CENTER OF PLANNING AND ECONOMIC RESEARCH

LECTURE SERIES

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GEORGE N. PARASKEVOPOULOS

ATHENS 1977

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*Opinions or value judgements expressed in this book are those of the author and do not necessarily represent those of the Center of Planning and Economic Research.*

# *CENTER OF PLANNING AND ECONOMIC RESEARCH*

*The Center of Planning and Economic Research (KEPE) was founded in 1961 as an autonomous public organization, under the title «Center of Economic Research,» its basic objective being research into the problems of the operation, structure and development of the Greek economy. Another of its objectives was the training of young Greek economists in modern methods of economic analysis and research. For the establishment and operation of the Center considerable financial aid was provided by foreign foundations.*

*During 1964, the Center of Economic Research was reorganized into its present form, as the Center of Planning and Economic Research. In addition to its function as a Research and Training Institute, the Center, in its new form, was assigned the following tasks by the State: (1) the preparation of economic development plans at a national and regional level, (2) the evaluation of public investment programmes, and (3) the study of short-term developments in the Greek economy and ad-*

*vising on current problems of economic policy.*

*For the realization of these aims, the KEPE, during its first years of operation (1961-1966) collaborated with foreign scientists and foundations. The latter helped in the selection of foreign economists who joined the Center to carry out scientific research into the problems of the Greek economy and in the organization of an exchange programme, including the post-graduate training of young Greek economists at universities abroad.*

*The Center has also developed a broad programme of scholarships for post-graduate studies in economics. Thus, in collaboration with foreign universities and international organizations, a number of young economists from Greece are sent abroad each year to specialize in the various fields of economics. In addition, the KEPE organizes a series of training seminars and lectures, frequently given by distinguished foreign scholars invited for that purpose to Greece.*

*In addition to the above, the KEPE maintains contact with similar institutions abroad, and exchanges publications and information concerning developments in methods of economic research, thus contributing to the promotion of the science of economics in the country.*

## *ACKNOWLEDGEMENTS*

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*The present study had roots in my Ph.D. dissertation («An Econometric Analysis of the Foreign Trade of Greece,» University of Pennsylvania, pp. 209-213) in which an attempt, limited in scope, had been made to estimate the foreign demand for the tourist services of Greece. To my thesis advisor Lawrence R. Klein, I owe a debt of deepest gratitude for his supervision, continuous encouragement, and constructive suggestions during the development of this project. I am also heavily indebted to Phoebus J. Dhrymes for his advice and invaluable comments at every stage of this study.*

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*GEORGE N. PARASKEVOPOULOS*

*November 1976*

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# I. INTRODUCTION

This study is concerned with the estimation of the export demand equations for tourist services. It provides a quantitative explanation of the allocation of a country's exports of tourist services to various countries and measures the individual and combined effects of the main variables determining the demand for international tourism.[1] The exporting countries covered are: Austria, Greece, Italy, Spain and Switzerland.[2]

The estimated parameters reported here are based on cross-section data taken from 17 of the O.E.C.D. member-countries over the period 1958-1970. A major problem in this type of analysis is to find a way to take account of

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1. A similar attempt, but limited in scope, appears in my doctoral dissertation under the supervision of the Benjamin Franklin Professor Lawrence R. Klein at the University of Pennsylvania. George N. Paraskevopoulos, *An Econometric Analysis of the Foreign Trade of Greece* (Doctoral Dissertation, University of Pennsylvania, 1971), pp. 209-213.

2. Throughout the text of this paper, the term «five countries» should be understood to include Austria, Greece, Italy, Spain and Switzerland.

any international differences in disposable incomes and consumer prices among the sample countries that are not taken care of by the official exchange rates. This problem was dealt with by adjusting the income and price variables with the Gilbert-Kravis purchasing power parities estimates for consumption.[1]

Although a considerable amount of econometric work exists in international economics, most of this work has been concentrated on merchandise trade and, with few notable exceptions,[2] very little has been done on invisibles in general or on international tourism in particular. A major reason for the neglect of this important part of international trade is lack of appropriate data. Data for invisibles do not match the volume and quality available for

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1. See page 33.

2. H.Peter Gray, *International Travel-International Trade* (Heath Lexington Books, Lexington, Mass., 1970), and «The Demand for International Travel by the United States and Canada,» *International Economic Review* (January, 1966); G. N. Paraskevopoulos, *An Econometric Analysis of the Foreign Trade of Greece* (Doctoral Dissertation, University of Pennsylvania, 1971); J. R. Artus, «An Econometric Analysis of International Travel,» *I.M.F. Staff Papers* (November, 1972), and «The Effects of Revaluation on the Foreign Travel Balance of Germany,» *I.M.F. Staff Papers* (November, 1970); A.S. Gerakis, «Effects of Exchange-Rate Devaluations and Revaluations on Receipts from Tourism,» *I.M.F. Staff Papers* (November, 1965); and W. Krause and D. Jud, *International Tourism and Latin American Development* (University of Texas Press, 1974).

merchandise trade. However, the importance of international tourism and other exported services to the world economy, and the very significant contribution of the balance of services to the overall balance of payments of various countries call for much more attention to be paid to these major export industries.[1] It is accordingly the purpose of this study to fill, to some degree, this gap by estimating export demand equations for tourist services.[2] Estimation of quantitative relationships between the relevant economic variables should play an invaluable rôle in economic policy and provide an indispensable aid to economic forecasting.[3]

## An Overview of International Tourism

The importance of international tourism to the world economy and its rôle in internation-

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1. Exports of services of the O.E.C.D. member-countries accounted for more than 25 percent of their total exports of goods and services in 1972. O.E.C.D., *Tourism Policy and International Tourism* (Paris, 1974).

2. The socio-political, educational and cultural aspects of international tourism are also equally important and they merit a serious investigation.

3. Lawrence R. Klein, «The Use of Econometric Models as a Guide to Economic Policy,» *Econometrica* (1947), Vol. 15.

al payments are now widely recognized.[1] In 1972, the world international tourist receipts, excluding those from international tourist transport, amounted to about $24 billion, and the foreign tourist arrivals reached approximately 200 million (Table 1).

During the period under review, international tourism has grown faster than merchandise exports. As can be seen from Table 1, between 1958 and 1970, the world international tourist receipts increased at an average annual rate of 10.5 percent, while the corresponding rate for the value of the world merchandise exports was 9.2 percent. International tourism has emerged as one of the most dynamic export industries. The income elasticity of foreign demand for tourism was found to be substantially above unity and, therefore, as real disposable income increases, consumer demand shifts towards imported tourist services.

On the other hand, the growth of international tourism has not been uniform throughout the 1958-1970 period. Expansion of tourism slowed down in the latter part of the period; slower economic growth in the main tourist-generating countries in 1965-1970, the Middle

1. For details on this subject see: Michael Peters, *International Tourism* (Hutchinson and Co., London, 1969), and John M. Bryden, *Tourism and Development* (Cambridge University Press, 1973).

TABLE 1

INTERNATIONAL TOURISM AND WORLD EXPORTS
1958-1972

| Years | International Tourism | | World Exports of Goods (f.o.b.) | |
|---|---|---|---|---|
| | No. of arrivals in millions | Receipts[a] in billions of U.S.$ | Value in billions of U.S.$ | Volume 1958=100 |
| 1958 | 55.3 | 5.4 | 108.1 | 100 |
| 1960 | 71.2 | 6.8 | 128.0 | 118 |
| 1962 | 81.4 | 7.8 | 141.4 | 131 |
| 1964 | 108.0 | 9.6 | 172.4 | 155 |
| 1966 | 130.8 | 12.5 | 203.6 | 179 |
| 1968 | 139.7 | 13.8 | 239.6 | 214 |
| 1970 | 169.0 | 17.9 | 312.4 | 259 |
| 1972 | 198.0 | 23.8 | 412.4 | 297 |

AVERAGE ANNUAL RATES OF GROWTH

| Period | International Tourism | | World Exports | |
|---|---|---|---|---|
| | Arrivals | Receipts | Value | Volume |
| 1958-62 | 10.2 | 9.6 | 6.9 | 7.0 |
| 1962-66 | 12.5 | 12.5 | 9.5 | 8.1 |
| 1966-70 | 6.6 | 8.6 | 11.3 | 9.7 |
| 1958-70 | 9.8 | 10.5 | 9.2 | 8.3 |

*Sources*: I.U.O.T.O., *Economic Review of World Tourism, 1972* (Geneva,1972), and *World Tourism, 1971-1973* (Geneva, 1975); U.N., *Statistical Yearbook*.

*a*. Excluding international tourist transport receipts.

East War in 1967, and the social unrest in Europe in 1968 were the main contributing factors.[1]

The very significant contribution of international tourism to the balance of payments of many countries has established it as one of the largest and most dynamic export industries, and its importance is expected to continue growing. Rising standards of living, population increases, improvements in transportation and communications, longer paid vacations, and expansion in education are expected to continue producing high rates of growth in the exports of tourist services. Table 2 shows that in 1972 world foreign exchange earnings from tourism were about 6 percent of merchandise exports. For some countries international tourism has become a major source of foreign exchange. In 1972, international tourist receipts were 66 percent of merchandise exports for Spain, 45 percent for Greece, and 41 percent for Austria. For Italy and Switzerland the percentages ranged between 12 and 21 percent during the 1962-1972 period (Table 2).

Both the demand and supply sides of the international tourist market are dominated by

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1. International tourism is particularly sensitive to fluctuations in general economic activity and to international socio-political disturbances.

TABLE 2

INTERNATIONAL TOURIST RECEIPTS COMPARED WITH MERCHANDISE EXPORTS, 1962-1972
(In millions of U.S. dollars)

| Country and Region | International tourist receipts[a] | | Exports of merchandise | | % (1) as a percentage of (2) | |
|---|---|---|---|---|---|---|
| | 1962 | 1972 | 1962 | 1972 | 1962 | 1972 |
| Austria | 354 | 1.600 | 1.263 | 3.883 | 28.0 | 41.2 |
| Greece | 76 | 393 | 250 | 871 | 30.4 | 45.1 |
| Italy | 847 | 2.176 | 4.666 | 18.548 | 18.2 | 11.7 |
| Spain | 513 | 2.511 | 736 | 3.803 | 69.7 | 66.0 |
| Switzerland | 470 | 1.296 | 2.216 | 6.828 | 21.2 | 19.0 |
| Rest of the O.E.C.D. | 4.084 | 12.498 | 83.649 | 259.266 | 4.9 | 4.8 |
| Total O.E.C.D. | 6.344 | 20.474 | 92.780 | 293.199 | 6.8 | 7.0 |
| Rest of world | 1.456 | 3.326 | 48.420 | 119.201 | 3.0 | 2.8 |
| World total | 7.800 | 23.800 | 141.200 | 412.400 | 5.5 | 5.8 |
| PERCENTAGE DISTRIBUTION | | | | | | |
| Total O.E.C.D. | 81.3 | 86.0 | 65.70 | 71.10 | | |
| Rest of world | 18.7 | 14.0 | 34.30 | 28.90 | | |
| World total | 100.0 | 100.0 | 100.0 | 100.0 | | |

*Sources*: O.E.C.D., *Tourism Policy and International Tourism* (Paris, 1974); I.U.O.T.O., *Economic Review of World Tourism, 1972* (Geneva, 1972), and *World Tourism, 1971-1973* (Geneva, 1975); U.N., *Statistical Yearbook*.

*a*. Excluding international tourist transport receipts.

developed countries, and the O.E.C.D. member-countries account for more than 80 percent of that market (Table 2). In 1972, the O.E.C.D. member-countries spent approximately $21 billion on international tourism and received about $20.5 billion from exports of tourist services. However, developing countries which are in close geographical proximity to the tourist importing countries have also become major exporters of tourist services.[1] For these countries exports of tourist services not only constitute a major source of foreign exchange, but also offer opportunities for stimulating investments and generating income and employment.[2] It should be kept in mind, however, that in developing countries the actual contribution of international tourism to their balance of payments can only be the net foreign exchange earnings; that is, international tourist receipts reduced by the import content (direct and indirect) of exported tourist services.

The selection of the "five countries" covered

1. In 1972, for example, the foreign exchange earnings from tourism were about $1.7 billion for Mexico and accounted for more than 40 percent of the total international tourist receipts of the developing countries in recent years. United Nations, *Statistical Yearbook* (New York, 1973), and *Elements of Tourism Policy in Developing Countries* (New York, 1973).

2. W. Krause and D. Jud, *International Tourism and Latin American Development*, *op.cit.*; John M. Bryden, *Tourism and Development*, *op.cit.*; and United Nations, *Elements of Tourism Policy in Developing Countries* (New York, 1973).

in this study was partly dictated by the availability of data. Moreover, because of time and space limitations, this analysis was limited to traditional tourist countries in which international tourism has become an important export industry and a major source of foreign exchange. In 1972, international tourist receipts accounted for 33 percent of the total exports of goods and services for Spain, 26 percent for Austria, 21 percent for Greece, 12 percent for Switzerland, and 9 percent for Italy.[1] The countries selected represent a variety of tourist attractions, they are of various sizes, and they reflect different levels of economic development.

1. O.E.C.D., *Tourism Policy and International Tourism* (Paris, 1974).

## II. THE FORMULATED HYPOTHESIS AND ADJUSTMENT OF DATA

### The Model

The specification of the export demand equation for tourist services is mainly based on the theory of consumer behaviour. The consumer allocates his income among goods and services in an effort to achieve maximum satisfaction.[1] The bulk of international tourism consists of holiday tourism, an item of final consumption. In addition, tourism for business and other purposes contains elements of holiday tourism.[2]

The theory of demand suggests that the main determinants of the foreign demand for tourist services are: the real per capita disposable income[3] of the importing country, the relative price of the exported tourist services,

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1. Regional economists place more emphasis on the gravity models in their analysis of inter-regional travel: Walter Isaard and others, *Methods of Regional Analysis: An Introduction to Regional Science* (The M.I.T. Press, Cambridge, Massachusetts, 1960).

2. H. Peter Gray, *International Travel-International Trade, op. cit.*, and A. J. Burkart and S. Medlik, *Tourism* (Heinemann, London, 1974).

