n=1992) |                 |                 |                 |                 |                 |                 |
| FOOD                       | -.465<br>(.068) | .229<br>(.033)  | .024<br>(.004)  | .073<br>(.011)  | .047<br>(.007)  | .092<br>(.014)  |
| LODG                       | .200<br>(.028)  | -.515<br>(.072) | .032<br>(.005)  | .098<br>(.014)  | .062<br>(.009)  | .123<br>(.018)  |
| RECR                       | .153<br>(.023)  | .233<br>(.035)  | -.603<br>(.090) | .075<br>(.011)  | .048<br>(.008)  | .094<br>(.015)  |
| TRANS                      | .198<br>(.028)  | .301<br>(.042)  | .031<br>(.005)  | -.713<br>(.100) | .062<br>(.009)  | .121<br>(.017)  |
| CLOTH                      | .165<br>(.023)  | .252<br>(.035)  | .026<br>(.004)  | .081<br>(.011)  | -.625<br>(.086) | .102<br>(.014)  |
| OTHER                      | .174<br>(.024)  | .265<br>(.036)  | .028<br>(.004)  | .085<br>(.012)  | .054<br>(.008)  | -.607<br>(.082) |

For the business traveler, all categories are price inelastic. For the pleasure traveler, all categories except lodging and transportation are price inelastic. Lodging and transportation have unit price elasticity. This is not surprising as the expenditure elasticities for these two categories are larger than the others, and price elasticities tend to be proportional to expenditure elasticities in the LES. The elasticity of demand for recreation by business travelers is not significantly different from zero, however, and requires some explanation. The traveler who is strictly on business consumes few recreation goods because he has no time. Small changes in price are unlikely to affect his demand. The traveler who is combining business and pleasure or attending a convention is also unlikely to change his plans because of limited time and probable pre-trip recreation decisions.

Tests for differences in the uncompensated own price elasticities (Table 4-7) indicate a difference at the 90 percent confidence level<sup>7</sup> for transportation, clothing, and the miscellaneous category. That is, in these three categories, the own price elasticities are significantly smaller.

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<sup>7</sup>A one-sided test may be appropriate, given the hypothesis that price elasticities for the business traveler are less than that of the pleasure traveler. In this case, the confidence level increases to 95 percent.

Compensated own price elasticities (Table 4-8) are negative for both groups of visitors. Results for the business visitor, however, indicate that none of the compensated own price elasticities is significantly greater than zero. This implies that gross substitution effects are almost entirely due to the income effect. This supports the secondary hypothesis of limited substitutability and low price elasticities for the business traveler. In contrast, all of the compensated price elasticities are significantly greater than zero for the pleasure traveler.

Positive cross price elasticities are in accordance with the LES restriction that all goods be net substitutes. These are essentially zero for the business visitor and small for the pleasure visitor, all under .3 percent in the latter case. Small cross price elasticities are not surprising, given the aggregate nature of the goods, but the data cannot distinguish any cross substitution possibilities for the business traveler.

Satisfaction of the negativity condition of consumer demand theory is indicated by negative eigenvalues of the Slutsky substitution matrix. This result holds for both business and pleasure travelers. The likelihood ratio test also substantiates the validity of estimation by the partitioning or "unpooled" method. The method of the test is to estimate a demand system for the pooled group of

travelers, constraining to zero coefficients of dummy variables identifying trip purpose. The demand system is again estimated allowing the coefficients of the dummy variables to assume their estimated values. The likelihood ratio test is given by the statistic

$$L = -2 (LL_C - LL_U)$$

which is distributed as a chi-square statistic with as many degrees of freedom as the number of constraints. Results appear in Table 4.9 below.

