

*Manpower Structure and Needs of
Tourism in Puerto Rico:
An Input-Output Approach*

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Introduction

From fiscal year 1970 to 1979 tourist expenditures in Puerto Rico increased from \$280.2 millions to \$345.8 millions, at 1972 prices (an increase of 3.1 percent per year). During 1979 demand for hotel services amounted to \$134.8 millions. The increase in tourist demand induced output changes (intermediate plus final demand) in a large number of industries (including hotels). For instance, during 1979, tourist expenditures (after adjusting for imports content) amounted to \$313.5 (at 1972 prices). These expenditures generated \$428.1 millions of output in the system. To produce this output it was necessary to hire about 32,000 workers or 75 employees per million dollars of output. Likewise, to deliver the \$134.8 millions of expenditures in hotels services, it was necessary for this industry to produce \$140.9 millions which required about 8,382 workers in the own hotel industry and about 1,376 in the rest of the system.¹ Direct requirements amounts to 59 workers per million dollar of output. The employment created by tourist activity amounted to 4 percent of total employment of the economy during 1979 (807,000) and about 8 percent of employment in private services. The purposes of this chapter are various. First, the direct and total (direct plus indirect) employment requirements will be estimated. Second, employment

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1. According to multiplier analysis of Chapter 2, total employment requirements (direct, indirect and induced) amounted to 15,758 workers during Fiscal Year 1979. See also P.R. Planning Board, Informe-Económico al Gobernador (Fiscal year 1978).

impact of tourist expenditures by industrial sector will be estimated. Third, employment will be divided by occupations using a manpower matrix. This latter will be at the same time divided into male and female employment. Finally, some projections of manpower needs for 1985 will be offered. These latter are based on four different scenarios of growth rates- in gross domestic product. The above-mentioned estimates will offer the policymaker various methodological tools necessary in manpower planning.

II. Methodology and Source of Data

A. Final Demand, Output and Employment Coefficients for Fiscal Years 1977 and 1979

As explained elsewhere, the latest input-output accounting data are those of fiscal year 1972. However, we have annual data on employment by industrial sector and value added. In some cases we do have data on output on annual basis, for instance, agricultural production and new construction. In other cases, it was not difficult to estimate output for 1979. At any rate, the most important and latest available source of data is the I.O. Table of 1972. From this latter, we obtained final demand vector, which includes tourist expenditures vector as one of its components. Employment figures on annual basis are published in Puerto Rico Planning Board, Informes Económicos al Gobernador and P.R. Department of Labor, Census of Manufacturing Industries (published annually in October). To make more realistic estimates of employment impact of final demand for hotel's services and tourist expenditures in general we used (when availability of data allowed us to do so) the more up-to-date employment coefficients (all derived using output data at 1972 prices). In some isolated cases

(like hotels, agriculture, and construction), we estimated coefficients for fiscal year 1979, but in most cases we used 1977 data. To obtain how much employment per million dollar of output (intermediate plus final sales) was necessary in the hotel industry, historical figures of employment were divided by an estimate of output for fiscal year 1979. Employment for this year amounted to 8,382 workers. In order to obtain the output of the hotel industry, we first took historical figures of total tourist expenditures (published annually) and adjusted it for important content and prices (1972 was used as a base period). The price index used was that of “expenditures of non-residents in Puerto Rico”. The second step was to obtain the proportion that constitutes hotel's final demand in total tourist expenditures vector. This historical proportion of 1972 was applied to tourist expenditures in 1979 to get hotels final demand. Once we obtained tourist expenditures and hotel final demand vectors² both were then multiplied by the Leontief's inverse matrix to obtain output vectors as solution to the model. To obtain employment impacts direct employment coefficients have to be estimated.

Since 1979 figures for output are estimates of the author, labor coefficients for this year are not the official figures. Therefore, the policy maker can make use of 1972 figures as the official ones until 1977 Input Output table is published.

The direct employment requirements of the hotel industry were estimated by using the above-mentioned output estimates together with employment figures published in Puerto Rico Planning Board, Informe Económico al Gobernador (Fiscal Year 1979). According to the above-mentioned estimates, the ratio of tourist expenditures to final demand for hotel

2. The hotel's final demand vector is made up of dollar figures for hotel's demand and zeros in the remaining sectors.

services is 2.3261. In other words, out of every dollar of tourist expenditures (net of imports), 43 cents are allocated to hotels. The ratio of final demand for hotels services to its output is 1.0450. Direct employment in hotels for fiscal year 1979 amounted to 8,382 workers and the estimated output was \$140.9 millions. Therefore, the direct employment coefficient (employment per million dollars of output) was 59.5 man-years³ (monetary figures were expressed in 1972 prices).