3. Disposable income may serve at the same time as a proxy variable for foreign trade which appears to be a more suitable income or activity variable for business tourism.

the relative price of the available substitutes, and the population of the importing country. Apart from these variables, exchange controls, distribution of income, demographic characteristics, family relations, and tastes in the importing country, as well as social, cultural, and political factors, may also exert an influence on the demand for international tourism. But in applied econometric work, the efficiency of the estimates is not always compatible with the inclusion of all relevant variables in the equation. In addition, statistical data are not readily available for all these variables. Therefore, the export demand equation for tourist services may be written as:

$$X_{ijt} = f_{it}\left(\frac{DI_{jt}}{CPI_{jt}\ PPP_j}, \frac{(PE_{it}+TC_{ijt})R_j}{CPI_{jt}\ PPP_j}, \frac{\sum_{k\neq i} a_{kjt}(PE_{kt}+TC_{kjt})\,R_j}{CPI_{jt}\ PPP_j}, N_{jt}\right) \qquad (1)$$

$i = 1,2 \ldots n$ exporting countries

$j = 1,2 \ldots n$ importing countries $(j \neq i)$

$k = 1,2 \ldots n$ export-competing countries $(k \neq i)$

where,

$X_{ijt}$ = quantity of exported tourist services from country i to country j at time t

$DI_{jt}$ = per capita disposable income of country j at time t, in national currency

$CPI_{jt}$ = consumer price index of country j at time t, 1963 = 100

$PPP_j$ = purchasing power parity for consumption of country j in 1963

$PE_{it}$ = f.o.b. export price of tourist services of country i at time t, in U.S. dollars

$TC_{ijt}$ = transportation cost of a round trip between country i and country j at time t, in U.S. dollars

$R_j$ = official exchange rate of country j

$a_{kjt}$ = share of exported tourist services of country k in the import market of country j at time t

$PE_{kt}$ = f.o.b. export price of tourist services of competing country k at time t, in U.S. dollars

$TC_{kjt}$ = transportation cost of a round trip between country k and country j at time t, in U.S. dollars

$N_{jt}$ = population of country j at time t

Equation (1) implies that consumers are free from money illusion and react to price changes rationally. Ideally, this hypothesis should be tested instead of assumed, but the nature of the available statistical data has discouraged such an effort.

The estimated parameters of equation (1) are based on cross-section data. In time series analysis, the income, population and price variables have exhibited a high degree of multicollinearity, and it was not possible to estimate the individual effects of those variables

with much precision.[1] In cross-section analysis, however, the independent variables are virtually uncorrelated and the individual effects are easily estimated.

The cross-section data used in this study are drawn from 17 of the O.E.C.D. member-countries: Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Norway, Spain, Sweden, Switzerland, the United Kingdom and the United States. Two reasons dictated the selection of these countries: data are readily available and the countries constitute a homogeneous group which is expected to satisfy the homogeneity assumption in cross-section analysis.[2] The structural coefficients of the foreign de-

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1. G. N. Paraskevopoulos, *An Econometric Analysis of the Foreign Trade of Greece, op.cit.*, pp. 210-212.

2. It is reasonable to assume that the sample countries are homogeneous in behaviour in the sense that the inter-country differences observed in the consumption of international tourist services can be mainly explained by the explanatory variables included in the equation. Since the omitted variables are of secondary importance and are not expected to be systematically related to the included explanatory variables, it stands to reason to assume that the structural coefficients are the same for each country in the sample (see p. 47). Lawrence R. Klein, *A Textbook of Econometrics* (Prentice-Hall, Inc., Englewood, New Jersey, second edition, 1974); S.J. Prais and H.S. Houthaker, *The Analysis of Family Budgets* (Cambridge University Press, 1971); and P.A.V.B. Swamy, *Statistical Inference in Random Coefficient Regression Models* (Springer-Verlag, Berlin-Heidelberg-New York, 1971).

mand equations for tourist services are assumed to be the same for each of the importing countries. That is, the countries selected behave substantially in the same way towards consumption of tourist services. Although Japan has recently become an important tourist-generating country, it was excluded from the sample because, during the period under review, the number of the Japanese travellers to the "five countries" was relatively small and mainly for non-holiday purposes.

For any particular year t, all the importing countries are faced with the same market conditions, that is, the f.o.b. export prices of tourist services are held constant. However, in the international tourist market, transportation cost constitutes the major part of the c.i.f. export price and varies significantly among the importing countries. The greater the distance of an importing country from the export tourist market, the higher is the c.i.f. import price of that country. Therefore, the corresponding c.i.f. prices are substantially different among the individual countries.

The c.i.f. export price of tourist services has been included in the demand equation for international tourism. This is the price on which consumer behaviour is based and which dictates the demand for tourist services.

Since the f.o.b. export price of tourist services is held constant at a given point in time, the variance of the c.i.f. export price variable is equal to the variance of the transportation cost variable. But the c.i.f. export price variable is used instead of simply using the transportation cost variable, because the level of the f.o.b. price affects the size of the c.i.f. price elasticity.

Let X, P, and T be the volume of exported tourist services, the f.o.b. export price, and the transportation cost respectively. Then the elasticity of foreign demand for tourist services with respect to the c.i.f. export price (P+T) is given by

$$-\gamma = \frac{d\log X}{d\log (P+T)} = \frac{dX}{d(P+T)} \cdot \frac{P+T}{X}$$

since P is constant, we have

$$-\gamma = \frac{dX}{d(P+T)} \cdot \frac{P+T}{X} = \left(\frac{dX}{dT} \cdot \frac{T}{X}\right)\left(1+\frac{P}{T}\right)$$

or

$$-\gamma = -\tau\left(1+\frac{P}{T}\right) \qquad (2)$$

where,

$\tau$ is the elasticity of foreign demand for tourist services with respect to transportation cost.

The term in parentheses in equation (2) is greater than 1. Thus, the c.i.f. price elasticity is larger than the transportation elasticity, and given the transportation cost and the transportation elasticity, the size of the c.i.f. price elasticity depends on the level of the f.o.b. export price of tourist services. When the ratio P/T increases, the $\gamma$ increases relative to $\tau$.

The competitive price, a weighted average of the c.i.f. export prices of the competing countries, also varies among the sample countries. It should be mentioned, however, that because of the weighting scheme, the variation in the c.i.f. competitive price is about one-half of that in the c.i.f. own price.

Since the official exchange rates do not reflect the relative purchasing powers of the national currencies, differences also exist in the consumer price levels of the importing countries.

Thus, the cross-section equation, for any particular year t, would run as follows:

$$X_{ij} = f_i\left(\frac{DI_j}{CPI_j \quad PPP_j}, \frac{(PE_i+TC_{ij})R_j}{CPI_j \quad PPP_j}, \frac{\Sigma a_{kj}(PE_k+TC_{kj})R_j}{\substack{k\neq i \\ CPI_j \quad PPP_j}}, N_j\right) \qquad (3)$$

## Adjustment of Data

The problem of adjustment of data and more precise definitions of the variables entering into the relationship will be considered next.

International tourist flows are usually measured in three ways: in terms of foreign exchange received from the exports of tourist services; in terms of foreign tourist arrivals at tourists' accommodation; and, finally, in terms of the total number of nights spent by foreign tourists in all or certain types of accommodation.

Exports of tourist services include a variety of goods and services bought by foreign tourists in the country visited (e.g., accommodation, food, recreation and entertainment, purchases from shops, cultural and various other tourist activities). If all the importing countries actually paid the same f.o.b. price, the f.o.b. exports of tourist services could be the most appropriate measure of the quantity of tourism. But, although all tourists are faced with the same market conditions, prices actually paid by them are expected to be different. It is reasonable to assume that high income countries purchase high quality tourist products and, consequently, pay high prices. In this case, variations in expenditures reflect changes not only in quantity but in quality (price) as well.

Thus, the expenditures income elasticities are expected to be biased upwards relative to those in terms of quantities.[1] Unfortunately, the regional distribution of international tourist receipts for the "five countries" covered in this study is not available; however, country data exist on the number of arrivals recorded either at frontiers or at tourists' accommodation, and on the number of nights spent by foreign tourists in these accommodations.

An international tourist has been defined as any person visiting a country, other than that in which he actually resides, for a period of at least 24 hours and for any reason other than following an occupation remunerated from the country visited.[2] Based on this definition, an overnight stay may be treated as a complex commodity characterized by a number of attributes (e.g., entertainment, cultural, sport and other activities)[3] and that its price is related

---

1. Since $E = QP$, $\frac{dE}{dY} \cdot \frac{Y}{E} = \frac{dQ}{dY} \cdot \frac{Y}{Q} + \frac{dP}{dQ} \cdot \frac{Y}{P}$, the elasticity of price with respect to income ( $\frac{dP}{dY} \cdot \frac{Y}{P}$ ) is expected to be positive.

2. See: O.E.C.D., *Tourism in the O.E.C.D. Member Countries* (Paris).

3. See: K. J. Lancaster, «A New Approach to Consumer Theory,» in R.E. Quant (ed.), *The Demand for Travel: Theory and Measurement* (Heath Lexington Books, Lexington, Mass., 1970), and Z. Griliches (ed.), *Price Indices and Quality Change* (Harvard University Press, Cambridge, Mass., 1971), Papers by P. J. Dhrymes, I.B. Kravis and R.E. Lipsey.

to quantities and qualities of these attributes. That is, the overnight stay is the basic commodity supplied in many varieties, and it is sold at different prices. On the assumption that the quantities of the attributes possessed by the basic commodity (overnight stay) are approximately the same for all the importing countries, the number of nights spent by foreign tourists in all types of tourists' accommodation would be an appropriate measure of the quantity of tourism. Thus, the total number of nights has been selected as the dependent variable.

The total number of nights constitutes a direct measure of the rate of capacity utilization of the tourist industry. However, the recorded figures for overnight stays in tourists' accommodation do not include nights spent in homes of friends and relatives. In many instances, these figures also exclude various types of supplementary accommodation (rooms in private houses, camping sites, youth hostels, etc.). Because nights spent in hotels and similar establishments constitute the bulk of the total tourists' accommodation, and because in a cross-section study all consumers are faced with the same market conditions, model (3) is still applicable to the foreign demand for tourist services of the hotel industry.

Because estimates based on tourist arrivals at frontiers or at tourists' accommodation provide interesting comparisons with those based on the number of nights, both estimates are reported here. It should be kept in mind, however, that the number of arrivals at tourists' accommodation are somewhat higher than the number of tourists visiting the country because of the multiple hotel registrations within the country visited.

Tourism for holiday purposes accounts for the major part of international tourism. Therefore, the real per capita disposable income of the importing country was selected as the appropriate income variable. Disposable income may serve at the same time as a proxy for foreign trade, which appears to be a more suitable activity variable for business tourism.

For international comparisons, the national incomes of the various countries expressed in national currencies should be converted to the same monetary unit. The standard approach used is to convert the national incomes of the different countries into United States dollars through the use of the official exchange rates. However, the official exchange rates do not correspond closely to the relative price levels of the different countries, and thus international

comparisons based on official exchange rates are not very reliable.

To deal with the problem of international comparisons the Gilbert-Kravis purchasing power parity (PPP) estimates for consumption were utilized to convert the disposable incomes of the importing countries into United States dollars. The PPP estimate for consumption obtained as the ratio of the consumer prices of a country to those of the United States reflects the relative purchasing power of the national currencies; specifically, it measures the amount of the domestic currency required to purchase a basket of consumer goods and services which would cost $1 in the United States in a given year.

For France, Germany, Italy and the United Kingdom, PPP estimates for 1970 are given in the Kravis-Kenessey-Heston-Summers United Nations Study.[1] Estimates for Belgium, Denmark, the Netherlands and Norway for 1950 and 1955 are taken from the Gilbert-Kravis O.E.C.D. Studies.[2] For Austria, Fin-

1. I. B. Kravis, Z. Kenessey, A. Heston, and R. Summers, *A System of International Comparisons of Gross Product and Purchasing Power* (Johns Hopkins University Press, 1975).

2. M. Gilbert and I. B. Kravis, *An International Comparison of National Products and the Purchasing Power of Currencies* (O.E.C.D., Paris, 1954); M. Gilbert and Associates, *Comparative National Products* (O.E.C.D., Paris, 1958).

land, Sweden and Switzerland, PPP estimates are provided by the statistical office of the Federal Republic of Germany.[1] The PPP for Canada is assumed to be equal to one. Finally, for the remaining sample countries, Greece, Ireland and Spain, the PPP's for consumption were estimated from a regression equation fitted to 12-country[2] cross-section data on the ratio of PPP's to the official exchange rates and per capita income.

The above studies provide PPP estimates which are based on two sets of weights: United States quantity weights and quantity weights of the European country concerned. The PPP estimates based on European weights are lower than those based on United States weights. Because of the negative correlation between the price and quantity purchased, the relative price level of a country tends to be lower if the prices are weighted by the quantities purchased in that country. To minimize this bias, the PPP's

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1. *Statistisches Jahrbuch für die Bundesrepublik Deutschland* (1972).

2. The sample countries are Austria, Belgium, Denmark, France, Germany, Italy, the Netherlands, Norway, Sweden, Switzerland, the United Kingdom and the United States. As was expected, a high positive correlation exists between these two variables (R=.93). See, also, B. Balassa, «The Purchasing-Power Parity Doctrine: A Reappraisal,» *Journal of Political Economy* (1964), reprinted in R.N. Cooper (ed.), *International Finance* (Penguin Books, 1969).

used in this study are geometric averages of the two sets of estimates.

Since PPP estimates for a particular year have been established, it is possible, in turn, to calculate PPP's for other years through the use of changes in the consumer price level of the United States relative to that of each of the other countries. The PPP estimates have been extrapolated by means of consumer price indices to 1963. Finally, the 1963 PPP estimates were selected as the base from which to derive the inter-country comparisons of income and price levels required for the other years of the period covered (1958-1970).

The real disposable incomes of the importing countries, expressed in terms of local currencies and in 1963 prices, were adjusted to U.S. dollars through the use of the 1963 PPP's in order to convert the national incomes of the importing countries to the same currency.

The f.o.b. export price of tourist services was obtained by dividing the f.o.b. international tourist receipts by the total number of nights spent by foreign visitors in all types of tourists' accommodation. One might take the view, however, that the average foreign tourist expenditure per night (day) is not completely free from errors of measurement, for two reasons. First, statistical data on international tourist

receipts are not always reliable. Second, the recorded figures for overnight stays in tourists' accommodation do not include nights spent in homes of friends and relatives and, in many instances, these figures also exclude various types of supplementary accommodation. But the bias introduced in the c.i.f. price elasticity estimate is more apparent than real. For any particular year t, the f.o.b. export price of tourist services is held constant. Therefore, for small errors of measurement in the f.o.b price variable, the bias introduced in the estimated c.i.f. price elasticity is practically insignificant.[1]

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1. The c.i.f. price elasticity of the demand for tourist services given by equation (2) is

$$\gamma = \tau \left(1 + \frac{P}{T}\right) \qquad (2)$$

where P stands for the observed f.o.b. export price of tourist services. The corresponding formula for the true f.o.b. export price P* is

$$\gamma^* = \tau \left(1 + \frac{P^*}{T}\right) \qquad (2a)$$

By definition, $P^* = P + K$ where K is the error of measurement. Hence, dividing equation (2) by equation (2a), we get:

$$\frac{\gamma}{\gamma^*} = \frac{1 + \frac{P}{T}}{1 + \frac{P^*}{T}} = \frac{P + T}{T + K + T}$$

The relative bias can be easily obtained; that is

The average foreign tourist expenditure per night for 1963 was selected as the base f.o.b. export price variable. To obtain the f.o.b. export prices for the other years of the 1952-1970 period the 1963 f.o.b. export price was multiplied by the consumer price index (1963=100) of the exporting country. Price indices for tourist services are not available, and consumer price indices have been used as proxies for the price indices of tourist services.