TABLE 4.9  
Test for Validity of Partitioning

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|                                |   |
|--------------------------------|---|
| Log Likelihood (unconstrained) | 13578.1                                     |
| Log Likelihood (constrained)   | 13597.4                                     |
| L = 38.6                       | $\chi^2(df=11) = 19.675$ at .05 error level |

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## CHAPTER V

### CONCLUSION

#### 5.1 Summary of Findings

Several conclusions can be made about the economic behavior of business travelers. First, business travelers do indeed demand larger quantities of those travel goods which jointly supply benefits for business and pleasure. They spend more on food, lodging and local transportation and less on clothing and recreation. Even within the transportation aggregate, they spend less on sightseeing and interisland transportation. This finding corroborates the previous work of Clotfelter(1983) and, less directly, the work of Woodbury(1983) and Long and Scott(1982, 1984).

Second, this is the first report demonstrating that business travelers have lower price elasticities than pleasure travelers for specific travel goods other than transportation to the destination. The difference in elasticities is significant for local transportation, clothing and the miscellaneous categories. In the other categories, business traveler elasticities are smaller, although not significantly so. It contrasts the findings of Gronau(1970) and supports the findings of Straszheim (1978) on demand for air travel.

Third, a surprising result is that business travelers demonstrate no pure substitution responses to price changes. Small substitution effects were expected. The implication of this finding is that uncompensated price elasticities are entirely determined by the income effect and that the consumption behavior of individuals traveling for business is tied primarily to the income generating function of the business trip. Consequently, this study is unable to discern evidence of any strong substitution relationships among the components of the travel bundle.

In contrast, pleasure travelers display larger substitution behavior. Compensated elasticities for pleasure travelers generally parallel the results of Fujii, Khaled and Mak(1985a), who estimate an Almost Ideal Demand System for similar goods and annual time series data on visitors to Hawaii. Although specific elasticity estimates in this paper are smaller than theirs, (1) food and lodging and (2) transportation and lodging are found to be moderately strong substitutes for pleasure travelers.

Fourth, similar expenditure responses are observed for both business and pleasure travelers, with the exception of two categories. Business travelers are more income responsive in the food category and less income responsive in the transportation category than pleasure travelers. In general, expenditure elasticities are in the same range as those reported by Fujii, Khaled and Mak(1985a).

As with the use of any special data set, caution is required in generalizing specific results. The business travel group in this study is a broadly defined group consisting primarily of individuals combining business and pleasure. Results for individuals traveling strictly for business would be different since these individuals do not necessarily gain utility from the business trip. Moreover, Hawaii is a resort destination where opportunities for business transactions or meetings are different from other resort destinations. The results of the study also represent average behavior within a given range of prices, incomes and tax structure. Since the effect of income distribution and taxes were not explicitly modeled, any specific findings are conditional.

Nevertheless, the results reported here are highly significant empirical findings. First, they provide additional evidence that tax deductibility and the double benefit nature of goods on the business pleasure borderline increases the demand for business travel. Second, they provide new evidence, based on actual expenditure data, that business travelers are less price sensitive than pleasure travelers for goods which make up the travel bundle.

#### 4.2 Further Implications and Future Research

The general qualitative results reported here have other implications. They indicate that business travelers have a higher demand for travel goods. If tax deductibility is a cause for this observation, then there is some support for Clotfelter's(1983) efficiency loss argument concerning over consumption of travel goods. A further implication is that tax revenues could be increased by including the personal component of such fringe benefits as business travel in the tax base. This suggests the development of some kind of optimality rule for the allowable proportion of deductibility, although decreasing the allowable deductibility would probably result in shrinkage of the travel sector and travel related sectors.

The findings of the study are also significant from the point of view of a regional economy such as Hawaii. They suggest the development of policy which encourages business travel to the region. For Hawaii, this is of importance because of the perceived anti-business climate which the state has. An immediate benefit of business travel is the lower burden on the infrastructure (roads, parks, sewerage) shared by tourists and residents for any given dollar flowing into the region.

