Economic Impact Analysis

An Assessment of the Economic Impacts of Portland International Raceway in 2004

Prepared for the City of Portland
Bureau of Parks and Recreation

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Section I

Executive Summary

Portland International Raceway ("PIR") is a premier motor sports facility offering a variety of racing and non-racing events throughout the year. The larger spectator events include the Rose Cup Race, the Champ Car Portland 200, the Portland Historics Auto Races, the Columbia River Classic/All British Field Meet, and the American Le Mans Grand Prix. These events typically draw tens of thousands of visitors to Portland.

Most of the activity at PIR, however, consists of small events and activities held by hobbyists, clubs, and other non-profit organizations. Indeed, PIR is a popular venue that accommodates a wide variety of recreational and other activities, including: drag racing, motocross, bicycle racing, police training, professional driving schools, and club events for car enthusiasts.

It's clear that PIR provides a unique motor sports facility for local and non-local users alike. But, how does PIR contribute to the local economy? It does so in three ways. First, the City of Portland spends money locally to keep the facility operating. Second, and more importantly from an economic perspective, PIR acts as a magnet that attracts users and visitors to Portland, whose spending represents a significant, ongoing economic stimulus to the local economy. Finally, as a local venue, it keeps spending by thousands of local motor sports and bicycle enthusiasts, and others in Portland. Effectively, PIR is a mechanism allowing them to "buy local."

ECONorthwest used budget and other data provided by PIR, results from two recent user and visitor surveys, and a specially constructed impact model of Multnomah County to estimate the economic impacts or contribution of PIR.[1] Our analysis shows that PIR had the following net economic impacts on Multnomah County in 2004:

- An increase of $45.3 million in output (a measure of overall economic activity);
- An increase of 690 full- and part-time jobs;
- An increase of $16.9 million in wages;
- An increase of $2.7 million in income for small business owners;
- An increase of $5.6 million in various other types of income such as rents, royalties, dividends and profits received by residents, local businesses, and others; and

[1] Government economic data, which is the backbone of impact models, is most readily available at the county level. Therefore, the impact analysis was done on Multnomah County rather than for Portland. However, an overwhelming portion of the impacts from PIR felt in Multnomah County occurs in Portland.

- An increase of $2.6 million in revenues for state and local tax jurisdictions that includes approximately $1.2 million in additional property tax revenues for Multnomah County.

Two important points about the economic impacts attributed to PIR need to be emphasized. First, unlike a construction project, for example, whose impacts are short-lived or transitory, the economic impacts of PIR are annual impacts that have been occurring, will continue to occur, and may increase in size depending on the activities and visitation generated by the facility.

Second, the impacts reported above represent the net or bottom-line impacts of PIR. That is, ECONorthwest performed a special type of impact analysis that only looks at spending that is new or additive to the local economy. Net impacts are often considerably smaller than gross impacts,[2] but provide a much more realistic estimate of the contribution of PIR to the local economy. Using a net impact analysis framework, ECONorthwest concludes the following:

- Given the size of the Multnomah County economy and its workforce, the impacts of PIR in an overall context are small but not trivial. For instance, absent PIR, the number of unemployed workers in Multnomah County would have gone up 2.4 percent, and the average annual unemployment rate in 2004 would have been 7.8 percent instead of 7.6 percent.

- Multnomah County's accommodations and food service sectors receive the majority of the employment and income impacts attributed to spending generated by PIR. In total, the job impacts of PIR represent almost one percent of the total, private covered employment in these sectors in 2004.

The results from recent surveys of user groups and visitors to the facility revealed additional information about PIR's operations in 2004:

- **PIR is vital for organizations that use the facility, and activities by these user groups benefit the local economy.** Based on the sample of completed surveys, in 2004, the average size of PIR user groups was 630 members. These user groups, on average, generated 2,100 participant-days and 2,570 visitor-days for their events held at PIR. Importantly, approximately 52.4 percent of attendees were from outside of Multnomah County. In addition, user groups spent, on average, approximately $52,000 per event with most of this spending benefiting a wide range of businesses located in Portland, including: insurance carriers, hotels and other lodging establishments, eating and drinking establishments, various equipment providers, and medical personnel. *Approximately 77 percent of the responding user groups indicated that without PIR they would not have held any events locally.*