It should be kept in mind, however, that if the 1963 f.o.b. export price contains errors of measurement, then the f.o.b. export prices for the other years will also contain these errors of measurement. But for purposes of testing the temporal stability of the price elasticities, the important issue is not whether all prices are measured with errors, but whether these prices contain the same observational errors. Although the price elasticity estimates would be biased, both the size and the direction of the bias are constant, and meaningful tests for the stability of the price elasticities over time can be applied.

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$$\frac{K}{P+K+T} = 1 - \frac{P+T}{P+K+T}$$

Therefore, if K is relatively small, then the relative bias for all practical purposes will be insignificant. For example, a 10% error in the observed f.o.b. export price of tourist services will cause about a 2.5% bias in the estimate of the c.i.f. price elasticity.

The cost of transportation in international tourism constitutes a major part of the c.i.f. export price of tourist services. In many instances, transportation cost accounts for more than 50 percent of the c.i.f. value of exported tourist services. The greater the distance between the importing and the exporting countries, the greater is the share of transportation cost in the c.i.f. export price of tourist services.

The round-trip economy air fares[1] in July of each year (the high season fares) for 1958 through 1970 between the countries' capitals have been selected as the transportation variable. It is reasonable to assume that these capitals (with the exception of the United States and Germany, where Chicago[2] and Frankfurt were selected respectively) represent the population centers of the corresponding countries. Since the air transport industry, during the period under review, has introduced various types of promotional air fares (excursion, group and charter fares), the average international air fare per passenger mile has steadily decreased

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1. *Official Airline Guide: International Edition* (Reuben H. Donnelley Corporation, Oak Brook, Illinois, July publications, 1958-1970).

2. In 1960, the population center in the United States was about the center of Illinois. See M. Clawson and J. Knetsch, *Economics of Outdoor Recreation* (The Johns Hopkins University Press, Baltimore, 1966), p. 94.

during that period.[1] If the distribution of tourists by the different categories of air fares (first class, economy, and other promotional fares) does not differ significantly among the importing countries, the transportation elasticity will be practically unaffected by using the economy air fare as the transportation variable instead of the more appropriate weighted average air fare variable. On the other hand, the c.i.f. price elasticity depends on the level of the transportation cost variable and, as was shown earlier, will be underestimated. Therefore, to avoid this bias the round-trip economy air fare had to be adjusted in order to reflect the actual average air fare prevalent in the tourist market.

Since statistical data on the average air fare between the countries' capitals are not readily available, the U.S. international average air fare per passenger mile was used as a base to estimate the average air fare variable.[2] To obtain

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1. According to the Air Transport Association of America, during peak travel seasons, almost one-half of all air passengers travel on some sort of promotional fare in recent years. Air Transport Association of America, *Air Transport* (Washington, D.C., 1971). See, also, International Air Transport Association, *I.A.T.A. Bulletin* (Montreal and Geneva, 1970).

2. The U.S. international average air fare per passenger mile was obtained by dividing the international passenger revenue of the U.S. scheduled airlines by the revenue passenger miles. Air Transport Association of America, *Air Transport*, *op.cit.*, various issues.

the average air fare from New York to London for a particular year, the U.S. international average air fare per passenger mile for that year was multiplied by the air distance between these two cities. Finally, to take into account the special incentive air fares, the round-trip economy air fares were multiplied by the ratio of average to economy air fares from New York to London. Obviously, it is assumed here that the ratio of average to economy air fares between New York and London is the same as that between any other pair of cities. There are reasons to expect that this assumption, for all practical purposes, is rather realistic. By international agreements (I.A.T.A.) for any particular trip, all airlines charge the same economy fares and offer the same special incentive fares.

Ideally, a weighted average of all air, sea and land fares where the weights are the number of travellers associated with each mode of transportation should be used as the most appropriate transportation variable. Unfortunately, no adequate data on sea and land fares are available. However, transportation cost could be defined to include not only the monetary cost (market price paid) but the price that the tourist assigns on his travelling time as well. Because the time differential between air and any other mode of transportation increases

with distance, and the price of travelling time is an increasing function of income,[1] the total transportation cost (fare plus price of time) for a trip by a time intensive mode of transportation approaches the air fare for the same trip. In addition, during the period under review, the average air fare has considerably decreased relative to the fares of the other modes of transportation.[2]

Finally, to derive the transportation cost per night, the adjusted round-trip economy air fares, for any particular year, were divided by the average number of nights (total number of nights divided by the number of arrivals) spent by residents of country j in country i during that year.

The competitive price introduced into the equation is a weighted average of the c.i.f. export prices of tourist services of the export-competing countries, where the weights are the shares of the countries' tourist services in j's market. For example, for any particular year t,

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1. R. Gronau, *The Value of Time in Passenger Transportation: The Demand for Air Travel* (National Bureau of Economic Research, New York, 1970).

2. International Air Transport Association, *I.A.T.A. Bulletin, op. cit.*

$$PCX_{ij}=\sum_{k\neq i} a_{kj}(PE_k+TC_{kj})$$

$i = 1,2 \ldots$ n exporting countries

$j = 1,2 \ldots$ n importing countries $(j \neq i)$

$k = 1,2 \ldots$ n competing countries $(k \neq i)$

where, $PCX_{ij}$ is the price of exported tourist services that are competitive with country i's exports of tourist services in j's market, $a_{kj}$ is the share of exported tourist services of country k in the import tourist market of country j, $PE_k$ is the f.o.b. export price of tourist services of competing country k, and $TC_{kj}$ is the round-trip economy air fare (adjusted) from the export-competing country k to the importing country j.

Because of data limitations, only the O.E.C.D. member-countries have been included in the weighted scheme (with the exception of the United States and Canada in which Mexico and the Caribbean Islands were also included). The included countries account for more than 90 percent of the tourist imports of country j from the export-competing countries.[1]

The c.i.f. export prices of tourist services of the export-competing countries were obtained

1. It should be mentioned, however, that collecting data and constructing more than 1,600 competitive prices was an enormous task; in fact, over 8,000 observations were obtained (in many instances not readily available) to calculate the competitive prices utilized in this analysis.

and adjusted in a way analogous to that used for the c.i.f. export price of tourist services of the country studied.

The f.o.b. export prices of tourist services, as well as the passenger air fares, are expressed in U.S. dollars. However, as was discussed earlier, the official exchange rates do not correspond closely to the relative price levels of the importing countries; the dollar prices would, in effect, underestimate (overestimate) the actual price of imported tourist services to the home consumer in countries with undervalued (overvalued) currencies. The domestic prices of imported tourist services, however, reflect the actual cost of these services to a purchaser at home and are the prices on which consumer behaviour is based. Domestic prices are obtained by converting dollar into national values at official exchange rates. Both the export price and the competitive price expressed in national currencies were deflated by the consumer price levels of the importing countries. To derive the consumer price levels the indices of consumer prices (1963=100) were multiplied by the 1963 PPP estimates.[1] The consumer price levels

1. In other words, to adjust the dollar prices for differences in the consumer prices among the importing countries which are not accounted for by the official exchange rates, both the export and competitive prices in terms of U.S. dollars were multiplied by the ratio of the official exchange rates to the PPP's.

represent the prices of the other consumer goods which compete with imported tourist services for the purchasing power of the home consumer (foreign tourist), and they serve at the same time as proxies for the prices of tourist services produced at home.

The adult population of the importing countries was introduced as a separate variable into the equation. Even though no adequate data on the distribution of foreign tourists by age are available, the adults (15 years of age or more) are expected to be the main consumers of international tourist services. Using adult instead of total population does not significantly affect the results. The effect of population can be dealt with either by working per capita data (dividing the dependent variable by the population variable) or by introducing population as a separate variable into the equation. The first procedure imposes the assumption that the population elasticity is equal to one, while the use of a separate variable tests this hypothesis instead of assuming it. The population is one of the most important variables associated with the foreign demand for tourism, and an attempt has been made to measure the individual effects of this important variable. The population variable may serve at the same time as a proxy for the size of the importing

country. It has been shown that the size of a country, as measured by population, has a negative effect on international trade.[1] In other words, small countries depend more on international trade than do large nations. Accordingly, it is reasonable to expect, other things being equal, that the propensity to import tourist services for a country with a small population will be higher than for large nations.

The distribution of population by occupation, city size, education and other demographic characteristics may also exert an important influence on the demand for international tourism. However, experiments with the ratio of urban to total population and the ratio of agricultural to nonagricultural employment did not produce significant results.

During the period covered, most of the importing countries, with the exception of Greece, have granted an unlimited quantity (or a reasonable amount) of foreign exchange per journey abroad. In certain years, however, some countries with balance-of-payment difficulties (e.g., the United Kingdom and France)

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1. H.B. Chenery, «Patterns of Industrial Growth,» *American Economic Review* (September, 1960); E.A.G. Robinson (ed.), *Economic Consequences of the Size of Nations* (St. Martins Press, New York, 1960), especially by S. Kuznets, «Economic Growth of Small Nations.»

imposed restrictions on currency allowances for travel abroad. A dummy variable for those years, in which the restrictions were mostly felt, was also tried, but the results did not prove to be significant. Since devaluations coincided with these foreign exchange restrictions, their effects might have been weakened by the effects of devaluation. As was discussed earlier, the relative prices have already been adjusted for changes in the official exchange rates. Another explanation is that restrictions on foreign travel allowances might be more important to the demand for international tourism if exports of tourist services were measured in terms of expenditures instead of in terms of tourist nights or arrivals. This implies that restrictions on foreign currency allowances per journey abroad have a negative effect on the country's average expenditure per night on international tourism.

Finally, special events, such as the Olympic Games, international exhibitions, socio-political problems and other favourable or unfavourable factors, are generally expected to affect the country's total exports of tourist services but not the regional distribution of these tourist services.

In general, the secondary variables are likely to vary more widely in cross-section than

in time series analysis.[1] However, in this cross-section study the empirical results indicate that the included explanatory variables explain more than 90 percent ($\bar{R}^2$ ranges from 90 to 97 percent) of the variation in the explained variable in most cases. Thus, it appears that the omitted variables are of secondary importance and that variations in them must be relatively small. The cross-section sample consists of observations on 17 of the O.E.C.D. member-countries over the 1958-1970 period. During that period, all countries included in the sample (with the exception perhaps of Greece and Spain) are reasonably homogeneous as far as consumption of international tourist services is concerned, and thus the homogeneity assumption required in cross-section analysis is expected to be approximately satisfied. Furthermore, the cross-section data are national aggregates reflecting the average behaviour of individual consumers in each importing country.

However, omission of the secondary variables may introduce bias in the estimated parameters of the explanatory variables present in the equation. In applied econometrics, however,

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1. Lawrence R. Klein, *A Textbook of Econometrics, op. cit.*, and Jean Crocket, *Consumer Expenditures and Incomes in Greece* (Center of Planning and Economic Research, Athens, 1967).

it is the extent of the bias, and not its mere existence, that is important. The size of the bias in the estimated coefficient of a particular explanatory variable included in the equation is given by the product of two regression coefficients: (1) the coefficient of the omitted variable from the true equation, and (2) the auxiliary regression coefficient of that particular explanatory variable in the regression equation of the omitted variable on all the included explanatory variables (auxiliary regression equation).[1] Since there is no reason to suppose that the omitted variables are systematically related to the included explanatory variables, the bias must be very small. In addition, when the coefficient of the omitted variable in the true equation is also small, the bias in the estimated parameters is negligible.

The identification problems pertinent to the method of estimation should be considered before the empirical estimates are presented. One may argue on logical grounds that the explanatory variables in the export demand equation for tourist services are predetermined. In this case, the export demand equation constitutes

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1. P. Rao and R. L. Miller, *Applied Econometrics* (Wadsworth Publishing Co., Belmont, California, 1971), and H. Theil, *Principles of Econometrics*, (John Wiley and Sons, New York, 1971), Chap. 11.

an uniequational complete model[1] and its parameters may be properly estimated by the method of least-squares.

The f.o.b. export prices of tourist services are held constant at a particular point in time, but even overtime export prices of tourist services are given for an individual importing country. Neither the importing nor the exporting country possesses any monopsonistic or monopolistic power in the world tourist market. The international air fares are regulated by the International Air Transport Association. The air fares do not respond to short-run changes in demand for any particular route, but flights are shifted from one route to another to accommodate these demand changes. Finally, populations, world prices and world incomes are determined outside of our model. The international tourist flows between any two pairs of countries are relatively small.

Several functional forms were tried, and the log-linear form was chosen as the most appropriate. Thus, for any particular year t, the equation to be tested may be written as

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1. K. A. Fox, *Intermediate Econometrics Statistics* (John Wiley and Sons, Inc., New York, 1968), Chap. 11.

$$X_{ij} = A \left( \frac{DI_j}{CPI_j \quad PPP_j} \right)^{\beta} \left( \frac{(PE_i + TC_{ij}) R_j}{CPI_j \quad PPP_j} \right)^{\gamma}$$

$$\left( \frac{\sum_{k \neq i} a_{kj} (PE_k + TC_{kj}) R_j}{CPI_j \quad PPP_j} \right)^{\delta} N_j^{\varepsilon} e^{u_{ij}} \qquad (4)$$

It will be convenient at this point to simplify notation and rewrite equation (4) as follows:

$$X_{ij} = A \ (DY_j)^{\beta} \ (PX_{ij})^{\gamma} \ (PCX_{ij})^{\delta} \ (N_j)^{\varepsilon} \ e^{u_{ij}} \qquad (5)$$

Where,

$X_{ij}$ = quantity of exported tourist services from country i to country j.

$DY_j = \dfrac{DI_j}{CPI_j \quad PPP_j}$ = real per capita disposable income in conutry j, converted to U.S. dollars through the use of 1963 PPP's for consumption,

$PX_{ij} = \dfrac{(PE_i + TC_{ij}) \ R_j}{CPI_j \quad PPP_j}$ = country i's relative export price of tourist services in j's market,

$PCX_{ij} = \dfrac{\sum_{k \neq i} a_{kj} \ (PE_k + TC_{kj}) \ R_j}{CPI_j \quad PPP_j}$ = the relative export price of tourist services of the export-competing countries in j's market.