Related to this is the question of how a "quality" tourist is defined. The multiplier effects of the business

travel dollar may be different from that of the pleasure travel dollar, and needs to be investigated. Multiplier effects from expenditure on lodging are smaller than multiplier effects from retail expenditure (Liu, 1985), for example. Note that lodging represents a major category where business travel expenditure is larger than pleasure travel expenditure. In addition, the stimulation of business travel alone may cause a reallocation of resources among the local industries providing tourism services. For example, business travelers spend less on clothing and recreation. Thus, these industries would not grow at the same rate as overall visitor arrivals.

What are the implications of the price inelasticity of business travelers? It has been suggested elsewhere (Fujii, Khaled and Mak, 1985b) that a hotel room tax can be exported, although with significant negative impact on the lodging and certain non-lodging sectors of the travel industry. This study supports their general finding with respect to the demand behavior of business travelers. However, the negative effects are much smaller.

A major problem with a business travel tax is the discrimination of business use of a travel good. Pleasure travelers are the major users of lodging facilities in a region like Hawaii. A hotel room tax would not differentiate the business use. One possibility is a use tax for facilities primarily used by business travelers,

such as convention centers or business services provided by hotels. Some hoteliers in the United States, for example, now provide audio-visual facilities, tele-conferencing and telex services, small computer facilities, and secretarial services.

Information about the market segment represented by business travel is also of interest to the travel industry. Most major domestic and international airlines have instituted business fare classes, distinct from first class and coach. In-house hotel surveys indicate that business travelers desire convenience and quality over economy. New survey techniques<sup>1</sup> also indicate that the business travel market is made up of different price elastic segments. A MasterCard International survey, for example, identifies three such segments. This suggests that further work on the price responsiveness of specific subsegments of the business market would be useful. Results from such work would clearly improve the effectiveness of targeting

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<sup>1</sup>The concept and application of psychographic measures of attitudes, behavior and preferences, is widely accepted in the field of marketing. Commonly implemented through Activity-Interest-Opinion statements, major factors influencing behavior are identified through a principal components type analysis. In the area of travel, it has been used to identify factors such as desirable destination characteristics and attitudes toward trip planning. It has also been used to relate levels of expenditure with attitudes.

promotional advertising. This not only applies to the market sector but to government agencies which advertise as well.

Many research problems in the area of business travel remain. The LES can be used for estimating the demand behavior of business travelers to other destinations where there is sufficient budget data. In particular, the method of this paper can be used for the developing countries, which lack long time series data. The use of different functional forms, such as the translog or AIDS, can also be investigated. With cross section data or additional years of budget data, these alternative forms can be used to test the robustness of the findings here.

Another area of research is the analysis of different submarkets of the business travel market. There are differences between travel strictly for business and travel which combines business and pleasure. Differentiation of business travelers can also be made in terms of their attitudes and opinions. Currently, women make up the fastest growing segment of the business travel group. Empirically, this may affect the distribution of expenditures in the travel bundle and the elasticity estimates.

Yet another area to explore is the explicit effect of tax deductibility on the demand for the various travel goods. The development of a model which takes substitution for the business trip in production may lead to further

useful empirical predictions. Furthermore, sensitivity analysis of changes in the tax rate and the proportion of deductibility would be extremely valuable to policy makers.

Empirical research on the business traveler is just beginning. Of special interest is the finding in this paper that business travelers do not react to price increases in as variable a manner as pleasure, or discretionary, travelers. It is hoped this sheds useful light for makers of policy.



## APPENDIX A

### Mathematical Appendix

#### Section 1. Derivation of Own Price Elasticity from the Consumer Maximization Problem: The Pleasure Traveler.

The consumer's problem is to maximize  $U(Z, X)$  subject to the income constraint  $M = P_X X + P_Z Z$ . The Lagrangean function is given by

$$L = U(Z, X) + k(M - P_X X - P_Z Z).$$

The first order conditions are

$$U_Z - kP_Z = 0$$

$$U_X - kP_X = 0$$

$$M - P_X X - P_Z Z = 0.$$

Income constant demand relations for  $X$  and  $Z$  can be determined if the determinant of the matrix of the second order derivatives of the Lagrangean

$$\begin{vmatrix} U_{ZZ} & U_{ZX} & -P_Z \\ U_{XZ} & U_{XX} & -P_X \\ -P_Z & -P_X & 0 \end{vmatrix}$$

is non-zero. Non-negativity of this determinant is also required for utility maximization.