[2] *Gross economic impacts* offer a perspective on the magnitude of overall economic impacts that can be traced back to an activity. Gross economic impacts, however, do not necessarily reflect the creation of new jobs or income as they do not take into account the jobs or income creation that would have occurred in absence of the activity being analyzed. To provide context for the net economic impacts reported here, the gross economic impacts attributed to PIR include: $63.6 million in output; 970 full- and part-time jobs; $23.8 million in wages; $3.9 million in small business income; $7.8 million in other types of income; and $3.7 million in tax revenues for state and local tax jurisdictions.

- **PIR keeps and attracts visitors who visit often and spend a lot of money in the local economy.** On average, visitors that responded to the survey went to over 9 individual events in 2004, with an average party size of 3.2 persons and average spending per party of $425 per visit. In addition, approximately 73.5 percent of the respondents indicated that they lived outside of Multnomah County, with 23.2 percent living outside of the Portland metropolitan area. *For these non-residents, almost 87.4 percent indicated that they would not have visited Portland but for PIR.*

The following sections of the report provide greater details regarding the impact analysis of PIR. Section II provides background information on PIR and summarizes the methodologies used in this analysis. Section III presents a discussion of the results of two surveys of users and visitors to PIR. Section IV reports the findings of the economic impact analysis. In addition, an Appendix has been included that explains economic impact analyses, how they are conducted, and how they should be interpreted.

Section I Background and Methodologies

To provide context for the analysis in this report, this section begins with a history of PIR followed by a description of its operations in 2004. It concludes with discussions on the methodologies used in this research.

Portland International Raceway

Portland International Raceway ("PIR") is located just off of Interstate 5, approximately three miles north of downtown Portland. Its mission is to provide a safe place for groups, clubs, and organizations to conduct racing and non-racing vehicle-oriented events.

History

PIR was built on vacant land purchased by the City of Portland from the Army Corps of Engineers in 1960. The vacant site consisted of the abandoned roads of the former World War II City of Vanport, which was destroyed by a flood in 1948. The sale stipulated that the site could only be used for recreational purposes. Racing began in 1961 with the first Rose Cup races.

In 1970, the City of Portland and the Rose Festival entered into an agreement to renovate the grounds. Over time, the original asphalt pavement had deteriorated and racing groups became reluctant to sanction races there. Repaving was financed with a $100,000 loan from the city, which PIR paid back in less than three years with rents earned from racing events.

PIR has grown to become a major racing venue on the west coast. It is entirely self-financed—paying for operating and capital expenses through revenues generated from rents, food concessions, and advertising.

Overview of Operations

PIR is owned and operated by the City of Portland through the Bureau of Parks and Recreation. The 180-acre property has a 1.96 mile paved road course, a quarter-mile paved drag strip, a dirt motocross track, bleacher seating for 26,000 people, general admission grass seating for 60,000 people, parking for 1,500 vehicles, and meeting facilities.

PIR generally does not put on events; instead, PIR facilities are rented to various user groups, such as clubs, racing schools, charities, and operators of spectator racing events. PIR does promote drag racing events and a yearly automotive swap meet. PIR's facilities are unique, and enable it to accommodate a wide range of recreational and other activities. Most motor sports venues on the west coast consist primarily of dirt tracks and/or drag strips. PIR, however, offers these and a major road course, all in close proximity to a major city. As such, PIR is a very popular venue.

Events

While probably best known for the two largest events, the Portland 200 Champ Car race and the American *Le Mans* series, most of the schedule at PIR is used for small events and groups. Non-profits and local hobbyists conduct ninety-five percent of the events held at the raceway. There are many types of events held at PIR. For brevity, a partial list of events and uses is presented here:

- The Champ Car World Series is, as the name implies, a series of racing events held at tracks around the world. The Portland event is PIR's most popular event.

- Portland Historics is an event consisting of about 250 vintage cars in high-speed races. Sponsored by Baxter Auto Parts, the event is a fundraiser for the Children's Cancer Association.