$N_j$ = adult population of country j
$U_{ij}$ = random disturbances

Taking logarithms on both sides of (5), we have

$$\log X_{ij}=\alpha+\beta\log DY_j+\gamma\log PX_{ij}+\delta\log PCX_{ij}+\varepsilon\log N_j+U_{ij} \quad (6)$$

Although the total number of tourist nights has been selected as the more appropriate measure of the quantity of tourism, estimates with the foreign tourist arrivals as the dependent variable are also presented. Where data are available, the following two export demand equations for tourist services are estimated.

(1) the tourist nights equation

$$\log XN_{ij}=\alpha+\beta\log DY_j+\gamma\log PXN_{ij}+\delta\log PCXN_{ij}+\varepsilon\log N_j+U_{ij} \quad (7)$$

Where,

$XN_{ij}$ = the total number of tourist nights in country i by residents of country j
$PXN_{ij}$ = the relative export price per night of country i in j's market
$PCXN_{ij}$ = the relative export price per night of the export-competing countries in j's market

(2) the tourist arrivals equation

$$\log XA_{ij}=a+b\log DY_j+c\log PXA_{ij}+d\log PCXA_{ij}+e\log N_j+V_{ij} \quad (8)$$

Where,

$XA_{ij}$ = the total number of tourist arrivals (visits) in country i from country j

$PXA_{ij}$ = the relative export price per visit of country i in j's market

$PCXA_{ij}$ = the relative export price per visit of the export-competing countries in j's market

# III. EMPIRICAL RESULTS AND THEIR INTERPRETATION

Three different kinds of estimates are provided by this analysis: (1) pure cross-section estimates based on annual data for each of the years of the 1958-1970 period; (2) pure cross-section estimates based on seven-year and six-year averages for the subperiods 1958-1964 and 1965-1970 respectively; and (3) estimates based on a combined sample of cross-section and time series data over the 1958-1970 period. The estimated parameters were obtained by the method of ordinary least-squares. However, the covariance analysis technique has been applied in cases of pooling cross-section and time series data. In all cases, the t-values of the parameter estimates are reported in parentheses directly below the regression coefficients. The coefficient of determination ($\bar{R}^2$) has been adjusted for degrees of freedom.

## Pure Cross-Section Estimates

The first set of estimates are presented in Tables 3 through 10 for each of the five countries, for each year of the 1958-1970 period, and for both the tourist nights equation and the

tourist arrivals equation. Because the log-linear form has been used, the least-squares estimates are constant elasticities. The following interesting observations emerge from these estimated elasticities.

The income, own-price and population elasticities have the theoretically expected signs and are highly significant. For all cases, except for Spain, the cross-price elasticity has the right sign, but it is not always significant at the 5 percent level. The coefficients of determination ($\bar{R}^2$) are very high. They range from 84 to 88 percent for Austria, and they are above 90 percent for every other country. It appears that the real disposable income, the adult population and the relative prices make a very significant contribution to an explanation of the variations in the export demand for tourist services. It should be mentioned, however, that the most important variables in this explanation of the demand for tourist services are, in order of importance, the population, the own-price and the per capita disposable income.

Tables 3, 6 and 9 give the elasticities of the tourist nights equations; while Tables 4, 5, 7, 8 and 10 show similar information for the tourist arrivals equations. For Greece and Spain, the tourist nights equations have not been estimated, since no adequate data on nights are

TABLE 3

AUSTRIA: TOURIST NIGHTS EQUATIONS

$\log XN_{ij}=\alpha+\beta\log DY_j+\gamma\log PXN_{ij}+\delta\log PCXN_{ij}+\varepsilon\log N_j+U_{ij}$

| Year | $\alpha$ | $\beta$ | $\gamma$ | $\delta$ | $\varepsilon$ | $\overline{R}^2$ |
|---|---|---|---|---|---|---|
| 1958 | —3.25 | 1.98 | —2.55 | 1.35 | .84 | .85 |
| | (—0.68) | (3.46) | (—5.92) | (1.70) | (4.62) | |
| 1959 | —2.34 | 1.97 | —2.61 | 1.10 | .89 | .88 |
| | (—0.56) | (3.97) | (—6.79) | (1.59) | (5.51) | |
| 1960 | —.40 | 1.79 | —2.53) | .86 | .86 | .87 |
| | (—.09) | (3.60) | (—6.31) | (1.19) | (5.20) | |
| 1961 | —5.00 | 2.34 | —2.57 | 1.02 | .87 | .85 |
| | (—0.97) | (3.93) | (—5.81) | (1.22) | (4.88) | |
| 1962 | —3.74 | 2.16 | —2.63 | 1.03 | .90 | .85 |
| | (—0.71) | (3.57) | (—6.14) | (1.21) | (5.02) | |
| 1963 | —5.93 | 2.41 | —2.74 | 1.25 | .89 | .85 |
| | (—1.07) | (3.70) | (—6.06) | (1.39) | (4.90) | |
| 1964 | —6.68 | 2.45 | —2.68 | 1.16 | .94 | .85 |
| | (—1.19) | (3.70) | (—5.74) | (1.27) | (5.02) | |
| 1965 | —6.87 | 2.48 | —2.65 | 1.10 | .94 | .86 |
| | (—1.35) | (4.00) | (—6.12) | (1.28) | (5.31) | |
| 1966 | —7.40 | 2.46 | —2.70 | 1.22 | .97 | .85 |
| | (—1.35) | (3.68) | (—6.05) | (1.30) | (5.14) | |
| 1967 | —6.88 | 2.48 | —2.70 | .92 | 1.00 | .83 |
| | (—1.21) | (3.53) | (—5.50) | (.92) | (5.07) | |
| 1968 | —6.83 | 2.49 | —2.74 | .97 | .98 | .83 |
| | (—1.01) | (3.17) | (—5.38) | (.89) | (4.79) | |
| 1969 | —6.82 | 2.51 | —2.63 | .69 | 1.02 | .83 |
| | (—1.00) | (3.16) | (—5.27) | (.63) | (5.05) | |
| 1970 | —7.69 | 2.59 | —2.68 | .77 | 1.03 | .85 |
| | (—1.09) | (3.21) | (—5.20) | (.66) | (5.17) | |
| Average | | 2.32 | - 2.65 | 1.03 | .93 | |

TABLE 4

AUSTRIA: TOURIST ARRIVALS EQUATIONS

$\log XA_{ij} = a + b \log DY_j + c \log PXA_{ij} + d \log PCXA_{ij} + e \log N_j + V_{ij}$

| Year | a | b | c | d | e | $\bar{R}^2$ |
|---|---|---|---|---|---|---|
| 1958 | —6.28 | 2.35 | —3.15 | 2.32 | .69 | .86 |
| | (—1.07) | (4.08) | (—5.73) | (2.35) | (3.74) | |
| 1959 | —3.88 | 2.24 | —3.07 | 1.79 | .77 | .87 |
| | (—0.70) | (4.23) | (—5.86) | (1.92) | (4.43) | |
| 1960 | —5.27 | 2.30 | —2.99 | 1.92 | .74 | .88 |
| | (—0.95) | (4.53) | (—6.15) | (2.07) | (4.51) | |
| 1961 | —6.39 | 2.57 | —2.89 | 1.59 | .77 | .84 |
| | (—0.94) | (4.02) | (—4.88) | (1.43) | (4.05) | |
| 1962 | —6.06 | 2.53 | —3.00 | 1.70 | .77 | .83 |
| | (—0.86) | (3.78) | (—4.83) | (1.47) | (3.93) | |
| 1963 | —8.26 | 2.77 | —3.10 | 1.90 | .75 | .83 |
| | (—1.14) | (3.90) | (—4.90) | (1.60) | (3.82) | |
| 1964 | —8.23 | 2.74 | —3.12 | 1.86 | .80 | .84 |
| | (—1.26) | (4.19) | (—4.98) | (1.69) | (4.27) | |
| 1965 | —8.31 | 2.80 | —3.12 | 1.75 | .81 | .86 |
| | (—1.36) | (4.53) | (—5.13) | (1.65) | (4.59) | |
| 1966 | —9.19 | 2.79 | —3.23 | 1.96 | .83 | .84 |
| | (—1.38) | (4.19) | (—4.95) | (1.67) | (4.43) | |
| 1967 | —7.80 | 2.80 | —3.17 | 1.58 | .85 | .83 |
| | (—1.15) | (4.02) | (—4.53) | (1.31) | (4.39) | |
| 1968 | —8.55 | 2.82 | —3.16 | 1.71 | .83 | .82 |
| | (—1.00) | (3.43) | (—4.25) | (1.24) | (3.97) | |
| 1969 | —8.30 | 2.86 | —3.09 | 1.43 | .88 | .82 |
| | (—0.97) | (3.45) | (—4.21) | (1.06) | (4.27) | |
| 1970 | —8.70 | 2.89 | —2.89 | 1.20 | .91 | .83 |
| | (—1.00) | (3.46) | (—3.89) | (0.87) | (4.46) | |
| Average | | 2.65 | —3.08 | 1.75 | .80 | |

TABLE 5

GREECE: TOURIST ARRIVALS EQUATIONS

$\log XA_{ij} = a + b\log DY_j + c\log PXA_{ij} + d\log PCXA_{ij} + e\log N_j + V_{ij}$

| Year | a | b | c | d | e | $\bar{R}^2$ |
|---|---|---|---|---|---|---|
| 1958 | —2.20 | 2.58 | —3.26 | 1.10 | .80 | .96 |
| | (—.86) | (10.01) | (—7.63) | (2.15) | (9.51) | |
| 1959 | —1.68 | 2.68 | —3.59 | 1.16 | .87 | .97 |
| | (—.70) | (11.60) | (—9.00) | (2.39) | (11.17) | |
| 1960 | —3.14 | 2.51 | —3.10 | 1.07 | .87 | .97 |
| | (—1.36) | (11.82) | (—8.66) | (2.29) | (12.22) | |
| 1961 | —1.80 | 2.50 | —3.09 | .81 | .88 | .96 |
| | (—.64) | (9.40) | (—7.19) | (1.47) | (10.63) | |
| 1962 | —3.20 | 2.44 | —2.81 | .99 | .80 | .95 |
| | (—1.08) | (8.50) | (—6.31) | (1.63) | (9.13) | |
| 1963 | —6.40 | 2.98 | —2.79 | 1.00 | .72 | .92 |
| | (—2.09) | (9.72) | (—6.22) | (1.53) | (8.04) | |
| 1964 | —7.52 | 2.93 | —3.01 | 1.55 | .69 | .96 |
| | (—3.03) | (11.66) | (—7.59) | (2.76) | (9.14) | |
| 1965 | —8.80 | 3.12 | —3.16 | 1.92 | .59 | .94 |
| | (—2.85) | (9.80) | (—6.15) | (2.60) | (6.17) | |
| 1966 | —8.54 | 3.10 | —3.18 | 1.97 | .55 | .92 |
| | (—2.33) | (8.33) | (—5.31) | (2.17) | (4.97) | |
| 1967 | —7.44 | 2.87 | —2.87 | 1.57 | .60 | .91 |
| | (—2.00) | (7.70) | (4.75) | (1.70) | (5.35) | |
| 1968 | —10.24 | 2.64 | —2.44 | 1.62 | .74 | .90 |
| | (—1.87) | (5.23) | (—3.24) | (1.35) | (5.28) | |
| 1969 | —11.84 | 2.52 | —2.42 | 1.98 | .81 | .89 |
| | (—1.97) | (4.75) | (—3.16) | (1.53) | (5.38) | |
| 1970 | —11.65 | 2.33 | —1.89 | 1.92 | .65 | .84 |
| | (—1.79) | (4.08) | (—2.28) | (1.38) | (4.20) | |
| Average | | 2.71 | —2.89 | 1.44 | .74 | |

TABLE 6

ITALY: TOURIST NIGHTS EQUATIONS

$$\log XN_{ij}=\alpha+\beta\log DY_j+\gamma\log PXN_{ij}+\delta\log PCXN_{ij}+\varepsilon\log N_j+U_{ij}$$

| Year | $\alpha$ | $\beta$ | $\gamma$ | $\delta$ | $\varepsilon$ | $R^2$ |
|---|---|---|---|---|---|---|
| 1958 | —3.94 | 2.10 | —2.04 | 1.10 | .85 | .86 |
| | (—1.01) | (4.32) | (—5.64) | (1.94) | (6.70) | |
| 1959 | —1.25 | 1.87 | —2.26 | .93 | .91 | .93 |
| | (—.49) | (6.06) | (—8.09) | (2.44) | (10.17) | |
| 1960 | —1.95 | 1.81 | —2.26 | 1.10 | .94 | .89 |
| | (—.59) | (4.75) | (—6.48) | (2.16) | (8.25) | |
| 1961 | —1.90 | 1.88 | —2.24 | .94 | .93 | .93 |
| | (—.71) | (6.08) | (—8.33) | (2.33) | (10.72) | |
| 1962 | —2.21 | 1.95 | —2.28 | .93 | .94 | .92 |
| | (—.74) | (5.60) | (—7.51) | (2.03) | (9.74) | |
| 1963 | —4.02 | 2.15 | —2.34 | 1.14 | .91 | .91 |
| | (—1.22) | (5.59) | (—7.51) | (2.34) | (9.12) | |
| 1964 | —3.82 | 2.10 | —2.17 | .97 | .91 | .91 |
| | (—1.17) | (5.50) | (—6.96) | (1.98) | (8.95) | |
| 1965 | —3.65 | 2.12 | —2.26 | 1.02 | .89 | .90 |
| | (—1.10) | (5.30) | (—6.63) | (1.92) | (8.21) | |
| 1966 | —4.11 | 2.15 | —2.44 | 1.28 | .89 | .90 |
| | (—1.19) | (5.16) | (—6.87) | (2.28) | (8.04) | |
| 1967 | —3.61 | 2.08 | —2.58 | 1.34 | .91 | .90 |
| | (—1.07) | (4.99) | (—6.95) | (2.34) | (8.15) | |
| 1968 | —2.54 | 1.98 | —2.39 | 1.07 | .89 | .88 |
| | (—.61) | (4.00) | (—6.25) | (1.68) | (7.32) | |
| 1969 | —2.76 | 1.94 | —2.29 | .97 | .93 | .88 |
| | (—.64) | (3.86) | (—5.97) | (1.50) | (7.42) | |
| 1970 | —4.38 | 2.04 | —2.25 | 1.17 | .92 | .87 |
| | (—.95) | (3.80) | (—5.60) | (1.67) | (7.13) | |
| Average | | 2.01 | —2.29 | 1.07 | .91 | |