To solve for  $dX^M/dP_X$ , it is sufficient to solve the system

$$\begin{vmatrix} U_{ZZ} & U_{ZX} & -P_Z \\ U_{XZ} & U_{XX} & -P_X \\ -P_Z & -P_X & 0 \end{vmatrix} \begin{vmatrix} dZ/dP_X \\ dX/dP_X \\ dk/dP_X \end{vmatrix} = \begin{vmatrix} 0 \\ k \\ X \end{vmatrix}$$

Using Cramer's rule to solve for  $dX/dP_X$ , the price elasticity of demand by the pleasure traveler is given by

$$\frac{dX}{dP_X} \frac{P_X}{X} = \frac{U_{ZZ}P_X - U_{XZ}P_Z - (P_Z U_Z/X)}{-U_{ZZ}P_X + 2U_{XZ}P_Z - (P_Z^2 U_{XX}/P_X)}$$

$$= -1 \quad \text{when } U = a \ln(X) + b \ln(Z).$$

## Section 2. Derivation of Own Price Elasticity from the Consumer Maximization Problem: The Business Traveler.

The business traveler's problem is to maximize  $U(Z, X)$  subject to the income constraint

$$M(X, Y^0) = P_X X + P_Y Y^0 + P_Z Z.$$

The Lagrangean function is given by

$$L = U(Z, X) + k(M(X) - P_X X - P_Y Y^0 - P_Z Z).$$

The first order conditions are

$$U_Z - kP_Z = 0$$

$$U_X + k(M_X - P_X) = 0$$

$$M - P_X X - P_Y Y^0 - P_Z Z = 0.$$

Income constant demand relations for  $X$  and  $Z$  can be determined if the determinant of the matrix of the second order derivatives of the Lagrangean

$$\begin{vmatrix} U_{ZZ} & U_{ZX} & -P_Z \\ U_{XZ} & U_{XX} + kM_{XX} & M_X - P_X \\ -P_Z & M_X - P_X & 0 \end{vmatrix}$$

is non-zero. Non-negativity of this determinant is also required for utility maximization.

To solve for  $dX/dP_X$ , it is sufficient to solve the system

$$\begin{vmatrix} U_{ZZ} & U_{ZX} & -P_Z \\ U_{XZ} & U_{XX} + kM_X & M_X - P_X \\ -P_Z & M_X - P_X & 0 \end{vmatrix} \begin{vmatrix} dZ/dP_X \\ dX/dP_X \\ dk/dP_X \end{vmatrix} = \begin{vmatrix} 0 \\ k \\ X \end{vmatrix}$$

Using Cramer's rule to solve for  $dX/dP_X$ , the price elasticity for the business traveler is given by

$$\begin{aligned} & (dX/X)/(dP_X/P_X) \\ &= [U_{ZZ}P_X - U_{XZ}P_Z - (P_Z U_Z/X) - U_{ZZ}M_X] / \\ & \quad [-U_{ZZ}P_X + 2U_{XZ}P_Z - U_{XX}(P_Z^2/P_X) - U_{ZZ}M_X^2/P_X + 2U_{ZZ}M_X \\ & \quad - 2U_{XZ}M_X(P_Z/P_X) - U_Z M_{XX}(P_Z/P_X)] \\ &= [-(b/Z^2)P_X - (b/ZX)P_Z + (b/Z^2)M_X] / \\ & \quad [(b/Z^2)P_X + (b/ZX)P_Z - 2(b/Z^2)M_X + (b/Z^2)M_X^2/P_X \\ & \quad - (b/Z)(P_Z/P_X)(M_X/X)c] \end{aligned}$$

where  $U(Z, X) = a \ln(X) + b \ln(Z)$  and  $M(X, Y) = AX^c(Y^0)^d$ .