To estimate the employment impact of tourist expenditures, it was necessary to calculate the direct employment coefficients of all the industrial sectors selling output to tourist (according to the vector of tourist expenditures (In the year 1972 updated to 1979). Since we did not have output figures on annual basis, the 1972 I-O table was updated to 1977 using RAS Method.⁴ The Output vector of this matrix (at 1972 prices) was used as denominator to derive men-per million dollars of output. Employment figures were taken from P.R. Department of Labor Census of Manufacturing Industries of Puerto Rico (October 1977). Once the employment coefficients were estimated, they were multiplied by the output vector derived from the solution to the I-O model (using as final demand the tourist expenditures vector) to obtain employment flows generated by tourist expenditures and hotel demand. In mathematical terms:

$$(I-A)^{-1} F = X \quad (1)$$

$$X(N) = E \quad (2)$$

3. The figure of 8,382 workers are direct-employment requirements of the industry it does not include the indirect requirements generated in the system per million dollars of final demand for hotel's services.

4. It was not possible to up-date matrix to 1979 due to lack of data for this year. When data for 1979 allowed us to estimate the employment coefficients, then we used 1979 figures (i.e., hotels). For RAS Method see Stone, Bates and Bacharach: 1963.

Where:

X is equal to the Vector of Output

F is equal to Tourist Expenditures for Fiscal Year 1979 (at 1972 prices)

$(I-h)^{-1}$ is equal to 1972 Leontief's Inverse

N is equal to employment by industrial sector divided by Output (or direct employment coefficients).

E is equal to employment.

Direct and indirect employment requirements were estimated by premultiplying the vector of direct employment coefficients by the inverse matrix. In other words, we estimated employment coefficients by industrial sectors (including hotels) and the resulting vector was then multiplied by the I-O inverse matrix to obtain direct plus indirect employment requirements.

In addition to the direct plus indirect employment creation of tourist expenditures and demand for hotel services, there is also some employment creation induced by consumption. This latter can be estimated by augmenting the I-O matrix by an additional sector (households). The results will not only reflect direct plus indirect employment creation, but also employment created by additional consumption.

Employment requirements by occupations (manpower matrix) were obtained by using the latest available manpower flows matrix (for fiscal year 1975)⁵. The manpower flows

5. Manpower flows matrix was estimated by Mr. Benjamin Batista, Economist of Puerto Rico Planning Board. The direct coefficient and total manpower coefficient matrices were estimated by this author.

matrix was converted to a direct coefficients manpower matrix by dividing the employment by occupation of each industry by its corresponding output. The direct plus indirect manpower matrix was obtained by pre-multiplying direct coefficient matrix by I-O inverse.

Female employment and coefficients were estimated by using the proportion obtained from the U.S. Department of Commerce, Census of Population for the year 1970 (Detailed Statistics Part).

The data on employment by occupation for the year 1979 were estimated by using the proportions of 1975 manpower together with historical figures on employment.

In Part III we also show statistics on hotels derived from the latest available Census of Business published by the U.S. Department of Commerce in 1972. These are related to employment per million dollars of receipts when hotels are classified by employment size and receipt size.

Also shown same projections of tourist expenditures and hotel's final demand based on alternative rates of growth of gross domestic product (at 1972 prices). The following procedure was used: First G.D.P. was extrapolated to 1985 (after being deflated or expressed in 1972 prices). Since in input-output accounting GDP is equal to final demand minus imports, we distributed the totals by a final demand vector of proportions taken from 1972 I-O table. The Leontief's model was solved to obtain output. To obtain employment impact it was necessary to estimate domestic final demand. This latter was estimated as a proportion of total final (equals GDP) and distributed according to 1972 vector of weights estimated from the domestic final demand of the same year. Using our estimated labor coefficients, we obtained employment figures for year 1985.

B. The Mathematical Model

The following are the equations used in our estimates:

$$N' = E'/X \quad (1)$$

Where:

N' is equal to men per million dollars of output (direct employment coefficients) by industrial sector

E' is employment by industrial sector and X is equal to output (defined as intermediate plus final demand).

$$X_t = (I-A)^{-1} F_t \quad (2)$$

$$X_n = (I-A)^{-1} F_n \quad (3)$$

Where:

$(I-A)^{-1}$ is Leontief's inverse matrix (or direct plus indirect requirements matrix of the input-output system)

F_t = vector of tourist expenditures for the year 1979 (expressed in 1972 prices) F_n = vector of final demand for hotel services X_t, X_n are equal to output generated by tourist expenditures and hotel's demand, respectively.

$$X_t (N') = E_t' \quad (4)$$

$$X_n (N') = E_n' \quad (5)$$

Where F_t, E_n are employment flows generated by tourist expenditures and hotel's final demand, respectively.

$$N'(I-A)^{-1} = L' \quad (6)$$

Where L' are direct plus indirect employment requirements.

$$\bar{N}' (I-\bar{A}) = \bar{L} \quad (7)$$

Where:

\bar{N}' is a vector of direct employment coefficients

When household sector is added to I-O matrix as an additional endogenous sector.