TABLE 7

ITALY: TOURIST ARRIVALS EQUATIONS

$$\log XA_{ij} = a + b\log DY_j + c\log PXA_{ij} + d\log PCXA_{ij} + e\log N_j + V_{ij}$$

| Year | a | b | c | d | e | $R^2$ |
|---|---|---|---|---|---|---|
| 1958 | —5.61 | 2.37 | —2.42 | 1.59 | .76 | .88 |
| | (—1.19) | (4.54) | (—5.09) | (2.26) | (6.19) | |
| 1959 | —1.23 | 2.08 | —2.69 | 1.31 | .83 | .94 |
| | (—.40) | (6.19) | (—7.33) | (2.74) | (9.68) | |
| 1960 | —3.58 | 2.17 | —2.82 | 1.74 | .83 | .92 |
| | (—.94) | (5.54) | (—6.62) | (2.91) | (8.34) | |
| 1961 | —2.50 | 2.14 | —2.66 | 1.36 | .85 | .96 |
| | (—.90) | (7.35) | (—8.73) | (3.24) | (12.11) | |
| 1962 | —2.86 | 2.22 | —2.66 | 1.34 | .84 | .95 |
| | (—.90) | (6.57) | (—7.75) | (2.79) | (10.68) | |
| 1963 | —4.59 | 2.47 | —2.84 | 1.59 | .81 | .94 |
| | (—1.34) | (6.60) | (—7.71) | (3.10) | (9.72) | |
| 1964 | —4.59 | 2.40 | —2.74 | 1.50 | .82 | .95 |
| | (—1.44) | (6.83) | (—7.52) | (3.08) | (10.41) | |
| 1965 | —3.55 | 2.36 | —2.76 | 1.39 | .80 | .93 |
| | (—1.01) | (5.98) | (—6.48) | (2.51) | (8.82) | |
| 1966 | —3.87 | 2.39 | —2.95 | 1.63 | .80 | .93 |
| | (—1.08) | (5.93) | (—6.78) | (2.85) | (8.64) | |
| 1967 | —3.50 | 2.35 | —3.07 | 1.68 | .81 | .94 |
| | (—1.06) | (6.22) | (—7.44) | (3.18) | (9.40) | |
| 1968 | —2.86 | 2.23 | —2.92 | 1.56 | .81 | .93 |
| | (—.69) | (4.88) | (—6.40) | (2.53) | (8.41) | |
| 1969 | —3.41 | 2.21 | —2.81 | 1.49 | .85 | .92 |
| | (—.80) | (4.77) | (—6.19) | (2.43) | (8.63) | |
| 1970 | —4.67 | 2.16 | —2.67 | 1.61 | .86 | .92 |
| | (—1.04) | (4.48) | (—5.51) | (2.48) | (8.31) | |
| Average | | 2.27 | —2.77 | 1.52 | .82 | |

TABLE 8

SPAIN: TOURIST ARRIVALS EQUATIONS

$\log XA_{ij} = a + b\log DY_j + c\log PXA_{ij} + e\log N_j + V_{ij}$

| Year | a | b | c | e | $\bar{R}^2$ |
|---|---|---|---|---|---|
| 1961 | 4.53 | 1.86 | —2.56 | .91 | .94 |
| | (1.66) | (4.91) | (—9.09) | (9.89) | |
| 1962 | 5.23 | 1.88 | —2.61 | .85 | .94 |
| | (1.83) | (4.74) | (—8.84) | (8.84) | |
| 1963 | 5.68 | 2.41 | —3.15 | .74 | .92 |
| | (1.60) | (4.91) | (—8.42) | (6.53) | |
| 1964 | 5.67 | 2.53 | —3.34 | .75 | .93 |
| | (1.62) | (5.28) | (—9.20) | (6.98) | |
| 1965 | 5.01 | 2.08 | —2.82 | .84 | .90 |
| | (1.28) | (3.77) | (—7.07) | (6.90) | |
| 1966 | 5.13 | 2.30 | —3.06 | .80 | .90 |
| | (1.29) | (4.02) | (—7.55) | (6.32) | |
| 1967 | 4.71 | 2.37 | —3.08 | .77 | .90 |
| | (1.15) | (3.97) | (—7.75) | (6.07) | |
| 1968 | 5.15 | 2.14 | —2.75 | .71 | .86 |
| | (1.03) | (2.95) | (—6.19) | (4.80) | |
| 1969 | 4.49 | 2.18 | —2.71 | .73 | .87 |
| | (.90) | (3.07) | (—6.39) | (5.26) | |
| 1970 | 3.87 | 2.26 | —2.68 | .71 | .85 |
| | (.71) | (2.90) | (—5.85) | (4.69) | |
| Average | | 2.20 | 2.88 | .78 | |

TABLE 9

SWITZERLAND: TOURIST NIGHTS EQUATIONS

$\log XN_{ij}=\alpha+\beta\log DY_j+\gamma\log PXN_{ij}+\delta\log PCXN_{ij}+\varepsilon\log N_j+U_{ij}$

| Year | $\alpha$ | $\beta$ | $\gamma$ | $\delta$ | $\varepsilon$ | $R^2$ |
|---|---|---|---|---|---|---|
| 1958 | 2.37 | 1.07 | —1.71 | .31 | .99 | .94 |
| | (0.87) | (3.30) | (—7.79) | (.71) | (9.60) | |
| 1959 | 2.65 | 1.12 | —1.84 | .29 | 1.00 | .96 |
| | (1.21) | (4.19) | (—9.61) | (.82) | (11.44) | |
| 1960 | 1.61 | 1.08 | —1.74 | .33 | 1.06 | .96 |
| | (.77) | (4.53) | (—10.48) | (1.00) | (13.44) | |
| 1961 | 2.03 | 1.06 | —1.85 | .44 | 1.04 | .96 |
| | (.87) | (3.91) | (—10.26) | (1.22) | (12.53) | |
| 1962 | 1.36 | 1.16 | —1.90 | .47 | 1.04 | .95 |
| | (.52) | (3.82) | (—9.35) | (1.15) | (11.49) | |
| 1963 | —.30 | 1.36 | —1.94 | .64 | 1.01 | .96 |
| | (—.12) | (4.70) | (—10.82) | (1.75) | (12.62) | |
| 1964 | —.82 | 1.37 | —1.87 | .58 | 1.04 | .95 |
| | (—.31) | (4.24) | (—9.10) | (1.42) | (11.36) | |
| 1965 | —2.32 | 1.60 | —1.92 | .65 | 1.01 | .95 |
| | (—.88) | (4.84) | (—9.28) | (1.58) | (11.19) | |
| 1966 | —2.96 | 1.66 | —1.98 | .76 | 1.00 | .95 |
| | (—1.05) | (4.62) | (—8.85) | (1.70) | (10.38) | |
| 1967 | —1.39 | 1.46 | —2.05 | .80 | 1.00 | .94 |
| | (—.49) | (3.99) | (—8.31) | (1.66) | (10.08) | |
| 1968 | —.63) | 1.45 | —1.91 | .51 | .98 | .93 |
| | (—.18) | (3.44) | (—7.26) | (.94) | (8.84) | |
| 1969 | —.68 | 1.42 | —1.77 | .37 | .99 | .93 |
| | (—.19) | (3.35) | (—6.58) | (.67) | (9.29) | |
| 1970 | —2.69 | 1.57 | —1.72 | .57 | .98 | .93 |
| | (—.74) | (3.16) | (—6.46) | (1.02) | (9.24) | |
| Average | | 1.35 | —1.87 | .52 | 1.01 | |

TABLE 10

SWITZERLAND: TOURIST ARRIVALS EQUATIONS

$$\log XA_{ij} = a + b\log DY_j + c\log PXA_{ij} + d\log PCXA_{ij} + e\log N_j + V_{ij}$$

| Year | a | b | c | d | e | $\bar{R}^2$ |
|---|---|---|---|---|---|---|
| 1958 | .53 | 1.29 | —2.18 | 1.07 | .92 | .94 |
| | (.14) | (3.48) | (—6.56) | (1.64) | (8.12) | |
| 1959 | 2.17 | 1.24 | —2.24 | .84 | .95 | .95 |
| | (.68) | (4.03) | (—7.80) | (1.54) | (9.74) | |
| 1960 | .58 | 1.24 | —2.13 | .92 | 1.00 | .96 |
| | (.19) | (4.42) | (—8.48) | (1.77) | (11.46) | |
| 1961 | .30 | 1.28 | —2.31 | 1.14 | .98 | .96 |
| | (.09) | (3.98) | (—8.28) | (2.02) | (10.64) | |
| 1962 | .56 | 1.41 | —2.42 | 1.26 | .97 | .95 |
| | (.15) | (3.94) | (—7.84) | (2.03) | (9.83) | |
| 1963 | —2.56 | 1.63 | —2.49 | 1.46 | .93 | .96 |
| | (—.74) | (4.86) | (—8.91) | (2.61) | (10.57) | |
| 1964 | —3.07 | 1.62 | —2.40 | 1.38 | .98 | .95 |
| | (—.83) | (4.43) | (—7.58) | (2.25) | (10.15) | |
| 1965 | —4.13 | 1.80 | —2.47 | 1.44 | .95 | .95 |
| | (—1.10) | (4.77) | (—7.27) | (2.22) | (9.80) | |
| 1966 | —4.80 | 1.84 | —2.53 | 1.56 | .95 | .94 |
| | (—1.14) | (4.40) | (—6.66) | (2.12) | (9.03) | |
| 1967 | —2.59 | 1.60 | —2.61 | 1.52 | .96 | .94 |
| | (—.65) | (3.88) | (—6.40) | (2.10) | (8.99) | |
| 1968 | —.97 | 1.53 | —2.39 | 1.10 | .95 | .92 |
| | (—.19) | (3.10) | (—5.32) | (1.29) | (7.92) | |
| 1969 | —.28 | 1.42 | —2.09 | .76 | .98 | .93 |
| | (.05) | (2.93) | ( 4.92) | (.93) | (8.64) | |
| 1970 | —2.99 | 1.58 | —2.06 | 1.03 | .97 | .93 |
| | (—.61) | (3.32) | (—4.95) | (1.31) | (9.07) | |
| Average | | 1.50 | —2.33 | 1.19 | .96 | |

available. The small differences between the tourist nights and the corresponding tourist arrivals elasticities may be partly attributed to a specification bias. If the tourist nights equation is correctly specified, a small bias exists in the estimates of the tourist arrivals equation because of left out variables.[1] The absolute values of the income and price elasticities are slightly overestimated, and the population elasticity is slightly underestimated, in the tourist arrivals equation.

There is substantial evidence that the income elasticity is quite high. This is in agreement with

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1. The tourist nights equation without the income and population variables has been specified as

$$\log XN_{ij} = \alpha + \gamma \log PXN_{ij} + \delta \log PCXN_{ij} + U_{ij} \quad (9)$$

and its tourist arrivals analogue may be written as

$$\log XA_{ij} = a + c \log PXA_{ij} + d \log PCXA_{ij} + V_{ij} \quad (10)$$

Let $L_{ij}$ and $LC_{ij}$ be the average length of stays per tourist of country j in country i and in the export-competing countries respectively. Then

$$XN_{ij} = XA_{ij} \cdot L_{ij}, \quad PXA_{ij} = PXN_{ij} \cdot L_{ij} \text{ and}$$
$$PCXA_{ij} = PCXN_{ij} \cdot LC_{ij}$$

By substituting these definitions in equation (9), we obtain the following tourist arrivals equation

$$\log XA_{ij} = \alpha + \gamma \log PXA_{ij} + \delta \log PCXA_{ij} - [(1+\gamma)\log L_{ij} + \delta \log LC_{ij}] + V_{ij} \quad (11)$$

If equation (9) is correctly specified, the true specification of the tourist arrivals equation is given by equation (11). In estimating (10) instead of (11) the results may be biased because of omitting the relevant explanatory variables $L_{ij}$ and $LC_{ij}$. The extent and direction of bias depend on the coefficient of $L_{ij}$ and $LC_{ij}$ in (11), and on the auxiliary regression coefficients of the included explanatory variables obtained by regressing $L_{ij}$ ($LC_{ij}$) on all the included explanatory variables.

*a priori* expectations that international tourism is a luxury item. In all but one case—Switzerland—the income elasticity was found to range between 2.0 and 2.8. During the 1958-1970 period, the average (arithmetic) income elasticity is 2.32 for Austria, 2.71 for Greece, and 2.01 and 2.20 for Italy and Spain respectively. Taking into consideration that the tourist arrivals elasticities for Greece and Spain include a small positive specification bias, the size of the elasticity of foreign demand for tourist services with respect to income seems to fall in the interval from 2. to 2.5.

The estimated income elasticity for Switzerland is lower than for any other country. The average income elasticity is 1.4 and the individual elasticities vary from 1.1 to 1.7 over the 1958-1970 period. One explanation of this result might be that the share of Swiss exports of tourist services for non-holiday purposes (business, international meetings, etc.) in the total Swiss exports of tourist services is higher than the corresponding shares in the other countries. Exports of tourist services for non-holiday purposes are not expected to be very sensitive to disposable income changes. Another possibility is that the demand for tourist attractions of the other countries is growing faster than that for Switzerland. The Mediterranean

countries enjoy strong advantages in terms of tourist resources. Greece, Italy and Spain possess beautiful beaches and the pleasant Mediterranean climate as well as places of historical and cultural interest.[1]

Although cross-section estimates are not strictly comparable to those obtained from time series data,[2] a comparison of our estimates with those of other time series studies[3] is very interesting. Although the cross-section estimates reflect essentially long-run adjustments and the time series estimates are usually measures of short-run parameters, it can be seen from Table 11 that the income elasticity estimates based on cross-section data are in close agreement with those based on time series data. The similarity of these two sets of estimates is compat-

1. Gray has found that the United States income elasticity of demand for wanderlust travel (mainly seeing places) is somewhat higher than that for sunlust travel (mainly vacationing to rest). H. Peter Gray, *International Travel-International Trade, op.cit.*, p. 72.

2. E. Kuh and J. Meyer, «How Extraneous Are Extraneous Estimates?» *Review of Economics and Statistics* (November, 1957), and E. Kuh, «The Validity of Cross-Sectionally Estimated Behavior Equations in Time Series Applications,» *Econometrica* (April, 1959).

3. H. Peter Gray, *International Travel-International Trade, op. cit.*, Chap. 3; J. R. Artus, «An Econometric Analysis of International Travel,» *op. cit.*; M. Evans, *An Econometric Model of the French Economy* (O.E.C.D., Paris, 1969), pp. 28-29; W. Krause and D. Jud, *International Tourism and Latin American Development, op.cit.*, Chap. II; and G. N. Paraskevopoulos, *An Econometric Analysis of the Foreign Trade of Greece, op.cit.*, pp. 209-213.