Denote this elasticity by  $E_{XX}$ .  $E_{XX} > -1$  if and only if

$$\begin{aligned} 0 &> \frac{1}{Z} - \frac{M_X}{ZP_Z} + \frac{cP_Z}{XP_X} \\ \frac{M_X}{ZP_Z} &> \frac{1}{Z} + \frac{cP_Z}{XP_X} \\ cM &> XP_X + cZP_Z \\ c(XP_X + Y^0P_Y) &> XP_X \end{aligned}$$

By inspection,  $E_{xx}$  is inelastic when  $c \geq 1$  and elastic when  $c \leq 0$ .  $E_{xx}$  is indeterminate otherwise.

With taxes, the business traveler maximizes  $U(Z, X)$  subject to the income constraint

$$(1-t)M(X, Y^0) = (1-t)(P_X X + P_Y Y^0) + P_Z Z.$$

The first order conditions are

$$U_Z - kP_Z = 0$$

$$U_X + k(M_X - P_X)(1-t) = 0$$

$$(1-t)(M(X) - P_X X - P_Y Y^0) - P_Z Z = 0.$$

The own price elasticity of business travel  $X$  can be derived by solving the system of equations

$$\begin{vmatrix} U_{ZZ} & U_{ZX} & -P_Z \\ U_{XZ} & U_{XX} + k(1-t)M_{XX} & (M_X - P_X)(1-t) \\ -P_Z & (M_X - P_X)(1-t) & 0 \end{vmatrix} \begin{vmatrix} |dZ/dP_X| \\ |dX/dP_X| \\ |dk/dP_X| \end{vmatrix} = \begin{vmatrix} 0 \\ k(1-t) \\ X(1-t) \end{vmatrix}$$

In this case, the own price elasticity  $E_{xx}$  is

$$\begin{aligned} & [-U_{ZZ}(M_X - P_X)(1-t)^2 - U_{XZ}(1-t)P_Z - P_Z^2 k(1-t)/X] / \\ & [-U_{ZZ}(M_X - P_X)^2 (1-t)^2 / P_X - 2U_{XZ}P_Z(M_X - P_X)(1-t) / P_X \\ & - P_Z^2 (U_{XX} + k(1-t)M_{XX}) / P_X ]. \end{aligned}$$

When  $U(Z, X) = a \ln(X) + b \ln(Z)$  and  $M(X, Y) = A X^c (Y^0)^d$ ,

$E_{xx} > -1$  if and only if

$$\begin{aligned} 0 &> \frac{(1-t)^2}{Z} - \frac{M_X(1-t)^2}{Z P_X} + \frac{P_Z c(1-t)}{P_X X} \\ \frac{M_X(1-t)}{Z P_X} &> \frac{(1-t)}{Z} + \frac{P_Z c}{X P_X} \\ M c(1-t) &> (1-t) X P_X + Z P_Z c \\ c(1-t)(X P_X + Y^0 P_Y + Z P_Z) &> (1-t) X P_X + Z P_Z c \end{aligned}$$

If  $t = .5$ , then  $E_{xx} > -1$  if and only if

$$(c-1)XP_x + cYP_y - cZP_z > 0.$$

There is no necessary value of  $c$  for which this condition holds.

### Section 3. Derivation of Standard Errors for Calculated Elasticities.

The method of calculation of standard errors is from Kmenta(1971), which uses a second degree Taylor expansion for a function of several variables. When price elasticities are functions of the estimated parameters, the variance of these elasticities can be derived as an expansion around the values of the estimated parameters. For example, if  $a = f(b_1, b_2, \dots, b_n)$

$$\text{Var}(a) = \sum_k \left( \frac{df}{db_k} \right)^2 \text{Var}(b_k) + 2 \sum_{j < k} \frac{df}{db_j} \frac{df}{db_k} \text{Cov}(b_j, b_k).$$