$(I-\bar{A})^{-1}$ is the augmented I-O matrix

\bar{L}' = Vector of direct, indirect, plus induced employment requirements

$$N = E/X \quad (8)$$

$$N(I-A)^{-1} = L \quad (9)$$

$$N(X) = E \quad (10)$$

Where:

N is the manpower matrix of direct requirements

E = manpower flows matrix

L = Direct plus Indirect manpower requirements matrix

X and $(I-A)^{-1}$ are defined as above.

(Manpower matrices can be divided into male and female employment and coefficients.)

III. Analysis of the Results

A. Hotel Industry

Tables 1 and 2 show tourist expenditures, output generated by these expenditures, hotel final demand generated by tourists, and an estimate of output for the hotel industry (output equals intermediate plus final sales). We are also including in table 1 the price index used to deflate the current price data and tourist expenditures adjusted for import content.

Table 1
 Tourist Expenditures and Output Generated, Puerto Rico Fiscal Year 1969-1979
 (in million dollars)

	Expenditures in Current Prices	Price Index (1972=100)	Expenditures at Constant Prices	Tourist Expenditures Net of Imports	Output Generated
1969	\$234.0	83.5%	\$280.2	\$254.0	346.8
1970	235.4	89.6	262.7	238.2	325.3
1971	234.7	95.1	246.8	223.7	305.5
1972	258.9	100.0	258.9	234.7	320.5
1973	317.3	104.4	303.9	275.5	376.2
1974	360.3	120.7	298.5	270.6	369.5
1975	375.0	138.4	270.9	245.6	335.4
1976	392.5	145.0	270.7	245.4	335.1
1977	423.9	148.0	286.4	259.6	354.5
1978	481.9	155.4	310.1	281.1	383.9
1979	565.0	163.4	345.8	313.5	428.1

Source: Puerto Rico Planning Board, Informe Económico al Gobernador, 1979 and estimates of the author.

Table 2
 Tourist Expenditures Demand Induced by Tourist Expenditures and Output of the Hotel Industry,
 Puerto Rico Fiscal Year 1969-1979 (in million dollars, 1972=100)

	Tourist Expenditures (Net of Imports)	Demand for Hotel Services	Hotel Industry Output
1969	254.0	109.2	114.1
1970	238.2	102.4	107.0
1971	223.7	96.2	100.5
1972	234.7	100.9	105.4
1973	275.7	118.5	123.8
1974	270.6	116.3	121.5
1975	245.6	105.6	110.3
1976	245.4	105.5	110.2
1977	259.6	111.6	116.6
1978	281.1	120.8	126.2
1979	313.5	134.8	140.9

Source: Estimates of the author. Tourist expenditures figures are based on current price data published by Puerto Rico Planning Board.

A glance at these tables will straw the following points:

1. For every million dollars of tourist expenditures, the demand for hotel services increases by \$429,911 (a ratio of 2.33 to one of tourist expenditures over demand for hotel services).
2. Every million dollars of tourist expenditures induces an increase of \$1.24 million in the output of the industrial sectors of the economy.
3. Hotel output its about equal to final demand, since this industry is more oriented toward satisfying final demand than intermediate demand.

Table 3 presents time series data on employment, output estimates (except for 1972 when the output figures is taken from the I-O table)and direct employment coefficients. Since the official output figure is that of Fiscal Year 1972 (the remainder years are estimates), the policy makers have the option of using this year coefficient as the official one (80.01 men per million dollars of output). However, since output estimates are quite realistic, the 1979 data should be given serious thought in the planning process. We can observe from this table that while in 1972 eighty-eight men year were needed to deliver one million dollars of output by 1979 this figure was only 59, implying a considerable increase in productivity. In other words, partial labor productivity (output per man) in the hotel industry has increased from \$11,362.39 to \$16,809.83 from 1972 to 1979 (an increase of 47.9 percent).

However, direct employment requirements, as reflected in the direct employment coefficients, do not offer a complete picture of employment creation by the industry since to satisfy final demand hotels purchase intermediate inputs from other sectors and pay wages and salaries to the workers. Therefore, demand for workers increase in the whole system (there will be not only direct effects, but also indirect and-induced). In order to obtain indirect and induced creation of jobs, the direct coefficient has to be multiplied by

employment multipliers Type I and II. Table 4 illustrates direct employment requirements and jobs creation in the system in response to hotel output and final demand.