TABLE 11

COMPARISON OF INCOME ELASTICITIES

| Types of study | Region or country | Income elasticity |
|---|---|---|
| Artus | | |
| Time series (1955-1970)[a] | W. Europe | 2.3 |
| Evans | | |
| Time series (1952-1966)[b] | France | 2.5 |
| Gray | | |
| Time series (1951-1968)[c] | Canada | 2.6 |
| Time series (1952-1968)[d] | United States | 2.0 |
| Jud | | |
| Time series (1958-1968)[e] | South America | 2.0 |
| Paraskevopoulos | | |
| Time series (1951-1966)[f] | Greece | 2.2 |
| Present study | | |
| Cross-section (1958-1970)[g] | Austria | 2.3 |
| " " " " [h] | Greece | 2.8 |
| " " " " [g] | Italy | 2.1 |
| " " " " [h] | Spain | 2.1 |
| " " " " [g] | Switzerland | 1.4 |

*a*. Tourist expenditures.
*b*. Tourist receipts.
*c*. Canadian overseas tourist expenditures.
*d*. Tourist expenditures of the United States (excluding those in Mexico, the Caribbean and Central America).
*e*. Tourist receipts from the United States.
*f*. Tourist receipts.
*g*. Tourist nights.
*h*. Tourist arrivals.

ible with any one of the following explanations: (1) the time series income coefficient includes not only the short-run effect, but the lagged effects as well; that is, the time series income coefficient will approximate the long-run income coefficient and the calculated elasticity can be interpreted as long-run elasticity; (2) the adjustment process does not spread beyond the observation period; (3) the time series estimates include a positive bias of various trend influences.

The results also demonstrate quite clearly that the foreign demand for tourist services is highly price elastic. The magnitudes of the estimated c.i.f. own-price elasticities, arithmetically more than $-2$, indicate that movements in relative prices are quite important in determining the demand for exported tourist services.

Although changes in the prices of the importing countries and in transportation cost can significantly affect both the quantity and value of international tourism, the price policies of the exporting countries are not equally effective. In some cases, the price policies of the tourist-exporting countries may be perverse. Transportation cost in international tourism constitutes a major part of the c.i.f. export price of tourist services. The greater the distance of the importing from the exporting country, the

larger is the share of transportation cost in the c.i.f. export price of tourism. The air fares, reflecting the profit maximization decisions of the airline industry, are determined by the International Air Transport Association (I.A.T.A.). Thus, price policies of the exporting countries, such as devaluation, subsidies and various promotional discounts, affect only the portion of the c.i.f. export price of tourism accounted for by the f.o.b. export price of tourist services.

The effect of devaluation and other domestic price policies on foreign exchange earnings from tourism, other things being equal, depends on the size of the elasticity of foreign demand for tourist services with respect to f.o.b. export price. Unless the f.o.b. price elasticity is arithmetically greater than one, devaluation, for example, will deteriorate the international tour-

TABLE 12

F.O.B. PRICE ELASTICITIES[a]

| C.I.F. Price Elasticity | T/P | | | | | | |
|---|---|---|---|---|---|---|---|
| | .25 | .50 | .75 | 1.00 | 1.25 | 1.50 | 2.00 |
| —2.0 | —1.60 | —1.33 | —1.14 | —1.00 | —.89 | —.80 | —.67 |
| —2.5 | —2.00 | —1.67 | —1.43 | —1.25 | —1.11 | —1.00 | —.83 |
| —3.0 | —2.40 | —2.00 | —1.71 | —1.50 | —1.33 | —1.20 | —1.00 |
| —3.5 | —2.80 | —2.33 | —2.00 | —1.75 | —1.56 | —1.40 | —1.17 |
| —4.0 | —3.20 | —2.67 | —2.28 | —2.00 | —1.78 | —1.60 | —1.33 |

*a*. Based on equation (12).

ist receipts. It can be shown that the f.o.b. price elasticity depends on the c.i.f. price elasticity as well as on the ratio of the transportation to the f.o.b. export price variables.[1]

The calculated f.o.b. price elasticities are given in Table 12 above.

The calculated f.o.b. price elasticities are substantially lower than the corresponding c.i.f. price elasticities. For example, if $\frac{T}{P} = 1$, the f.o.b. price elasticity is equal to one-half of the corresponding c.i.f. price elasticity; if $\frac{T}{P} = .5$, the f.o.b. price elasticity appears to be about 66 percent of the c.i.f. price elastic-

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1. Assuming that the export demand for tourist services is a function of its own price only, we have

$$\log X = \alpha + \gamma \log(P + T)$$

Where, X, P, and T are the quantity of tourism, the f.o.b. export price, and the transportation cost respectively. The partial derivative of X with respect to P is

$$\frac{\delta X}{\delta P} = \gamma \left( \frac{1}{P+T} \right) X$$

or

$$\theta = \frac{\delta X}{\delta P} \cdot \frac{P}{X} = \gamma \left( \frac{P}{P+T} \right) = \gamma \left( \frac{1}{1 + \frac{T}{P}} \right) \quad (12)$$

Hence, the f.o.b. price elasticity ($\theta$) depends on the c.i.f. price elasticity ($\gamma$) and the ratio $\frac{T}{P}$.

ity; while if $\frac{T}{P} = 2$, the f.o.b. price elasticity was found to be 33 percent of the c.i.f. price elasticity. In other words, given the c.i.f. price elasticity and the f.o.b. price of the exporting countries, its f.o.b. price elasticity depends on the geographical position of the country relative to the main tourist-importing countries. When transportation cost increases relative to the f.o.b. price, the f.o.b. price elasticity decreases relative to the corresponding c.i.f. price elasticity.

Since the effects of devaluation, subsidies and various promotional discounts of the tourist-exporting country on its international tourist receipts depend on the f.o.b. price elasticity, it seems that these price policy instruments are not very effective in countries with a relatively high transportation cost. On the other hand, countries in close geographical proximity to the main tourist-generating countries should pursue appropriate price policies, because international tourist receipts are very sensitive to changes in the f.o.b. prices of tourist services. For adjacent countries, the f.o.b. price elasticity is expected to be substantially above unity (see Table 12). For this reason, relatively high rates of inflation can adversely

affect foreign exchange earnings from tourism. In a neighboring country in which international tourism has become a major source of foreign exchange, subsidies and even devaluation can be used as policy instruments to offset the unfavourable effects of inflation on the country's international tourist receipts.

The estimated c.i.f. price elasticities are generally consistent with the results reported by other researchers in the field.[1] The time series estimates obtained by Artus and Gray give on the average a price elasticity estimate in the neighborhood of –2.5. It should be noted, however, that our cross-section estimates are not strictly comparable with those obtained from time series studies. But the differences among the various price elasticity estimates are mainly due to differences in the definition of the price variable.

Because of multicollinearity problems, transportation cost is not introduced into the equation in most of the time series studies. Thus, the estimated price elasticities, based on time series data, are expected to estimate f.o.b. price elasticities. The difference between the estimated f.o.b. price and c.i.f. price elasticities depends on the f.o.b. price-transportation cost

1. See reference on page 65.

ratio and the covariance of these two variables. Assume that the f.o.b. price-transportation cost ratio is equal to one in the following three extreme cases: (1) if the transportation cost variable is held constant, the estimated f.o.b. price elasticity is about one-half of the corresponding c.i.f. price elasticity;[1] (2) if the f.o.b. price and the transportation cost variables are highly correlated and they move in the same direction, the f.o.b. price elasticity estimate is approaching the c.i.f. price elasticity; (3) if the two variables are highly correlated but they move in opposite directions, the estimated price elasticity is downward biased in absolute value toward zero.[2] For example, if a country's currency is depreciated by 10 percent and the price elasticity of demand for tourist services is $-2$, the foreign demand for the country's tourist services, other things being equal, will increase by 10 percent; while the country's import demand will decrease by 20 percent.[3] This implies that the foreign exchange elasticities in the export and import demand equations will be $-1$ and $-2$ respectively. The export demand elasticity, with respect to the rate of exchange, reflects the

1. See equation (12).

2. In other words, the transportation cost is treated here as an error of measurement in the observed value of the price variable.

3. Assuming infinite supply elasticities.

f.o.b. price elasticity, whereas the import demand elasticity with respect to the same variables measures the c.i.f. price elasticity.

As was discussed earlier,[1] the c.i.f. price elasticity depends on the level of the f.o.b. price variable. If the f.o.b. price contains errors of measurement, the estimated c.i.f. price elasticity will be biased. But in this study the size of that bias is expected to be relatively small. It was estimated that a 10 percent error in the observed f.o.b. price will cause about a 2.5 percent bias in the estimate of the c.i.f. price elasticity.

The elasticity of demand for tourist services with respect to transportation cost, ranging from −1.5 to −2, confirms our expectations that transportation cost is an important determinant of the demand for international tourism (Table 13). An estimated transportation cost elasticity considerably in excess of unity does not lend support to the pessimistic views of the International Air Transport Association about the effects of the international air fare reductions.[2] The International Air Transport Association has generally opposed air fare reductions on the grounds that the transportation cost elasticity

1. See equation (2).

2. See M. R. Straszheim, *The International Airline Industry* (The Brookings Institution, Washington, D.C., 1969), Chap. VI.

TABLE 13

TRANSPORTATION COST ELASTICITIES
TOURIST ARRIVALS EQUATIONS

| Year | Austria | Greece | Italy | Spain | Switzerland |
|---|---|---|---|---|---|
| 1958 | —2.24 | —2.20 | —1.69 | n.a. | —1.26 |
| | (—6.03) | (—8.20) | (—6.73) | | (—6.52) |
| 1959 | —2.16 | —2.36 | —1.74 | n.a. | —1.30 |
| | (—6.17) | (—9.92) | (—9.98) | | (—8.23) |
| 1960 | —2.10 | —2.01 | —1.83 | n.a. | —1.25 |
| | (—6.59) | (—10.08) | (—9.69) | | (—9.66) |
| 1961 | —2.01 | —1.99 | —1.67 | —1.93 | —1.34 |
| | (—5.15) | (—8.07) | (—12.43) | (—9.57) | (—9.87) |
| 1962 | —2.05 | —1.79 | —1.65 | —1.88 | —1.39 |
| | (—5.16) | (—6.54) | (—10.56) | (—8.97) | (—9.81) |
| 1963 | —2.09 | —1.77 | —1.71 | —2.14 | —1.39 |
| | (—5.14) | (—6.47) | (—10.05) | (—8.77) | (—10.28) |
| 1964 | —2.05 | —1.84 | —1.62 | —2.24 | —1.33 |
| | (—5.21) | (—7.92) | (—11.00) | (—9.30) | (—9.33) |
| 1965 | —2.01 | —1.87 | —1.60 | —1.95 | —1.32 |
| | (—5.48) | (—6.11) | (—8.44) | (—7.00) | (—8.44) |
| 1966 | —2.05 | —1.84 | —1.66 | —2.12 | —1.31 |
| | (—5.30) | (—5.28) | (—9.49) | (—7.39) | (—7.53) |
| 1967 | —2.00 | —1.65 | —1.69 | —2.18 | —1.30 |
| | (—4.93) | (—4.78) | (—11.36) | (—7.46) | (—7.43) |
| 1968 | —2.00 | —1.45 | —1.64 | —2.00 | —1.21 |
| | (—4.73) | (—3.70) | (—10.21) | (—6.20) | (—6.19) |
| 1969 | —1.98 | —1.35 | —1.58 | —2.00 | —1.09 |
| | (—4.58) | (—3.20) | (—9.24) | (—6.42) | (—5.74) |
| 1970 | —1.80 | —1.07 | —1.45 | —1.88 | —1.04 |
| | (—4.17) | (—2.42) | (—8.12) | (—5.85) | (—5.81) |
| Average | —2.04 | —1.78 | —1.66 | —2.03 | —1.27 |

*Note*: Numbers in parentheses are t-values.

would be less than unity. On the contrary, our results indicate that reductions in international air fares will not only benefit the airline industry, but will benefit the international tourist industry even more. For any 10 percent reduction in air fares, other things being equal, the passenger revenues of the international airline industry are expected to increase by 5-10 percent; while both the volume and value of the exported tourist services will increase by 15-20 percent.

The cross-price elasticity with respect to the export price of the competing countries is not always significant at the 5 percent level and, in the case of Spain, has the wrong sign. There are some indications — though weak ones, due to the limitations of data — that a country's exports of tourist services face some price competiton from the exports of the competing countries in the world tourist market. This view is considerably supported by the results of pooling cross-section and time series data. As will be seen later, the estimated cross-price elasticity based on cross-section and time series pooled data is highly significant. However, the magnitudes of the estimated cross-price elasticities still remain relatively low.

One explanation of this low cross-price elasticity is that international tourism, in gen-

eral, is not a highly competitive item. Although there is not enough information about the motivations for travel, it could be assumed that many foreign tourists are motivated by the desire to visit places with different attributes which are not expected to be close substitutes.[1]

Another explanation is that tourist services constitute differentiated products distinguished by place of production. This suggests that the tourist exports of various countries do not face the same degree of competition from the exports of their competitors in the world tourist market. If the cross-price elasticities with respect to prices of certain competing countries are very low, the estimated cross-price elasticity, as a weighted average of the individual cross-price elasticities, blurs the high cross-price elasticities with respect to the prices of the close competitors. The competitive price introduced into the equation is a weighted average of the export prices of the competing countries, where both prices and weights are different in the various countries.[2] Furthermore, the cross-price elasticity for non-holiday travel is zero.

The size of the population elasticity appears

1. For a detailed discussion, see H. Peter Gray, *International Travel-International Trade*, *op.cit.*

2. See page 42.

to be slightly less than unity. This was expected since the population coefficient includes a negative size effect. The propensity to import tourist services for small nations is expected to be higher than for large nations. An estimated population elasticity in the neighbourhood of unity indicates that, *ceteris paribus*, population changes will lead to about the same proportionate change in the demand for international tourism.

It can be seen from Tables 3 through 10 that the single-year cross-section estimates have exhibited a remarkable stability over time. However, in order to make more meaningful comparisons with respect to temporal stability of the parameter estimates, the export demand equations were fitted to seven-year and six-year averages for the subperiods 1958-1964 and 1965-1970 respectively. The estimated elasticities for the two subperiods are presented in Tables 14 and 15.

