

INTRODUCTION

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What is the value of an airport to the surrounding community? At a facility such as Chicago's O'Hare International Airport, the answer, undeniably, is that the airport is an enormous asset to the City of Chicago. Thousands of employees and over a hundred tenants funnel hundreds of millions of dollars per year into the local economy through payroll and other expenditures. The indirect contributions from the millions of air passengers which pass through the city annually combine to make the induced economic impact of the airport even greater.

Similarly impressive statistics have been developed with the assistance of economic impact studies at many of our nation's busiest commercial airports. It is important to understand, however, that only a relatively small number of airports are large enough to let employment statistics and passenger expenditure figures carry the burden of proving the airport's value to the surrounding communities. In 1981, for example, there were almost 250 million passenger enplanements in the United States but ninety percent of those passengers were recorded at only 65 of our 12,000 airports.

The remaining airports, mostly general aviation and small hub facilities, are also valuable community assets. Although direct economic benefits are not as large nor easily measured, these facilities should be recognized for other important benefits to the community such as: corporate development attracted by the airport; convenient access to the national air transportation system; development of aviation related businesses; and local taxes on aircraft and related purchases, such as parts and fuel.

In light of increasing public awareness and active opposition to airport related problems, such as aircraft noise and forced relocation of homes and business, supporters of airport expansion programs frequently find themselves in the position of having to convince a hostile audience that the benefits accrued will outweigh the adverse impacts. However, without strong economic arguments which support this position, it is increasingly difficult to convince an informed public that airport expansion is, in fact, in their best interest. Unfortunately, most small airports, unlike the large commercial facilities, do not have the resources necessary to prepare a detailed assessment of their beneficial impacts on surrounding communities.

The Transportation Research Board Committee on the State Role in Air Transport has focused its attention over the past three years on the issue of the economic benefits of general aviation airports and hub airports which have a preponderance of general aviation activity. The committee sponsored a series of three conference sessions on various facets of this topic at the 1981, 1982 and 1983 Annual Meetings of the TRB. This circular is a documentation of the material presented at the conference sessions.

The circular is organized into three sections corresponding to the individual annual sessions. The 1981 session, titled "Economic Benefits of General Aviation," was organized and chaired by John W. Drake of Purdue University. Transcripts of the oral presentations delivered at the 1981 session are provided in Part 1 of this circular. The 1981 session closed with a paper authored by William F. Shea (Associate Administrator for Airports, Federal Aviation Administration) and Mary Brugo (Port of Portland). This paper presented an over-

view of the methodology used to determine the economic impact of the Port of Portland aviation facilities and provided an excellent bridge to the central topic of the 1982 conference session sponsored by the committee.

The 1982 session, organized and chaired by Joel Crenshaw of Thompson/Crenshaw Associates, was titled, "Quantifying Benefits of General Aviation Airports." The four papers presented in the 1982 session are included in Part 2 of this circular. As with the previous year's session, the final paper of the 1982 conference was selected to provide a bridge to the 1983 session.

The third session in this series was titled, "Financing General Aviation Airports." Organized by Harry Wolfe of Harry P. Wolfe and Associates, and chaired by Merrill Goodwyn of the Texas Aeronautics Commission, this session marked the conclusion of the committee's series on general aviation airports. The five papers presented in the 1983 session are included in Part 3 of this circular.

Covering a span of three years and including 14 separate presentations, the reader can expect to find many diverse opinions within this circular, some of which the reader may agree with and some, undoubtedly, the reader will oppose. It should be understood that this compilation of papers does not constitute a statement of opinion of the TRB Committee on the State Role in Air Transport. Rather, the intention here has been to provide an independent forum for a presentation of the varied views on this topic.

The editorial and review work on this circular was completed by Ashraf Jan (Federal Aviation Administration), Harry P. Wolfe (Harry P. Wolfe and Associates), Frank McKelvey (Michigan State University), John Upchurch (Arizona State University), and Herbert J. Guth (TRB Staff). Many thanks are due them for the labor which they put into this task, and to all of the speakers for their participation.