Table 3
Direct Employment Coefficients of the Hotel Industry 1972 to 1979
(Output in 1972 Prices)

	Employments	Output (in million dollars)	Direct Coefficient
1972	9,280	\$105.4	88.01
1973	10,140	123.8	81.91
1974	10,090	121.5	83.05
1975	9,100	110.3	82.50
1976	7,330	110.2	66.52
1977	7,784	116.6	66.76
1978	7,777	126.2	61.62
1979	8,382	140.9	59.49

Source: For employment see P.R. Planning Board Informe Económico al Gobernador 1979. Output (except for 1972) Figures and direct employment coefficients are estimates of the author.

Table 4
Employment Requirements and Employment Generated by Hotel Industry, Fiscal Years 1972-1979
(Employment Generation Estimates Based in the 1972 Input-Output Tables and Employment Coefficients)

	Direct Employment Requirements ¹	Direct Plus Indirect Requirements ²	Direct Indirect Requirements ³
1972	9,280	11,136	17,446
1973	10,140	12,168	19,063
1974	10,090	12,108	18,969
1975	9,100	10,920	17,108
1976	7,330	8,796	13,780
1977	7,784	9,340	14,634
1978	7,777	9,332	14,621
1979	8,382	10,058	15,758

¹ Employment in the Hotel industry only.

² Direct plus indirect employment generated in the system (including Hotels).

³ Direct, indirect plus induced employment generated in the system (including hotels).

Table 5 shows how the direct and indirect employment creation for fiscal year 1979 is distributed by main industrial sector including hotels. Most of the employment generated is in the service sectors, including hotels (9,033 out of 10,058).

Table 5

Output and Employment by Main Industrial Sector Generated by Final Demand of Hotel Services During Fiscal Year 1979 (output in million dollars, 1972=100)

Industrial Sector	Output	Direct Plus Indirect Employment
Agriculture, Mining and Construction	5.71	416
Manufacturing	11.06	204
Transportation, Communications and Public Utilities	13.73	405
Services and Government	150.10	9,033
Hotels	140.90	8,382
Other Services	9.2	651
Total	180.6	10,058

Source: Estimates of the author

The structure of hotel employment (employment by main occupational group) can be determined by using manpower matrices. Table 6 illustrates hotel employment by major occupational group. We immediately observe that 69.9 percent of jobs are held by service workers, 9.7% by clerical and kindred workers and 8.1 percent by managers and administrators.

Table 6

Hotel Employment by Major Occupational Group
Fiscal Year 1979 (1972=100)

Occupation	Number	Percentage of Total
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Professional, Technical and Kindred Workers	300	3.6
Managers and Administrators	680	8.1
Sales Workers	21	0.3
Clerical and Kindred Workers	811	9.7
Craftsmen and Kindred Workers	274	3.3
Operatives	295	3.5
Services Workers	5,855	69.9
Laborers	146	1.7
Total	8,382	100.0

Source: Puerto Rico Planning Board, Informe Económico

Table 7 shows the direct plus indirect employment requirements generated by hotel final demand in the economic system. These were derived (as it was explained in the methodological part) by using the manpower matrix together with the input-output inverse (the data was adjusted to figures of fiscal year 1979).

Table 8 shows how the share of each of the 8 major occupational group has been changing since 1963. We immediately observe that the share of service workers has increased from 59.2 percent in 1963 to 69.9 percent in 1979. The share of managers, clerical markers sales, workers and operative has decreased while the one for professionals has increased during the same period.

Table 7

Direct Plus Indirect Employment Requirements Generated by Hotels Final Demand by Major Occupational Group, Fiscal Year 1979 (1972=100)

Occupation	Number	Percentage of Total
Professional, Technical and Kindred Workers	460	4.6
Managers and Administrators	839	8.3
Sales Workers	84	0.8
Clerical and Kindred Workers	1,010	10.0
Craftsmen and Kindred Workers	529	5.3
Operatives	459	4.6
Services Workers	6,408	63.7
Laborers	269	2.7
Total	10,058	100.0

Sources: Puerto Rico Planning Board Manpower Matrix and Input-Output Table of 1972 (data adjusted to 1979 figures)

Table 8

Share of Each Major Occupational Group in Total Employment of
Hotel Industry in Puerto Rico Fiscal Year 1963, 1972 and 1979

Occupational Group	1963	1972	1979
Professional, Technical and Kindred Workers	3.0	4.5	3.6
Managers and Administrators	10.4	6.7	8.1
Sales Workers	0.9	0.3	0.3
Clerical and Kindred Workers	11.2	13.3	9.7
Craftsmen and Kindred Workers	3.9	4.1	3.3
Operatives	6.1	4.0	3.5
Services Workers	59.2	65.1	69.9
Laborers	3.6	1.9	1.7
Total	100.0	100.0	100.0