The comparison of the results for the two subperiods reveals that the t-values of the parameter estimates (with the exception of the cross-price elasticities), and the coefficients of determination ($\bar{R}^2$) are practically the same. The own-price elasticities, except for Greece, are essentially the same. The income and population elasticities differ by less than one standard

TABLE 14

SEVEN-YEAR (1958-1964) AND SIX-YEAR (1965-1970) AVERAGES

TOURIST NIGHTS EQUATIONS

$$\log XN_{ij}=\alpha+\beta\log DY_j+\gamma\log PXN_{ij}+\delta\log PCXN_{ij}+\varepsilon\log N_j+U_{ij}$$

| Country | Period | $\alpha$ | $\beta$ | $\gamma$ | $\delta$ | $\varepsilon$ | $\overline{R}^2$ |
|---|---|---|---|---|---|---|---|
| Austria | 1958-64 | —3.88 | 2.15 | —2.63 | 1.11 | .89 | .86 |
| | | (—.79) | (3.75) | (—6.22) | (1.39) | (5.10) | |
| Austria | 1965-70 | —7.28 | 2.53 | —2.68 | .93 | .99 | .85 |
| | | (—1.19) | (3.51) | (—5.60) | (.91) | (5.13) | |
| Italy | 1958-64 | —2.72 | 1.98 | —2.22 | 1.00 | .92 | .91 |
| | | (—.88) | (5.44) | (—7.24) | (2.16) | (9.11) | |
| Italy | 1965-70 | —3.77 | 2.08 | —2.37 | 1.16 | .90 | .89 |
| | | (—.99) | (4.57) | (—6.43) | (1.94) | (7.78) | |
| Switzerland | 1958-64 | 1.30 | 1.18 | —1.84 | .43 | 1.03 | .96 |
| | | (.56) | (4.23) | (—9.95) | (1.18) | (12.16) | |
| Switzerland | 1965-70 | —1.91 | 1.54 | —1.88 | .61 | 1.00 | .94 |
| | | (—.61) | (3.99) | (—7.72) | (1.22) | (9.85) | |

TABLE 15

SEVEN-YEAR (1958-1964) AND SIX-YEAR (1965-1970) AVERAGES
TOURIST ARRIVALS EQUATIONS

$$\log XA_{ij} = a + b \log DY_j + c \log PXA_{ij} + d \log PCXA_{ij} + e \log N_j + V_{ij}$$

| Country | Period | a | b | c | d | e | $\bar{R}^2$ |
|---|---|---|---|---|---|---|---|
| Austria | 1958-64 | —6.38 | 2.51 | —3.04 | 1.87 | .76 | .85 |
| | | (—1.01) | (4.12) | (—5.33) | (1.78) | (4.12) | |
| Austria | 1965-70 | —8.73 | 2.86 | —3.10 | 1.60 | .85 | .83 |
| | | (—1.17) | (3.90) | (—4.50) | (1.28) | (4.37) | |
| Greece | 1958-64 | —4.07 | 2.68 | —3.04 | 1.17 | .76 | .97 |
| | | (—1.77) | (11.93) | (—8.50) | (2.47) | (10.87) | |
| Greece | 1965-70 | —9.33 | 2.75 | —2.57 | 1.67 | .65 | .92 |
| | | (—2.23) | (7.02) | (—4.24) | (1.74) | (5.72) | |
| Italy | 1958-64 | —3.61 | 2.28 | —2.69 | 1.48 | .82 | .94 |
| | | (—1.08) | (6.31) | (—7.34) | (2.92) | (9.62) | |
| Italy | 1965-70 | —3.96 | 2.31 | —2.87 | 1.59 | .82 | .93 |
| | | (—1.04) | (5.50) | (—6.59) | (2.76) | (8.86) | |
| Switzerland | 1958-64 | —.29 | 1.39 | —2.33 | 1.15 | .97 | .96 |
| | | (—.09) | (4.29) | (—8.02) | (2.03) | (10.51) | |
| Switzerland | 1965-70 | —3.00 | 1.67 | —2.38 | 1.29 | .95 | .94 |
| | | (—.67) | (3.80) | (—5.89) | (1.70) | (8.87) | |
| Spain | 1961-65 | 5.33 | 2.13 | —2.89 | — | .81 | .93 |
| | | (1.68) | (4.85) | (—8.80) | | (8.00) | |
| Spain | 1966-70 | 4.46 | 2.29 | —2.85 | — | .74 | .88 |
| | | (.97) | (3.43) | (—6.79) | | (5.41) | |

deviation; a slightly higher income elasticity is obtained for the later subperiod. Finally, the F-ratio was used to test the equality of the slope coefficients for the two subperiods.[1] The hypothesis was accepted at the 5 percent level of significance. It appears, therefore, that no structural changes have taken place in the export demand equations for tourist services during the period covered.

A comparison of the results for the different countries reveals that they are, with a few exceptions, consistent and in close agreement. As was discussed previously, the income elasticity for Switzerland is somewhat lower than those for the other countries. The results for Greece for the last part of the period covered must be interpreted with much caution. Because of the opposition of foreign tourists to the military régime, Greece's exports of tourist services, particularly in 1967 and 1968, declined considerably, and the regional distribution of these exports was also affected significantly.

### Pooled Cross-Section and Time Series Estimates

The export demand equations were also fitted

1. The error variances for the two subperiods are practically the same.

to cross-section and time series pooled data. The pooled sample consists of 208 observations on 16 importing countries over the 1958-1970 period. For purposes of comparison, however, cross-section and time series estimates are also reported for the subperiods 1958-1964 and 1965-1970.

The pooled tourist nights equation for a particular exporting country may be written as:

$$\log XN_{jt} = \alpha + \beta \log DY_{jt} + \gamma \log PXN_{jt} + \delta \log PCXN_{jt} + \varepsilon \log N_{jt} + U_{jt} \qquad (13)$$

$$j = 1,2, \ldots N \ (N = 16)$$
$$t = 1,2, \ldots T \ (T = 13)$$

In cross-section and time series pooled data, it is assumed that the cross-section causal parameters (slope coefficients) remain constant over time. Testing for the temporal stability of the cross-section causal parameters, the F-ratio indicates that there are no differences between the corresponding slope coefficients for the cross-section equations at the 5 percent level of significance.

The pooling of cross-section and time series data necessitates additional assumptions concerning the stochastic mechanism of the disturbance term ($U_{jt}$) of the equation. The disturbance term in the pooled model is likely to in-

clude a country effect, a time effect and a joint effect (residual). Because of non-zero covariances between the disturbances of a given country at two different periods of time – $\text{Cov}(U_{jt} U_{jt'}) \neq 0$ for $t \neq t'$ — and between disturbances of two different countries at a given period of time – $\text{Cov}(U_{jt} U_{j't}) \neq 0$ for $j \neq j'$ — the variance-covariance matrix of the disturbances ($U_{jt}$) in the pooled equation is non-diagonal. Thus, the ordinary least-squares estimates, although unbiased and consistent, will not be efficient.

There are various approaches to the problem of estimating relationships when dealing with pooled cross-section and time series data. The covariance analysis technique (the least-squares with dummy variables) is commonly employed in estimating pooled relationships. To take into account the time effects and country effects, T-1 time dummies, and n-1 country dummies were introduced into the equation. The time effects did not affect the slope coefficients and did slightly improve the fit of the equation, while the country effects produced implausible results. The covariance analysis technique completely eliminates the between-country variation which accounts for the major part of the total variation in our data. In this study the variables vary significantly over country and relatively very little

over time for the same country. This can be seen by comparing the cross-section estimates based on country means to those based on both the between-country and within-country variation. The cross-section estimates based on seven-year and six-year averages for the periods 1958-1964 and 1965-1970 respectively are essentially the same as those based on cross-section and time series pooled data for the corresponding periods. The least-squares with country dummies is equivalent to taking the small deviations from country means and neglecting completely the large deviations between the country means.[1] Variations across

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1. The covariance model in the simple case of one independent variable, without the time effects, may be written as

$$Y_{jt} = a + bX_{jt} + \sum_{j=1}^{n-1} d_j D_j + U_{jt}$$

The covariance estimate of b is given by

$$\hat{b} = \frac{\sum_{t=1}^{T} \sum_{j=1}^{n} (X_{jt} - \bar{X}_{j.})\ (Y_{jt} - \bar{Y}_{j.})}{\sum_{t=1}^{T} \sum_{j=1}^{n} (X_{jt} - X_{j.})^2}$$

$$\hat{b} = \frac{\sum_{t=1}^{T} \sum_{j=1}^{n} (X_{jt}-\bar{X}..)\ (Y_{jt}-\bar{Y}..) - \sum_{t=1}^{T} \sum_{j=1}^{n} (\bar{X}_{j.}-\bar{X}..)\ (\bar{Y}_{j.}-\bar{Y}..)}{\sum_{t=1}^{T} \sum_{j=1}^{n} (X_{jt} - \bar{X}..)^2 - \sum_{t=1}^{T} \sum_{j=1}^{n} (\bar{X}_{j.} - \bar{X}..)^2}$$

Thus, the covariance model uses only the within-country variation and the between-country variation is completely neglected.

countries are much more important than variations within countries.

The error components method[1] coincides in this study with the covariance analysis technique. The rat'o ($\rho$) of the variance of the country effects ($\sigma_\mu^2$) to the variance of the disturbance term ($\sigma^2$) is close to one; while the ratio ($\omega$) of the variance of the time effects ($\sigma_\lambda^2$) to the variance of the disturbance term ($\sigma^2$) is close to zero.[2] Although research is

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1. P. Balestra and M. Nerlove, «Pooling Cross-Section and Time Series Data in the Estimation of a Dynamic Model: The Demand for Natural Gas,» *Econometrica* (July, 1960). See also T.D. Wallace and A. Houssain, «The Error Component Models in Combining Cross-Section with Time Series Data,» *Econometrica* (January, 1969); G.S. Maddala,«The Use of Variance Components Models in Pooling Cross-Section and Time Series Data,» *Econometrica* (March, 1971); and M. Nerlove, «A Note on Error Components Models,» *Econometrica* (March, 1971).

2. In the error components method, it is assumed that the disturbance term is composed of three independent random variables. That is

$$U_{jt} = \mu_j + \lambda_t + \nu_{jt}$$

Where,

$\mu_j$ are the country effects which are $N(O, \sigma_\mu^2)$

$\lambda_t$ are the time effects which are $N(O, \sigma_\lambda^2)$

$\nu_{jt}$ are the joint effects which are $N(O, \sigma_\nu^2)$

and $\text{Var}\,(U_{jt}) = \sigma^2 = \sigma_\mu^2 + \sigma_\lambda^2 + \sigma_\nu^2$

Define

$$\rho = \frac{\sigma_\mu^2}{\sigma^2} \quad \text{and} \quad \omega = \frac{\sigma_\lambda^2}{\sigma^2}$$

The ratios $\rho$ and $\omega$ were found to be close to one and zero respectively.

currently under way, we have not been able to obtain plausible results from the application of this generalized least-squares technique to our data. Finally, for any two successive cross-sections, the first-difference transformation technique suggested by Klein[1] has not produced acceptable results. This procedure also eliminates the most important variation across individual countries and coincides with the covariance analysis technique and, in this study, with the error components method.

On the other hand, the application of Zellner's[2] procedure to our data produced practically the same results as those obtained by ordinary least-squares applied to each equation separately. This is probably due to the high correlations between the independent variables for the different cross-section equations.[3] Thus, the ordinary least-squares with the time dummies whose coefficients were found significant have been used to estimate the parameters of the pooled equation.

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1. Lawrence R. Klein, *A Textbook of Econometrics, op.cit.*

2. A. Zellner, «An Efficient Method of Estimating Seemingly Unrelated Regressions and Test for Aggregate Bias,» *Journal of the American Statistical Association* (June, 1962).

3. According to Zellner, the gain in efficiency depends directly on the values of the off-diagonal elements of the variance-covariance matrix of the disturbances and inversely on the correlations between the different sets of the independent variables.

TABLE 16
AUSTRIA
TOURIST NIGHTS EQUATIONS

Pooled data (1958-1964)

$$\underset{}{\log XN} = \underset{(-2.30)}{-3.77} + \underset{(11.05)}{2.11}\ \log DY \underset{(-18.32)}{-2.60}\ \log PXN + \underset{(4.12)}{1.11}\ \log PCXN + \underset{(15.11)}{.88}\ \log N$$

$$\underset{(2.10)}{.38D_1} + \underset{(2.35)}{.43D_2} + \underset{(1.55)}{.28D_3} \qquad \bar{R}^2 = .88$$

Pooled data (1965-1970)

$$\log XN = \underset{(-3.19)}{6.82} + \underset{(9.67)}{2.44}\ \log DY \underset{(-15.73)}{-2.68}\ \log PXN + \underset{(2.79)}{1.00}\ \log PCXN + \underset{(14.36)}{.99}\ \log N \qquad \bar{R}^2 = .87$$

Pooled data (1958-1970)

$$\log XN = \underset{(-3.94)}{-5.21} + \underset{(14.46)}{2.23}\ \log DY \underset{(-23.97)}{-2.64}\ \log PXN + \underset{(4.95)}{1.07}\ \log PCXN + \underset{(20.72)}{.93}\ \log N$$

$$+ \underset{(4.20)}{.80D_1} + \underset{(4.44)}{.83D_2} + \underset{(3.65)}{.68D_3} + \underset{(2.45)}{.45D_4} + \underset{(2.57)}{.47D_5} + \underset{(1.97)}{.36D_6} \qquad \bar{R}^2 = .88$$

TABLE 16a
AUSTRIA
TOURIST ARRIVALS EQUATIONS

Pooled data (1958-1964)

$$\log XA = \underset{(-3.02)}{-6.32} + \underset{(12.26)}{2.46}\log DY \underset{(-15.97)}{-3.04}\log PXA + \underset{(5.41)}{1.88}\log PCXA + \underset{(12.38)}{.75}\log N + \underset{(2.03)}{.36}D_1 + \underset{(2.31)}{.40}D_2 + \underset{(1.66)}{.28}D_3 \qquad \bar{R}^2 = .88$$

Pooled data (1965-1970)

$$\log XA = \underset{(-3.08)}{-8.11} + \underset{(10.60)}{2.74}\log DY \underset{(-12.45)}{-3.09}\log PXA + \underset{(3.66)}{1.63}\log PCXA + \underset{(12.24)}{.86}\log N \qquad \bar{R}^2 = .86$$

Pooled data (1958-1970)

$$\log XA = \underset{(4.27)}{-7.13} + \underset{(15.79)}{2.55}\log DY \underset{(-19.79)}{-3.04}\log PXA + \underset{(6.32)}{1.76}\log PCXA + \underset{17.25)}{.80}\log N + \underset{(4.50)}{.82}D_1 + \underset{(4.76)}{.86}D_2 + \underset{(4.12)}{.73}D_3 + \underset{(2.83)}{.50}D_4 + \underset{(2.86)}{.50}D_5 + \underset{(2.42)}{.42}D_6 \qquad \bar{R}^2 = .87$$