PART 1: ECONOMIC BENEFITS OF GENERAL AVIATION

OVERVIEW OF METHODOLOGY USED TO DETERMINE THE ECONOMIC IMPACT OF THE PORT OF PORTLAND AVIATION FACILITIES

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Summary

Economic impact studies are management tools used to determine the economic benefits which accrue to a specified area due to the existence of certain activities and facilities. Study findings also are useful in estimating the economic benefits for expansion programs. This paper identifies the components and reviews the methodology used to develop the economic impact of the Port of Portland aviation facilities. The total value added economic impact of the Port's facilities exceeds \$1 billion annually and amounts to a flow of nearly \$3 million a day. Total economic impact is the sum of primary (direct and indirect) impact and induced impact. Direct and indirect impact is distinguished between providers and users of aviation services. Direct economic impact is calculated by estimating the revenues derived from the providers of the local activities associated with moving passengers and cargo. Indirect impact

is measured by estimating the revenue generated by the users of aviation services. Induced impact is derived by applying appropriate multipliers to the primary impact. Payroll alone constitutes 51 percent of the total impact and accounts for over 40,000 jobs. Another variable included in total impact is the revenue which remains in the area for rent, utilities, locally purchased services, depreciation, taxes and profit. The primary data used in the study was collected through personal and telephone interviews and mail surveys. Secondary information sources were used to cross-check data and to derive estimates where sampling techniques were necessary.

Introduction

The Port of Portland is a municipal corporation with jurisdiction in the tri-county area of Portland, Oregon. The Port operates Portland International Airport, Oregon's major commercial airport as well as the two busiest general aviation airports in the state -- Portland-Hillsboro Airport and Portland-Troutdale Airport. The Port also is currently studying the feasibility of developing a third general aviation airport in the metropolitan area. In addition to the aviation facilities, the Port operates modern deep-draft container, general cargo and bulk marine terminals, one of the major ship repair yards on the West Coast, as well as industrial parks. The Port is a major economic force in the Portland area and has a total annual operating budget of about \$200 million.

Economic impact studies provide port management with useful tools to inform its public and to respond to a variety of questions. In 1978 the Port hired Economics Research Associates of Los Angeles to determine the economic impact of its aviation facilities (1). In 1975, the same consultant did a similar study of the Port's marine terminals.

The annual economic impact of the Port of Portland Aviation facilities exceeds a billion dollars. That translates to a dollar flow of about \$3 million a day in the community. These are impressive statistics which have generated many inquiries from various transportation groups. The purpose of this paper is to describe the study components and to review the methodology used to develop the economic impact of the aviation facilities. This paper is not intended to serve as a set of procedures; rather it is to enlighten transportation colleagues who may be considering undertaking similar studies.

Definitions

An explanation of a few terms used to describe economic impact is needed. Every day people add

money to the economy of the community where they live. They buy groceries, drive a car and pay rent or make house payments. In short, they spend money.

In economic impact terms, people add value to the community -- directly, indirectly or it is induced through the ripple effect. Airports and firms which do business through the airports generate the aviation economic impact in much the same way people do -- they spend money.

The relationship of the impact components used in this presentation are shown on Figure 1. The first or primary round of spending that adds value to the community is known as direct and indirect impact. The induced impact occurs as the primary money continues to flow or ripple through the community as the second, third and other rounds of spending occur, in other words, how that money is spent and how it changes hands with different people at different times within the community.