# APPENDIX B

## Distribution of Westbound Visitors to Hawaii by Trip Purpose, 1980

|                       |           | Percent |
|-----------------------|-----------|---------|
| Pleasure              | 2,040,182 | 75.0    |
| Business              | 79,558    | 2.9     |
| Business & Pleasure   | 358,483   | 13.2    |
| Government & Military | 10,680    | 0.4     |
| Visiting Relatives    | 110,355   | 4.0     |
| Attend School         | 2,457     | 0.1     |
| Convention            | 93,821    | 3.5     |
| Other                 | 8,399     | 0.3     |
| Not Reported          | 14,928    | 0.5     |
| Total                 | 2,718,863 | 1.000   |

Source: Hawaii Visitors Bureau 1981 Annual Research Report

# APPENDIX C

Average Expenditures, 1974 and 1977  
(Per visitor per day in current dollars)

| Commodity           | 1974     |          | 1977     |          |
|---------------------|----------|----------|----------|----------|
|                     | Business | Pleasure | Business | Pleasure |
| Restaurant          | 11.55    | 10.34    | 13.51    | 11.86    |
| Night Club          | 1.20     | .93      | 1.20     | .95      |
| Dinner Show         | -        | -        | -        | -        |
| Groceries           | 1.57     | 1.40     | 1.59     | 1.55     |
| Total Food          | 14.32    | 12.67    | 16.30    | 14.36    |
| Lodging             | 15.18    | 13.32    | 20.05    | 16.86    |
| Attractions         | 1.00     | 1.22     | 1.25     | 1.59     |
| Other Entertainment | .73      | .60      | .84      | .59      |
| Total Recreation    | 1.73     | 1.82     | 2.09     | 2.18     |
| Ground Transport    | 4.21     | 2.80     | .91      | 1.01     |
| Auto Rental         | -        | -        | 3.58     | 2.21     |
| Interisland Trans   | .82      | 1.00     | 1.65     | 1.69     |
| Sightseeing         | .33      | .75      | .20      | .69      |
| Total Transport     | 5.37     | 4.55     | 6.34     | 5.60     |
| Clothing            | 6.35     | 4.18     | 4.17     | 4.28     |
| Gifts & Souvenirs   | 3.96     | 4.31     | 5.69     | 4.55     |
| Other               | 3.04     | 2.31     | 2.42     | 2.63     |
| Adjustment          | .33      | .87      | .90      | .81      |
| Total Misc          | 7.88     | 7.49     | 9.01     | 7.99     |
| TOTAL EXPENDITURE   | 50.83    | 44.03    | 57.97    | 51.28    |

Source: Hawaii Visitors Bureau 1974 and 1977 Expenditure Surveys

# APPENDIX D

## Visitor Expenditure Categories and Corresponding Price Indices (Index numbers 1977=100)

| Commodity Group      | 1974 | 1977  | 1980  |
|----------------------|------|-------|-------|
| FOOD*                | 82.2 | 100.0 | 130.8 |
| LODGING <sup>+</sup> | 74.8 | 100.0 | 139.9 |
| RECREATION*          | 78.1 | 100.0 | 117.7 |
| TRANSPORTATION*      | 86.5 | 100.0 | 143.5 |
| CLOTHING**           | 90.3 | 100.0 | 120.3 |
| OTHER**              | 80.4 | 100.0 | 126.2 |

Sources: \*State of Hawaii, Department of Planning and Economic Development, Hawaii's Income and Expenditure Accounts, 1958-1980, pp. 38-39.

\*\*State of Hawaii, Department of Planning and Economic Development, constructed from unpublished data on westbound visitor expenditures.

<sup>+</sup>Fujii, Khaled and Mak, "An Almost Ideal Demand System for Visitor Expenditures," Journal of Transport Economics and Policy, Vol. 19 (1985), 161-171.