Using manpower matrices derived from the Census of Population of 1960 and 1970 and adjusting the data by 1963 and 1972 employment totals, we can estimate direct and indirect employment requirements of the hotel industry by sex. Table 9 shows the occupational structure of the industry by sex for fiscal year 1963 and 1972. A glance at this table shows that while in 1963 female employment amounted 30.4 percent of total in 1972, this share has been reduced to only 22.6 percent. The lost was mainly due to the decrease in the share of female managers and administrators and service female workers. It seems that men have been displacing women as administrators and managers during the period. Table 10 shows the share of each major occupational group of female employment from 1963 to 1972.

Table 9

Change in the Occupational Structure of the Hotel Industry by Sex, Puerto Rico, 1963 to 1972

Fiscal Year 1963				Fiscal Year 1972			
Males	Females	Total	Females as % Total	Males	Females	Total	Females as % Total

Professional, Technical and Kindred Workers	130	50	180	27.8	360	53	413	12.8
Managers and Administrators	245	380	625	60.8	537	89	626	14.2
Sales Workers	45	10	55	18.2	4	28	32	87.5
Clerical and Kindred Workers	380	290	670	43.3	722	514	1,236	41.6
Craftsmen and Kindred Workers	320	15	235	4.5	371	14	385	3.6
Operatives	225	140	365	38.4	235	132	367	36.0
Services Workers	2,621	935	3,556	26.3	4,781	1,264	6,045	20.9
Laborers	211	6	217	2.8	176	0	176	0
Total	4,177	1,825	6,003	30.4	7,186	2,094	9,280	22.6

Source: Puerto Rico Planning Board and proportions taken from 1960 and 1970, Census of Population (Detailed Statistics) published by the U.S. Department of Commerce.

Table 10

Share of Each Major Occupational Group of Female Employment in Total Employment Fiscal Years 1963 and 1972

Occupational Group	1963	1972
Professional, Technical and Kindred Workers	0.8	0.6
Managers and Administrators	6.3	1.0
Sales Workers	0.2	0.3
Clerical and Kindred Workers	4.8	5.5
Craftsmen and Kindred Workers	0.2	0.2
Operatives	2.3	1.4
Services Workers	15.6	13.6
Laborers	0.1	0
Total	30.3	22.6

Source: Estimates of the author

Using Census of Business data published by the U.S. Department of Commerce we can get an idea of the employment in hotels classified by receipt size and employment size. Table 11 shows paid employees, payroll and receipts in hotels classified by receipt size while table 12 shows employment per million dollars of receipt of hotels classified by employment size. An analysis of table 11 shows that during 1972 (year of the latest Census of Business) there were 224 hotel establishments located in Puerto Rico. Most of them were located in the receipt size categories of \$10,000 to \$249,000. However, the 18 hotel establishments in the

category of \$100,000 or more received 82.7 percent of receipts, hired 78.5 percent of the workers and paid 87.1 percent of wages.

Table 11

Paid Employees, Payroll and Receipts in Hotels Establishments in Puerto Rico Classified by Receipts Size, Calendar Year 1972

Receipts Size	No.	Receipts (in 000\$)	Payroll (in 000 \$)	Paid Employees	% of Paid Employees in each Category
Less than \$ 5,000	6	21	7	5	0.05
5,000 - 9,000	7	56	13	10	0.11
10,000 - 24,000	42	727	193	99	1.04
25,000 - 49,000	41	1,492	362	175	1.84
50,000 - 99,000	41	3,001	916	302	3.17
100,000 - 249,000	52	8,196	2,528	659	6.92
250,000 - 499,000	11	3,922	1,345	400	4.20
500,000 - 999,000	6	4,939	1,491	396	4.16
1,000,000 or more	18	106,920	46,445	7,472	78.50
Total	224	129,274	53,300	9,518	100.00

Source: U.S. Department of Commerce, Census of Business, Puerto Rico 1972

Table 12 shows that the hotel establishment in the category of 50 employees or more generate 55 percent of receipts and hire 82.9 percent of paid employees.