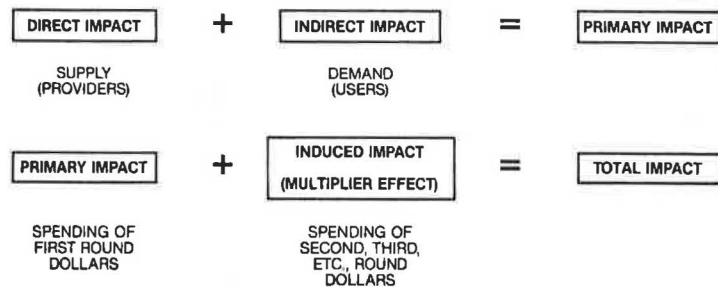
The direct impact is created by the flow of dollars of the providers of aviation services shown in Table 1. In the case of commercial aviation, the air carriers, airport concessionaires and government services such as those provided by the Federal Aviation Administration are examples of providers. General aviation examples include the fixed base operators and corporate operations. Military base operations are the Oregon Air National Guard and the U.S. Air Force Reserve.

The indirect impact results from the flow of dollars by users of aviation services. To avoid double counting, indirect impact was confined to the specific uses also shown on Table 1. For commercial aviation these include air passenger travel generated by local corporate headquarters for business trips outside the Portland area. Air freight users consisting of manufacturing and non-manufacturing firms which ship or receive some or all products by air are also part of indirect impact. For general aviation, indirect impact is confined to the dollar flow resulting from the use of noncorporate aircraft for business travel.

For commercial, general and military aviation, induced impact results from the multiplier effect which occurs with the respending of dollars initially generated by direct and indirect activity. Finally, total value added is the sum of the primary (direct and indirect) and induced impacts.

The term total impact, as used throughout this paper is actually total value added and is the residual revenue which remains in the area after some revenue is lost to other areas. Examples of such lost revenue, commonly identified as leakage, includes payments for nonlocally manufactured goods and federal tax payments. Thus, total value added is analogous to the net revenue for the study area.

Figure 1. Impact relationships.



Having defined the terms, Table 2 indicates the various impact values. Due to the importance payroll and employment contribute to total impact, these values are included in the tables. Payroll constitutes 51 percent of the total value added impact. The other variables which comprise total impact include the monetary flows which are an integral part of doing business. These are rent and utility payments, locally purchased services, depreciation, local and state taxes and profit.

Methodology

The measurement of economic impact entails the use of various techniques. Where possible, the preferred method is the development of primary data through interviews and surveys of the providers and users of aviation services. However, such procedures are neither completely possible nor always practical. Consequently, secondary data are also used as a means of making cross-checks and deriving

Table 1. Direct and indirect impact categories.

<u>Direct Impact</u> (Service Providers)	<u>Indirect Impact</u> (Service Users)
<u>Commercial Aviation</u>	
Air Carriers	Corporate Business Travel
Airport Concessionaires	Outside Portland Area
Ground Transportation	
Travel Agents	
Visitor and Crew Expenditures	Airfreight Users
Government Services	
Airport Development Aid Program (ADAP)	
<u>General Aviation</u>	
Fixed Base Operators	Noncorporate Business Travel
Government Services	
Concessionaires	
Corporate Operations	
ADAP	
<u>Military Base Operations</u>	
Oregon Air National Guard	None
U.S. Air Force Reserve	
Concessionaires	

Table 2. Total economic impact of the Port of Portland aviation facilities.