TABLE 17
ITALY
TOURIST NIGHTS EQUATIONS

Pooled data (1958-1964)

$$\begin{aligned} \text{logXN} = & \underset{(-2.74)}{-2.90} + \underset{(15.98)}{1.97}\ \text{logDY} \underset{(-21.23)}{-2.22}\ \text{logPXN} + \underset{(6.41)}{1.01}\ \text{logPCXN} + \underset{(26.72)}{.91}\ \text{logN} \\ & + \underset{(3.65)}{.51}D_1 + \underset{(3.36)}{.47}D_2 + \underset{(2.00)}{.28}D_3 + \underset{(1.26)}{.17}D_4 + \underset{(1.28)}{.17}D_5 + \underset{(1.13)}{.15}D_6 \end{aligned}$$

$\bar{R}^2 = .93$

Pooled data (1965-1970)

$$\begin{aligned} \text{logXN} = & \underset{(2.58)}{-3.50} + \underset{(12.65)}{2.03}\ \text{logDY} \underset{(-17.89)}{-2.36}\ \text{logPXN} + \underset{(5.36)}{1.14}\ \text{logPCXN} + \underset{(21.76)}{.90}\ \text{logN} \\ & + \underset{(2.39)}{.28}D_8 + \underset{(2.28)}{.27}D_9 \end{aligned}$$

$\bar{R}^2 = .91$

Pooled data (1958-1970)

$$\begin{aligned} \text{logXN} = & \underset{(-4.00)}{-3.33} + \underset{(20.49)}{2.00}\ \text{logDY} \underset{(-27.93)}{-2.28}\ \text{logPXN} + \underset{(8.39)}{1.06}\ \text{logPCXN} + \underset{(34.65)}{.91}\ \text{logN} \\ & + \underset{(7.25)}{.87}D_1 + \underset{(6.94)}{.82}D_2 + \underset{(5.35)}{.62}D_3 + \underset{(4.49)}{.51}D_4 + \underset{(4.53)}{.51}D_5 + \underset{(4.37)}{-.49}D_6 + \underset{(3.01)}{.33}D_7 \\ & + \underset{(2.47)}{.27}D_8 + \underset{(2.37)}{.26}D_9 \end{aligned}$$

$\bar{R}^2 = .92$

TABLE 17a
ITALY
TOURIST ARRIVALS EQUATIONS

Pooled data (1958-1964)

$$\log XA = \underset{(-3.15)}{-3.71} + \underset{(17.74)}{2.24}\ \log DY \underset{(-20.63)}{-2.66}\ \log PXA + \underset{(8.22)}{1.47}\ \log PCXA + \underset{(27.30)}{.82}\ \log N + \underset{(4.27)}{.50}D_1 + \underset{(3.95)}{.47}D_2 + \underset{(2.32)}{.27}D_3 + \underset{(1.39)}{.16}D_4 + \underset{(1.60)}{.19}D_5 + \underset{(1.49)}{.17}D_6 \qquad \bar{R}^2 = .94$$

Pooled data (1965-1970)

$$\log XA = \underset{(-2.57)}{-3.57} + \underset{(14.70)}{2.24}\ \log DY \underset{(-17.69)}{-2.83}\ \log PXA + \underset{(7.28)}{1.54}\ \log PCXA + \underset{(24.14)}{.82}\ \log N + \underset{(3.56)}{.34}D_8 + \underset{(3.17)}{.30}D_9 \qquad \bar{R}^2 = .94$$

Pooled data (1958-1970)

$$\log XA = \underset{(-4.36)}{-3.90} + \underset{(23.24)}{2.24}\ \log DY \underset{(-27.35)}{-2.73}\ \log PXA + \underset{(11.04)}{1.50}\ \log PCXA + \underset{(36.71)}{.82}\ \log N + \underset{(9.34)}{.93}D_1 + \underset{(9.01)}{.88}D_2 + \underset{(7.12)}{.69}D_3 + \underset{(6.06)}{.58}D_4 + \underset{(6.37)}{.60}D_5 + \underset{(6.27)}{.59}D_6 + \underset{(4.47)}{.42}D_7 + \underset{(3.63)}{.33}D_8 + \underset{(3.24)}{.30}D_9 \qquad \bar{R}^2 = .94$$

TABLE 18
GREECE
TOURIST ARRIVALS EQUATIONS

Pooled data (1958-1964)

$$\begin{aligned} \log XA = {} & \underset{(-3.93)}{-3.72} + \underset{(28.95)}{2.65}\log DY \underset{(-20.95)}{-3.08}\log PXA + \underset{(5.62)}{1.10}\log PCXA + \underset{(27.48)}{.80}\log N \\ & \underset{(-2.51)}{-.20D_1} + \underset{(2.32)}{.18D_6} \end{aligned}$$

$\bar{R}^2 = .97$

Pooled data (1965-1970)

$$\begin{aligned} \log XA = {} & \underset{(-5.17)}{-9.61} + \underset{(15.21)}{2.63}\log DY \underset{(-9.20)}{-2.50}\log PXA + \underset{(4.27)}{1.83}\log PCXA + \underset{(12.74)}{.66}\log N \\ & \underset{(-.89)}{-.11D_{10}} \underset{(-4.04)}{-.50D_{11}} \underset{(-3.09)}{-.39D_{12}} \end{aligned}$$

$\bar{R}^2 = .90$

Pooled data (1958-1970)

$$\begin{aligned} \log XA = {} & \underset{(-6.62)}{-6.44} + \underset{(29.47)}{2.60}\log DY \underset{(-19.39)}{-2.74}\log PXA + \underset{(6.41)}{1.35}\log PCXA + \underset{(25.85)}{.74}\log N \\ & + \underset{(2.55)}{.25D_4} + \underset{(3.38)}{.33D_5} + \underset{(4.51)}{.44D_6} + \underset{(2.43)}{.23D_7} + \underset{(3.25)}{.32D_8} + \underset{(3.60)}{.35D_9} \\ & \underset{(-3.00)}{-.29} \end{aligned}$$

$\bar{R}^2 = .94$

TABLE 19
SPAIN
TOURIST ARRIVALS EQUATIONS

Pooled data (1960-1965)

$$\log XA = \underset{(3.81)}{5.21} + \underset{(11.33)}{2.12}\log DY \underset{(-20.07)}{-2.84}\log PXA + \underset{(18.37)}{.81}\log N \qquad \bar{R}^2 = .93$$

Pooled data (1966-1970)

$$\log XA = \underset{(3.02)}{5.54} + \underset{(7.95)}{2.05}\log DY \underset{(-16.36)}{-2.73}\log PXA + \underset{(13.34)}{.74}\log N \qquad \bar{R}^2 = .90$$

Pooled data (1960-1970)

$$\log XA = \underset{(5.06)}{5.81} + \underset{(12.69)}{1.91}\log DY \underset{(-25.13)}{-2.67}\log PXA + \underset{(22.04)}{.79}\log N \qquad \bar{R}^2 = .91$$

TABLE 20
SWITZERLAND
TOURIST NIGHTS EQUATIONS

Pooled data (1958-1964)

$$\begin{aligned} \log XN = {} & \underset{(1.62)}{1.31} + \underset{(12.03)}{1.15}\,\log DY \underset{(-28.44)}{-1.83}\,\log PXN + \underset{(3.40)}{.43}\,\log PCXN + \underset{(34.96)}{1.03}\,\log N \\ & + \underset{(2.39)}{.22}D_1 + \underset{(2.63)}{.25}D_2 + \underset{(1.96)}{.18}D_3 + \underset{(1.45)}{.13}D_4 \end{aligned}$$

$\bar{R}^2 = .96$

Pooled data (1965-1970)

$$\log XN = \underset{(-1.47)}{1.62} + \underset{(11.01)}{1.49}\,\log DY \underset{(-21.69)}{-1.89}\,\log PXN + \underset{(3.64)}{.64}\,\log PCXN + \underset{(27.56)}{.99}\,\log N$$

$\bar{R}^2 = .95$

Pooled data (1958-1970)

$$\begin{aligned} \log XN = {} & \underset{(-.05)}{-.03} + \underset{(16.19)}{1.29}\,\log DY \underset{(-35.31)}{-1.85}\,\log PXN + \underset{(4.90)}{.51}\,\log PCXN + \underset{(44.17)}{1.01}\,\log N \\ & + \underset{(5.39)}{.52}D_1 + \underset{(5.66)}{.54}D_2 + \underset{(5.01)}{.47}D_3 + \underset{(4.50)}{.42}D_4 + \underset{(4.04)}{.37}D_5 + \underset{(2.78)}{.26}D_6 \\ & + \underset{(2.27)}{.21}D_7 \end{aligned}$$

$\bar{R}^2 = .96$

TABLE 20a
SWITZERLAND
TOURIST ARRIVALS EQUATIONS

Pooled data (1958-1964)

$$\begin{aligned} \log XA = {} & -.25 + 1.36\ \log DY - 2.29\ \log PXA + 1.13\ \log PCXA + .97\ \log N \\ & (-.21)\quad (12.22)\quad (-23.38)\quad (5.82)\quad (29.92) \\ & + .18D_1 + .22D_2 + .15D_3 + .10D_4 \\ & (2.03)\quad (2.42)\quad (1.74)\quad (1.20) \end{aligned}$$

$\bar{R}^2 = .96$

Pooled data (1965-1970)

$$\begin{aligned} \log XA = {} & -2.55 + 1.60\ \log DY - 2.35\ \log PXA + 1.25\ \log PCXA + .96\ \log N \\ & (-1.62)\quad (10.35)\quad (-16.48)\quad (4.67)\quad (25.00) \end{aligned}$$

$\bar{R}^2 = .95$

Pooled data (1958-1970)

$$\begin{aligned} \log XA = {} & -1.32 + 1.45\ \log DY - 2.31\ \log PXA + 1.17\ \log PCXA + .96\ \log N \\ & (-1.39)\quad (15.96)\quad (-28.25)\quad (7.39)\quad (38.94) \\ & + .46D_1 + .50D_2 + .43D_3 + .38D_4 + .35D_5 + .24D_6 \\ & (4.96)\quad (5.36)\quad (4.72)\quad (4.19)\quad (3.93)\quad (2.70) \\ & + .20D_7 \\ & (2.32) \end{aligned}$$

$\bar{R}^2 = .96$

$$\log XN_{jt} = \alpha + \beta \log DY_{jt} + \gamma \log PXN_{jt} + \delta \log PCXN_{jt} + \varepsilon \log N_{jt} + \sum_{t=1}^{T-1} d_t D_t + U_{jt} \qquad (14)$$

The estimates based on cross-section and time series pooled data are presented in Tables 16 through 20, for each of the five countries and for both the tourist nights and tourist arrivals equations.

The comparison of the pooled cross-section and time series estimates and the single period cross-section estimates reveals that the estimated elasticities of the former are just equal to the corresponding elasticities of the latter. However, a striking difference exists between the efficiencies of the results. As was expected, the relative efficiencies of the pooled estimators, measured in terms of the ratio of the variances, have increased considerably. The ratio of the variance of the pooled estimator to the variance of the single-period cross-section estimator is about 1/16. Since the reliability of an unbiased estimate is inversely related to the sample size (number of degrees of freedom), the pooled estimates become more reliable as the number of observations increases.

Finally, it can be seen from these tables (16-20) that the growth of international tourism slowed down during the 1964-1970 subperiod. The intercept in the pooled equation corre-

sponds to the 1970 level. In most cases, the coefficients of the dummy variables are positive for the 1958-1964 period and negative or zero for the 1964-1970 period.

# IV. SUMMARY AND CONCLUSIONS

The main findings of this study may be summarized as follows:

(i) The empirical results confirm our *a priori* expectations. The estimated parameters are highly significant and they remain stable over time.

(ii) Exports of tourist services are highly elastic with respect to the income levels of the importing countries. The income elasticity of foreign demand for tourist services could be placed in the neighbourhood of 2.5, and, therefore, as real disposable income increases, consumer demand shifts towards imported tourist services. This suggests one reason why international tourism has emerged as one of the most dynamic export industries.

(iii) An estimated price elasticity, ranging from –2.5 to –3.0, indicates that international tourism is very sensitive to relative price changes. However, since transportation cost constitutes a major part of the c.i.f. export price, tourist-exporting countries in determining price policies towards the promotion of tourist exports must realize that the effects of these

price policies depend on the geographical position of the country relative to the main tourist-generating countries.

(iv) The elasticity of demand for international tourism with respect to transportation cost was found to range from –1.5 to –2.0. This implies that reductions in air fares will benefit not only the tourist-exporting countries but the airline industry as well. Air fare reductions have substantially contributed to the expansion of international tourism during the sixties and early seventies.

(v) Although further research is needed, the results of this study indicate that exports of tourist services do not face very great price competition in the world tourist market.

(vi) Other things being equal, the smaller nations are expected to have a higher propensity to import tourist services than the larger nations.

(vii) The important rôle of international tourism to the economies of many countries and its very significant contribution to their balance of payments call for much more economic research for that neglected industry. In view of the limitations of data concerning tourism, efforts should be made to improve the statistical data that are indispensable to researchers and policy-makers.

(viii) Rising incomes, population increases, reductions in transportation cost, improvements in transportation and communications, longer paid vacations, and expansion in education are expected to continue to produce high rates of growth in international tourism.

# APPENDIX

# SOURCES OF DATA

## Tourist Nights ($XN_{ij}$) and Tourist Arrivals ($XA_{ij}$)

Data on the number of nights spent by foreign tourists of country j in country i and the number of foreign tourist arrivals by country of nationality for each of the five exporting countries, for each of the export-competing countries and for each year of the period covered (1958-1970) were obtained from the *Tourism in O.E.C.D. Member Countries* (various issues), published by the Organization for Economic Cooperation and Development (O.E.C.D.), and the *International Travel Statistics* (various issues), published by the International Union of Official Travel Organizations (I.U.O.T.O.). Data on the regional distribution of international travel between the United States and Canada by origin and destination were taken from the *Travel Between Canada and Other Countries*, published by the Dominion Bureau of Statistics (Canada).

## Disposable Personal Incomes ($DI_j$) and Consumer Price Indices ($CPI_j$)

Data on disposable incomes and consumer prices of the importing countries were taken from the *National Accounts Statistics* (various issues), published by the Organization for Economic Cooperation and Development (O.E.C.D.), and the United Nations' *Yearbook of National Accounts Statistics.*

## International Tourist Receipts and Expenditures

Data on international tourist receipts and expenditures for each country during the 1958-1970 period were obtained from the O.E.C.D. publication *Tourism in the O.E.C.D. Member Countries* (various issues).

## Transportation Cost ($TC_{ij}$)

The round-trip economy air fares between the population centers of the countries were taken from the *Official Airline Guide: International Edition* (July issues, 1958-1970), published by the Reuben H. Donnelley Corporation (Oak Brook, Illinois). Data on international passenger revenue of the U.S. scheduled airlines

and the revenue passenger miles were taken from the *Air Transport* (various issues), published by the Air Transport Association of America (Washington, D.C.).

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