Table 12

Employment per Million Dollars of Receipts of Hotels Classified by Employment Size Puerto Rico Calendar Year 1972

Employment Size	Numbers of Establishments	Paid Employees	Receipts (in 000 \$)	Paid Employees per million dollars of Receipts
1	38	n/a	n/a	n/a
2	18	42	568	73.94
3	21	63	798	78.95
4-7	41	221	2,649	83.43
8-9	17	143	1,436	99.58
10-19	45	581	6,767	85.86
20-49	18	572	6,961	82.17
50 or more	22	7,858	106,676	73.66

Source: U.S. Department of Commerce, Census of Business 1972

B. Impact of Tourist Expenditures

As it was explained in the methodological part, the impacts of tourist expenditures on output and employment for the whole economy and sector by sector were obtained using "open" and "closed" Leontief Input-Output models. First, we obtained total tourist expenditures for the latest year available (1979) and distributed them to form a vector, using as proportion weights derived from the latest I-O table (that of 1972) tourist expenditure vector. After expressing them in 1972 prices, they were post-multiplied by the Leontief's inverse to get the solution to model or output vector. This latter vector was then multiplied by direct labor requirements to obtain employment figures. Table 13 shows tourist expenditures for fiscal year 1979, employment coefficients, output generated, and employment created using a Leontief Open I-O model. The following major findings can be derived from the table:

Table 13

Output and Employment Generated By 313.5 Million dollars of Tourist Expenditures Puerto Rico,
Fiscal Year 1979 (million dollars at 1972 prices)

Industrial Sector	Tourist Final Expenditures	Output Generated	Employment Coefficients ¹	Employment Generated
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Sugar Cane	0.00	0.81	185.07	150
Other Agriculture	1.07	5.11	90.35	462
Mining	0.00	0.23	58.83	14
Construction	0.00	8.59	71.24	612
Dairy Products	3.11	3.48	27.00	94
Bakery Products	1.10	1.63	50.90	83
Sugar Refining	1.23	2.21	30.16	67
Malt Beverages	2.96	4.76	13.95	66
Alcoholic Beverages	2.69	4.41	4.19	18
Soft Drinks	1.22	3.83	10.59	41
Other Food	8.29	11.26	24.77	279
Tobacco Products	1.08	1.86	18.18	34
Apparel and Textiles	0.00	1.16	67.27	78
Furniture and wood	0.00	0.46	57.00	26
Paper Products	0.00	0.70	43.00	30
Printing and Publishing	0.00	0.81	34.59	28
Chemicals	0.00	3.48	10.54	37
Petroleum Refining	0.00	8.48	6.43	55
Leather Products	0.00	0.00	88.93	0
Stone, Clay and Glass	0.00	2.44	30.10	73
Primary Metals	0.00	0.23	24.48	6
Fabricated Metals	0.00	1.97	26.85	53
Non-electrical Machinery	0.00	0.00	21.37	0
Electrical Machinery	0.00	0.23	36.16	8
Transportation Equipment	0.00	0.00	40.07	0
Professional Instruments	0.00	0.93	44.51	41
Misc. Manufacturing Industries	1.82	2.90	34.08	99
Transportation	17.88	20.90	66.97	1,400
Communications	0.00	8.36	36.74	307
Electricity and Gas	0.00	8.82	16.81	148
Aqueduct	0.00	0.58	63.33	37
Trade	75.80	84.41	103.24	8,714
Finance	0.00	3.48	37.57	131
Insurance	0.00	2.21	54.22	120
Real Estate	0.00	13.59	5.03	68
Hotels	134.77	134.81	59.49	8,020
Personal Services	0.00	2.09	88.52	185
Business Services	0.00	2.55	55.18	141
Amusement and Recreation	33.23	41.10	119.46	4,910
Health Services	27.22	27.52	149.08	4,103
Other Services	0.00	4.53	140.29	635
Commonwealth Government	0.00	0.23	95.52	22
Municipal Government	0.00	0.12	136.71	16
Federal Government	0.00	0.58	78.18	45
Total	313.5	428.0	-	31,456

¹ Men per million dollars of Output

1. Most of the final demand of tourists is concentrated on service industries (92.2% of the total), especially hotels, trade, amusement and recreation, health services and transportation.

2. Demand from manufacturing sectors was concentrated on foods, products, and beverages.
3. Output generated by tourist demand is also concentrated on service sector(90% of total) as well as most of the employment. Sectors like hotels, trade, amusement and recreation, health services and transportation received most of the impact from tourist expenditure as measured by employment and output.
4. The table reveals that for each million dollars of increase in tourist expenditures, domestic output will increase by 1.37 million and employment by 100. In other words, that implicit output and employment multipliers are approximately 1.37 and 100 workers per million dollars of final tourist demand? respectively.
5. The \$313.5 mullion of tourist expenditures only generated 612 employments in agriculture, 612 in construction and 1,216 in manufacturing. Service sectors (including hotels) were responsible for remaining employment.

Using a "closed Leontief Input Output Model", the impact of Tourist expenditures on output and employment will increase considerably. This time employment and output figures will reflect changes induced by consumption expenditures. As was explained elsewhere, these figures are more realistic than those obtained by the open Leontief's Input-Output Model. Table 14 shows employment and Output figures using Leontief's Closed System.