IMPACT CATEGORY	PRIMARY IMPACT			+	INDUCED IMPACT	=	TOTAL IMPACT
	DIRECT	INDIRECT	TOTAL PRIMARY				
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VALUE ADDED (\$ MILLIONS)							
COMMERCIAL AVIATION	\$108.4	\$279.0	\$387.4	+	\$513.7	=	\$ 901.1
GENERAL AVIATION	17.5	7.7	25.2	+	32.8	=	58.0
MILITARY BASE OPERATIONS	17.7	--	17.7	+	27.3	=	45.0
TOTAL	<u>\$143.6</u>	<u>\$286.7</u>	<u>\$430.3</u>	+	<u>\$573.8</u>	=	<u>\$1,004.1</u>
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EMPLOYMENT							
COMMERCIAL AVIATION	6,254	9,865	16,119	+	20,960	=	37,079
GENERAL AVIATION	594	--	594	+	749	=	1,343
MILITARY BASE OPERATIONS	894	--	894	+	1,377	=	2,271
TOTAL	<u>7,742</u>	<u>9,865</u>	<u>17,607</u>	+	<u>23,086</u>	=	<u>40,693</u>
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PAYROLL (\$ MILLIONS)*							
COMMERCIAL AVIATION	\$ 64.3	\$134.5	\$198.8	+	\$261.1	=	\$ 459.9
GENERAL AVIATION	8.4	--	8.4	+	10.6	=	19.0
MILITARY BASE OPERATIONS	14.0	--	14.0	+	21.5	=	35.5
TOTAL	<u>\$ 86.7</u>	<u>\$134.5</u>	<u>\$221.2</u>	+	<u>\$293.2</u>	=	<u>\$ 514.4</u>

*Payroll is a subset of value added.

estimates. In doing economic impact studies, double counting poses some problems. In the Port's aviation impact study, precautions were taken to avoid double counting. For this reason, the impact values may be conservative.

Economic impact studies are tools used to quantify the economic benefits of certain activities at a given point in time, usually a fiscal or calendar year. The Port's aviation impact study was based on fiscal 1978 data. Up to a point, the dollar values can be updated by adjusting for inflation.

The major focus of the economic impact study was the Portland metropolitan area. The Portland Standard Metropolitan Statistical Area (SMSA) is comprised of Clackamas, Multnomah and Washington counties in Oregon and Clark County, Washington. The Port of Portland district does not include Clark County, but because the county is an integral part of the metropolitan area, it was included in the study. While the study emphasis is the Portland area, the total impact includes the state of Oregon.

Data Collection

Various Port of Portland records and data were made available to the consultants. These statistics were used to partially cross-check responses and to make estimates for nonresponses. The Port statistics included standard data such as passenger and freight volumes, number of operations and lease rates.

Other statistics which proved very useful to the consultants were the results of air passenger travel origin and destination surveys which the Port conducted in 1974 and 1978. The survey findings were used to determine travel detail for residents and nonresidents by trip purpose. The survey also provided ground transportation modal splits and various socio-economic profiles of air passengers.

The consultant designed four different questionnaires for the economic impact study. The questionnaires were targeted to different segments of the providers and users of aviation services:

- o Airline disbursement at Portland International Airport for air carriers.
- o Airport services for all providers except air carriers.
- o Airport users for air cargo users and resident business travelers to areas outside the Portland area.
- o Fixed base operators for specific general aviation operations.

Each questionnaire sought detailed employment, payroll and tax data for the study area. County of residence of employees was asked so impact areas could be identified and apportioned. Expenditures, gross revenue, gross receipts or sales were also asked of firms providing services. Volume of air cargo through Portland International Airport was asked of air cargo users.

Gross revenue values were collected because value added impact was derived for each direct impact category by applying the appropriate percentages from the Oregon input/output model (2). Conversely, employment and payroll data were compiled directly from the survey forms or were estimated from various business censuses.

Direct Impact - Commercial Aviation

As might be expected, of the three aviation groups, commercial aviation created the largest direct impact. Gross revenue for commercial aviation direct impact was \$198 million. The total value added direct impact which remained in the study area was \$108 million, 55 percent of gross.

The following section will highlight the methodology used to determine economic impact for the direct impact categories outlined in Table 1.