# APPENDIX E

## Chi-Square Test of Independence

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|                 | Number of Trips |       |       |       |       |
|-----------------|-----------------|-------|-------|-------|-------|
|                 | 1               | 2     | 3     | 4+    | Total |
| Business        | 13.26*          | 14.41 | 19.57 | 19.09 | 16.13 |
| Pleasure        | 86.74           | 85.59 | 80.43 | 80.91 | 83.87 |
| p-value = .0026 |                 |       |       |       |       |

|                 | Travel Party Size |       |       |       |  |
|-----------------|-------------------|-------|-------|-------|--|
|                 | 1                 | 2     | 3+    | Total |  |
| Business        | 19.72             | 15.41 | 15.67 | 16.15 |  |
| Pleasure        | 80.28             | 84.59 | 84.33 | 83.85 |  |
| p-value = .0879 |                   |       |       |       |  |

|                 | Age      |       |       |       |       |       |       |       |
|-----------------|----------|-------|-------|-------|-------|-------|-------|-------|
|                 | Under 10 | 10-19 | 20-29 | 30-39 | 40-49 | 50-59 | 60+   | Total |
| Business        | 0.00     | 3.70  | 11.24 | 22.29 | 23.06 | 16.83 | 9.73  | 16.04 |
| Pleasure        | 100.00   | 96.30 | 88.76 | 77.71 | 76.94 | 83.17 | 90.27 | 83.96 |
| p-value = .0001 |          |       |       |       |       |       |       |       |

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\*Column frequency

# APPENDIX F

## Uncompensated Price Elasticities (Standard errors in parentheses)

| $x_i \backslash p_i$       | FOOD            | LODG            | RECR            | TRANS           | CLOTH           | OTHER           |
|----------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Business Visitors (n=431)  |                 |                 |                 |                 |                 |                 |
| FOOD                       | -.539<br>(.158) | -.198<br>(.084) | -.025<br>(.007) | -.076<br>(.026) | -.053<br>(.015) | -.091<br>(.029) |
| LODG                       | -.204<br>(.068) | -.622<br>(.156) | -.028<br>(.008) | -.085<br>(.028) | -.060<br>(.017) | -.102<br>(.032) |
| RECR                       | -.158<br>(.064) | -.172<br>(.084) | -.332<br>(.199) | -.066<br>(.025) | -.047<br>(.015) | -.079<br>(.029) |
| TRANS                      | -.180<br>(.065) | -.196<br>(.085) | -.025<br>(.007) | -.428<br>(.197) | -.053<br>(.016) | 0.090<br>(.030) |
| CLOTH                      | -.161<br>(.062) | -.176<br>(.082) | -.022<br>(.007) | -.068<br>(.024) | -.364<br>(.173) | -.080<br>(.027) |
| OTHER                      | -.172<br>(.058) | -.187<br>(.076) | -.024<br>(.007) | -.072<br>(.024) | -.051<br>(.014) | -.423<br>(.173) |
| Pleasure Visitors (n=1992) |                 |                 |                 |                 |                 |                 |
| FOOD                       | -.709<br>(.068) | -.050<br>(.033) | -.014<br>(.003) | -.017<br>(.011) | -.022<br>(.007) | -.037<br>(.014) |
| LODG                       | -.125<br>(.028) | -.887<br>(.071) | -.019<br>(.005) | -.023<br>(.014) | -.030<br>(.009) | -.049<br>(.018) |
| RECR                       | -.096<br>(.022) | -.051<br>(.033) | -.642<br>(.091) | -.018<br>(.011) | -.023<br>(.007) | -.038<br>(.014) |
| TRANS                      | -.124<br>(.028) | -.066<br>(.042) | -.019<br>(.005) | -.832<br>(.100) | -.029<br>(.009) | -.049<br>(.017) |
| CLOTH                      | -.103<br>(.022) | -.055<br>(.033) | -.016<br>(.004) | -.019<br>(.011) | -.702<br>(.087) | -.041<br>(.014) |
| OTHER                      | -.109<br>(.023) | -.058<br>(.035) | -.016<br>(.004) | -.020<br>(.011) | -.026<br>(.007) | -.757<br>(.083) |

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