Table 14

Employment and Output Generated by \$313.5 Million of Tourist Expenditures Using a Leontief's

Closed Input-Output Model, Fiscal Year 1979 (1972 = 100)

Industrial Sector	Output (in million \$)	Employment
Sugar Cane	1.63	301
Other Agriculture	11.50	1,038
Mining	0.35	21
Construction	10.80	769
Dairy Products	7.32	198
Bakery Products	3.95	201
Sugar Refining	4.30	130
Malt Beverages	7.66	107
Alcoholic Beverages	7.08	30
Soft Drinks	6.27	66
Other Food	21.95	544
Tobacco Products	3.25	61
Apparel and Textiles	7.43	499
Furniture and wood	2.21	126
Paper Products	1.39	60
Printing and Publishing	1.97	67
Chemicals	7.55	80
Petroleum Refining	16.14	105
Leather Products	0.81	72
Stone, Clay and Glass	3.95	119
Primary Metals	0.46	11
Fabricated Metals	3.83	103
Non-electrical Machinery	0.12	3
Electrical Machinery	1.51	55
Transportation Equipment	0.35	14
Professional Instruments	1.74	77
Misc. Manufacturing Industries	4.18	142
Transportation	29.73	1,991
Communications	11.38	418
Electricity and Gas	14.75	248
Aqueduct	2.09	132
Trade	137.14	14,158
Finance	8.36	314
Insurance	4.30	233
Real Estate	44.36	232
Hotels	134.93	8,027
Personal Services	5.81	514
Business Services	3.83	211
Amusement and Recreation	42.96	5,132
Health Services	36.11	5,383
Other Services	13.35	1,873
Commonwealth Government	4.18	399
Municipal Government	0.23	31
Federal Government	3.60	281
Total	636.8	44,576

The following facts can be derived from the table:

- 1) When assuming the vector of consumption as endogenous (“closing the system”), Output amounted to \$3636.8 millions, or \$208.8 million more than when using the open system.
- 2) employment amounted to 44,576 or 13,120 more than the ones obtained with the open model.
- 3) Each million dollars increase in tourist expenditures creates 142 jobs and \$2.03 millions in output.
- 4) The increase in tourist expenditures will have considerable employment impact on sectors like hotels, trade, amusement and recreation, health services and transportation services.

C. Employment Projections for Year 1985

In this section we will discuss the results on some projections of employment needs of hotel industry and tourist activity using the input output model. Table 15 shows employment needs under four different scenarios of growth in gross domestic product for hotel and tourist activity. The most probable rate of growth of GDP at constant 1972 prices will be about 3%. Therefore, it is expected that by the year 1985 direct and indirect employment requirements generated by the hotel final demand will be around 12,010 if levels of productivity remains at 1979 level and the structure of the economy remains equal to that represented by 1972 I-O Table. Tourist expenditures will directly and indirectly generate about 42,154 jobs. However, if induced effects of consumption are taken into consideration, then employment effects will be greater. These latter are shown in table 16.

For year 1985 if the economy grows at 3 percent per year (starting in base year 1979), tourist expenditures will induce the creation of 53,237 jobs. Hotel employment requirements (direct, indirect and induced) will reach the number of 18,816.

Table 17 shows the projections of output gross domestic product, tourist expenditures and hotel final demand which were the base for our employment projections.

Table 15

Projected Employment Needs for 1985 Under Four Different Scenarios of Rate of Growth in Gross Domestic Product Puerto Rico (1972=100)

Rates Growth in GDP	Direct Plus Indirect Labor Needed to Produce Output Generated by Tourists Expenditures	Direct and Indirect Labor Needed to Produce Output generated by Hotel Demand	Estimated Employment Needs for the whole Economy
Actual (1979)	31,456 ¹	10,058 ²	807,000
2 Percent	35,424	11,327	908,812
3 Percent	37,568	12,010	963,596
4 Percent	39,802	12,726	1,021,107
5 Percent	42,154	13,479	1,081,454

Source: Estimates of the Author

¹Estimated using labor coefficients as derived from labor coefficients shown in table 13

²See table 5

Table 16

Projected Employment Needs for year 1985 Under Four Different Scenarios of Growth Rate of GDP Using Leontief's Closed input-Output Model (1972=100)

Rates Growth in GDP	Total Labor Needed to Produce Output Generated by Tourists Expenditures	Total Labor Needed to Produce Output generated by Hotel Final Demand	Estimated Employment for the whole Economy
Actual (1979)	44,576	15,758	807,000
2 Percent	50,199	17,746	908,812
3 Percent	53,237	18,816	963,596
4 Percent	56,403	19,938	1,021,107
5 Percent	59,736	21,118	1,081,454