The first direct impact category to be reviewed is air carriers. During fiscal 1978 there were 13 commercial carriers providing service through Portland International Airport -- 11 scheduled carriers, 3 commuters and 2 all-cargo airlines. During the study period, these 13 airlines carried 3.9 million passengers, 99.6 million pounds of freight and 32.7 million pounds of mail. To provide these services, the air carriers disbursed nearly \$70 million for the following:

- o Local payroll
- o Employee benefits
- o Landing fees
- o Advertising
- o Fuel
- o In-flight meals
- o Commercial accommodation for interrupted passenger service
- o Other services and supplies
- o Rentals -- Port of Portland
- o Building and equipment rentals
- o Local depreciation
- o Local taxes:
 - Property
 - State income
 - State fuel
 - Other state and local

The single largest airline disbursement was \$29 million for fuel. However, fuel creates a modest value added impact on the local economy because it is manufactured outside the study region. Local payroll was \$16 million and was the second largest airline disbursement. Excluding fuel, the other airline disbursements created substantial direct impact in the Port district. For analytic purposes, local air carrier disbursements were used in lieu of gross revenue.

Airport concessionaire gross revenue (\$9 million) was derived from mailed surveys and estimates. Since the airport concessionaire's leased space is based on gross revenue percentages, information was determined from Port lease records for firms which did not respond.

Ground transportation modes serving the airport are private automobiles, taxis, rental cars, bus and limousine. The distribution of ground transport usage was determined from a 1978 Port origin and destination study. Revenue, payroll and employment were imputed by estimating number of trips, fares and manpower for the mix of ground transportation.

During fiscal 1978, there were 90 travel agencies in the Portland area. The major agencies (40 percent) were surveyed by mail. In addition, average gross revenue and agent shares of ticket sales were also estimated from travel industry sources. By cross-checking the data sources, travel agent gross revenues related to air travel were estimated at \$8 million.

Airline visitor distributions were estimated through the use of the air passenger origin and destination data for nonresident business, convention and vacation travellers. Average visitor day

data and expenditure patterns were estimated from travel industry sources. Total gross revenue from visitors' expenditures was \$83 million. Information on airline crew layovers was obtained from the airlines and accounted for another \$76,000.

Operating budgets were used instead of gross revenues to determine the \$4.9 million government service input. The Federal Aviation Administration accounted for over 60 percent of the government impact. Other government agencies included Customs, U.S. Postal Service, Weather Service and Immigration and Naturalization. Another source of government revenue was Airport Development Aid Program (ADAP) funds which averaged about \$3 million per year.

Total direct gross revenue impact for commercial aviation was \$198 million, including a payroll of \$64 million and over 6,000 jobs. The value added residual which remained in the study area was \$108 million.

Direct Impact - General Aviation

The general aviation direct impact covers Portland-Hillsboro Airport (PHA) and Portland-Troutdale Airport (PTA) as well as the general aviation activities located at Portland International Airport. For fiscal 1978, the total value added impact was \$58 million, including a \$19 million payroll and 1,300 jobs. During the study period, general aviation had nearly 500,000 operations, and another 150,000 touch-and-go activities.

Direct impact for general aviation was generated by five fixed base operators (FBOs) and their five subtenants, six separate operations of the Federal Aviation Administration, seven firms with corporate aircraft, concessionaires and ADAP funds. All firms and agency operators were interviewed and surveyed.

The FBOs created the largest impact. These firms provide services for over 500 locally based aircraft as well as for itinerant aircraft. The FBO services include distributorships for aircraft sales and parts, maintenance, repair and avionics services for all major aircraft manufacturers. The FBOs also provide line services and flight operations. Their total gross revenue was \$41 million, they supported 444 jobs and had a \$6 million payroll. The direct value added impact which remained in the study area from FBO activity was \$12.4 million, about 70 percent of the total direct impact.

The FBOs were interviewed and surveyed. However, due to the complex and diverse nature of aircraft sales transactions involving out-of-state sales, trade-ins and factory purchases, the FBOs were unable to estimate sales commissions which remain in the Portland area. Thus, estimates were made from industry payroll and sales ratios developed from the Census of Wholesale Trade.

Corporate aviation impacts were derived from the operating budgets of the respective companies. The corporate aviation operating budgets were \$2.4 million, including a \$716,600 payroll and 33 jobs, such as company pilots, mechanics and flight coordinators.

The FAA operates three air traffic control towers, a flight service station, facilities sector offices and a general aviation district office at the Port's general aviation airports. Their total operating budget allocated for general aviation functions was \$1.6 million, with nearly all the budget being payroll for 61 employees.

Other tenants include restaurant, aviation insurance and miscellaneous concessionary services. Survey results of these firms accumulated a gross revenue of \$1.1 million, 48 full-time equivalent jobs, with a payroll of \$315,000. Finally, ADAP funds were \$370,000.

Direct Impact - Military Operations

The military base occupies a 400-acre leasehold area of Portland International Airport. During the study period there were about 26,000 annual military takeoffs and landings. The Oregon Air National Guard and the Air Force Reserve operating budgets and base visitor expenditures were \$17.7 million. Full-time personnel was 504 with a \$9.2 million payroll.

Direct Impact Value Added Calculation

For direct impact, the consultant arrayed the gross revenues for the categories outlined above. The value added residual was then determined by applying the percentage from the appropriate sectors of the Oregon input/output model. Input/output models develop sector flows through the iterative process. Thus, input/output sector values provide appropriate percentages for calculating the value added impacts which remain in the study area.

Indirect Impact

Indirect aviation impacts were confined to three users of aviation services. For commercial aviation, these were defined as air freight users and corporate business travel outside the Portland area. For general aviation noncorporate business travel was classified as service use.

To the extent a firm or industry uses the airport to ship its product, the employment, payroll and value added which are required to produce the shipments are considered the air freight indirect impacts of the airport. Total air freight value added impact was \$63 million including 3,000 jobs and a \$37 million payroll.

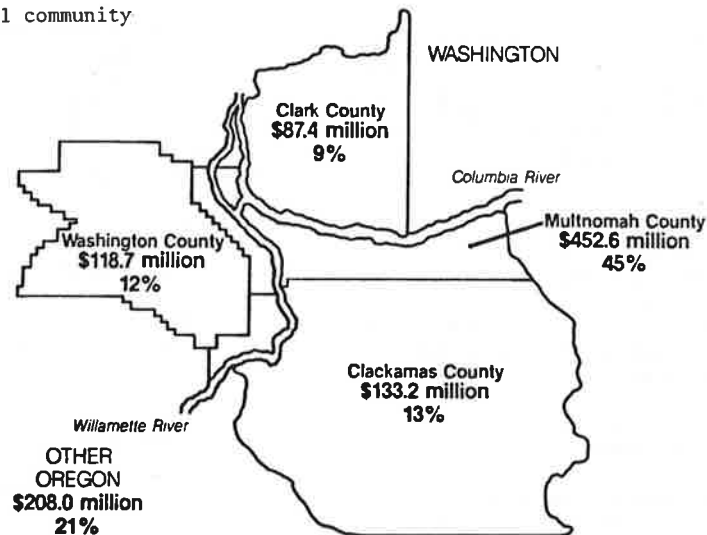
The economic impacts of outbound freight were much higher than those for inbound freight. Outbound freight accounts for 81 percent of value added, 64 percent of employment and 70 percent of payroll. This is largely attributable to the predominance of manufacturing in outbound freight, which creates a much higher value added component and slightly higher average wages per worker than does the distribution sector of the economy which dominates inbound freight.

Considerable estimating was used to derive air freight impact. For example, air freight users had difficulty identifying air cargo volume in relation to total cargo volume. Moreover, commodity origins and destinations were not readily available for much of the air freight.

Indirect air freight impact was estimated through the use of a 22 percent sample and use of secondary census data. First the consultants estimated inbound and outbound cargo by industry for the Portland SMSA and elsewhere in Oregon. After the weight of the cargo was estimated by industry type, the weight was converted into dollar value of shipments. Finally, to derive indirect value added, industry ratios were applied to wages and employment per dollar value of shipments.