Source: Estimates of the author

Table 17

Projections of Growth Domestic Product, Tourist Expenditures and Hotel Final Demand
Under Four Different Rates of Growth for GDP 1985 (in million 1972 dollars)

Rates Growth in GDP	Gross Domestic Product	Tourist Expenditures	Output Generated by Tourist Expenditures	Hotels Final Demand	Output Generated by Hotel Demand
2 Percent	9,459.2	353.1	482.2	151.8	203.3
3 Percent	10,029.4	374.4	511.3	160.9	215.4
4 Percent	10,628.0	396.7	541.7	170.6	228.3
5 Percent	11,256.1	420.2	573.9	180.6	241.8

Source: Estimates of the author

IV. Summary and Findings

In this chapter, we have analyzed the employment structure and employment generation capacity of the hotel industry and tourist activity by using input-output analysis.

Two versions of the input output model were used:

- 1) the "open" input-output model and 2) "closed" input-output model.

This latter captures the induced effects of consumption expenditures. Employment was analyzed by occupation and by sex, by means of manpower matrices. It was found that:

1. Every million dollars of tourist expenditures increases demand for hotel services by \$29,911.0.
2. Every million dollars of increase in tourist expenditures increases output of the economy by \$1.24 million.
3. While in 1972 eighty-eight men-years were needed to produce one million dollars of output in hotels, the figure reduced to 59 by fiscal year 1979 implying a considerable increase in labor productivity in this sector. In other words, partial labor productivity increased from \$11,362.39 per worker to \$16,809.83 from 1972 to 1979.

4. Direct employment of the industry is not a reliable figure for determining the employment effects on the economy per million dollars increase in the demand for both hotel services or tourist expenditures. There are also indirect and induced effects generated in the system. In the case of hotel direct employment requirement for fiscal year 1979 there were 8,382 employees. However, direct and indirect employment requirements per million dollars of hotel final demand were 10,058 and if we include induced effects, the figure increases to 15,758. In other words, every million dollars of increase in the demand for hotel services increases employment in the own industry by 59 and in the system by 112 implying on employment multiplier Type II of 1.88.
5. An increase in the demand for hotel services generates output in other industries and this latter requires workers. Demand for hotel services during 1979 generated \$180.6 millions of output in the system. Most of this was in the service sectors (\$150.10 millions). However, agriculture, manufacturing and transportation, communications and public utilities also benefited.
6. Most of the 8,382 direct jobs of the hotel industry during 1979 were occupied by service workers (5,855). Second in importance were professionals, clerical and managers. The lowest categories were sales workers and labourers.
7. While in 1963 female employment amounted to 30.4 percent of total employments in hotels, the share reduced to only 22.6 percent in 1972. We have to wait until 1980 Census of Population is published to find out how this share has changed recently.

The decreasing share was mainly due to a reduced proportion of female managers and administrators .

8. Looking as hotel size, we found that:
 - a. According to Census of Business of 1972, the 18 hotel establishments in the category of \$1,000,000 or more of receipts received 82.7 percent of receipts, hired 78.5 percent of workers and paid 87.1 percent of wages and salaries.
 - b. The hotel establishments in the category of 50 employees or more generate 85 percent of receipts and hire 82.9% of paid employees.

The analysis of tourist expenditures shows the following interesting findings:

1. Most of the final demand of tourist is concentrated in the service sectors, especially hotels, trade, amusement and recreation, health services and transportation.
2. For each million dollars of increase in tourist expenditures, the output of the economy will increase by \$1.4 millions and employment by 100.
3. The \$313.5 millions of tourist demand in 1979 (adjusted for import content) generated 612 jobs in agriculture, 612 in construction, 1,216 in manufacturing and 29,016 in services including government (these are direct plus indirect requirements).
4. Using the "Closed Leontief Input-Output Model," the impacts of tourist expenditures increase considerably. For instance, the \$313.5 millions of tourist final demand increased output of the economy by \$636.8 millions (\$208.8 millions more than when using the open system) and employment by 44,576 (or 13,120 jobs more than the open system). In other words, each million dollars increase in tourist expenditures creates 142 jobs and induce increase of \$2.03 millions in output through the system.

Projections for year 1985 shows that:

1. If the gross domestic product of the economy grows (at constant 1972 prices) at 3% from 1979 to 1985, then tourist expenditures will generate \$511.3 millions in output (5.1 percent of total GDP) and 53,237 direct, indirect and induced jobs in the system. If the economy grows at 5% then output generated by tourist expenditures will increase to \$573.9 millions and total jobs created to 59,736 (5.5 of total employment for the economy). These projections are based on constant 1979 level of productivity and constant 1912 structure of the economy.

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