Another commercial aviation indirect impact not captured elsewhere in the study is the use of business travel by local firm headquarters to administer operations for nonlocal markets. To estimate this travel impact, select data were taken from the origin-destination study. Case studies and an allocation approach were used. The analysis indicated air travel expense represented about 5 percent of a firm's out-of-the-area operating budget. Applying the percentage to average ticket

Figure 2: Distribution of total community economic impact.



fare for specific travellers yielded estimated value added of \$216 million, payroll of \$97 million and nearly 7,000 jobs related to commercial aviation.

Indirect noncorporate business travel usage was estimated for general aviation. (Corporate based aircraft were included in direct impact.) This impact was measured in terms of the annual value of business travel based on first class commercial air fares. Such a measurement does not capture the value of time saved, convenience, market access and increased productivity. Thus, it is recognized the \$7.7 million value added impact understates true indirect impact and fails to identify payroll and employment.

The indirect impact for noncorporate business travel was estimated from a limited survey the Port had conducted of its general aviation users. Based on the number of business or business/pleasure trips, the impact was developed by assuming regional travel under 300 miles and a \$100 fare in 1978.

Indirect impact was not developed for military aviation. Due to the methods used, indirect impacts were measured on value added, not gross revenue as was done in direct impact. Consequently, it was not necessary to use percentages from the input/output model for indirect impact.

Impact Summaries

Primary impact is simply the sum of direct and indirect impact. The foregoing narrative provided an overview of the methodology used to develop these impacts for value added, employment and payroll.

Induced impact was developed by applying the multiplier coefficients from the Oregon input/output model to the corresponding industry sectors of primary impact. Multiplier coefficients represent the ratio of induced impact to primary impact. Thus, the ratio of total impact (primary plus induced) to primary impact would be represented by the multiplier coefficient plus unity (e.g., $1.22 + 1.0 = 2.22$).

The induced impact values are greater than primary impact due to the second, third and subsequent rounds of respending that occur. Finally, total impact is the sum of primary and induced impact.

Apportionment

After total economic impact was identified, impact by county for the Port district, the Portland SMSA and for the remainder of Oregon was apportioned. The direct impact was apportioned on the basis of employee residence. As noted earlier, the survey questionnaires sought location of employee residence.

The indirect impact was apportioned as follows:

- Air cargo. For each industry identified from the census data, the impact was apportioned in proportion to the jurisdictional distribution of employment for all industry.
- Commercial corporate business travel. The distribution of residents was apportioned in proportion according to information contained in the Port's passenger origin and destination study.
- General aviation business travel. The distribution of based aircraft owner residences was used as the apportionment basis.

The induced impact was apportioned based on the following assumptions:

- The rate at which the primary impact "leaks" from the state of Oregon was constant.
- The impact from the initial round of respending was distributed on the same basis as primary impact, that is, employee residence.
- The impact from the final round of respending was distributed on the basis of population.
- The rate of change between the primary impact apportionment base and the final round of respending distribution base was constant.

The resulting direct and indirect induced values were summed to obtained total induced impact. Finally, by combining the direct, indirect and induced components of economic impact by jurisdiction, total impact was apportioned. The value added apportionment is shown in Figure 2.

CONCLUSION

This study measured the economic benefits of the Port of Portland aviation facilities. The study findings revealed an annual economic impact of \$1 billion, including several sizable components.

The development of an economic impact study is a major undertaking. Numerous industry sectors require careful and detailed analysis. Data collection can pose formidable problems, necessitating resourcefulness by the analysts. The final product enables management to assess the economic benefits provided to the community it serves. In addition, economic impact studies can be helpful in estimating the benefits of future projects.

Airport authorities which have not done economic impact studies for their facilities might consider such studies valuable tools for explaining the benefits airports contribute to the community. Finally, the publication of study results in a popular summary, with lay terminology, is a worthwhile endeavor.

References

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