- The American *Le Mans* series is a sports car endurance series held at ten tracks in North America. The race at PIR, the *Grand Prix* of Portland, is nationally televised.

- The Columbia River Classic historic event, paired with the All-British Field Meet, is growing in popularity, with events that are part of the weekend held in the St. John's neighborhood as well as downtown.

- PIR has a dirt motocross track that is used by two- and four-cycle dirt motorcycles for around 25 events each year.

- Between Thanksgiving and Christmas, PIR is home to the Winter Wonderland—a holiday lights show sponsored by locally-owned Bi-Mart.

- Pro Drive is a professional racing and driver safety school based at PIR which offers, among other services, driving safety instruction in skid cars.

- The Cascade Sports Car Club, Team Continental, and the Oregon Region of the Sports Car Club of America ("SCCA") operate amateur sports car races at PIR.

- Bicycle racing events including the Lombardi Sports Bicycle Races and events held by the Oregon Bicycle Racing Association. Bicycle groups reported about 11,900 total participants and 5,600 spectators at cycling events held in 2004 at PIR.

- Electrathon America Races (electric powered vehicles) is the largest event on the schedule for electric car enthusiasts, many coming from high school and college teams across the country.

- Kart racing events sanctioned by the Portland Karting Association use the road course each year, and the national championships for road racing karts has come to PIR a couple of times in the last 5 years.

- Drag racing at PIR encompasses everything from high school drags to high level amateur racing. The Wednesday Night Summit ET Series is a National Hot Rod Association event that gives season points and prize money to competitors. The Les Schwab Late Night Drags are open to all and offer no prize money. PIR hosts more than 90 drag race events each season.

- Marque clubs, such as the Rose City Corvette Club, the BMW Club, and Lotus Club Northwest, put on driver education and track days for their members at PIR.

- Police departments throughout the region rent PIR for training purposes.

Operations in 2004

PIR held approximately 650 days of events in 2004. (Event days are greater than calendar days because PIR was double and triple booked on most days during peak season.) PIR estimates that track participants, spectators, and others made approximately 420,000 visits to the raceway in 2004.

The primary revenue source for PIR is rent paid by users of the facility. PIR also earns revenues for the City of Portland through advertising and by renting parking spaces to the nearby Expo Center. As shown in Table 1, PIR earned $1,587,859 in calendar year 2004.

Table 1: Rent and Other Revenues Earned by PIR in 2004

Event or Use	Revenue to PIR	Event or Use	Revenue to PIR
ABFM / SOVREN	$19,098	OMRRA	$45,566
Advertising Revenue	92,222	Pacific Super Sport Riders	14,700
Alfa Romeo Club	6,198	Photography	12,000
American Le Mans Race	67,667	PIR Drags	268,048
Audi Club	12,000	PIR Swap Meet	62,442
Autosports	5,700	Police Training	54,500
Bicycles / Roller Blades	8,400	Porsche Club	10,618
BMW Club	15,553	Portland Historic Races	35,519
Broadacre Parking Rental	36,566	Portland Karting Association	44,176
Cascade Sports Car Club	56,625	Pro Drive	81,845
Champ Car Race	97,096	Proformance School	1,900
Corvette Club	2,182	Reg Pridmore School	1,900
Cyclocross	5,851	Reimbursements	166,908
Driving Unlimited	1,900	Ride-n-Drives	12,000
Ducati Motorcycle Event	2,878	Rose Cup Races	20,387
Electrathon America	630	SCCA (Race & SOLO II)	65,452
JMA Racing - Motorcycle	11,400	Shelby Club	6,796
Lights Rental	3,400	Speed Secrets	13,300
Lotus Club	6,000	Team Continental	9,400
Mike Sullivan School	1,900	Testing	106,438
Motocross Races	49,274	Tri Club Day	3,224
Mudfest	1,900	Winter Wonderland	38,000
NE Sport Bike Association	8,300	**Total**	**$1,587,859**

Source: Portland International Raceway.

Competitive Advantage

To the casual observer unfamiliar with motor sports, PIR may appear to be a typical racing facility. However, PIR has functional and location attributes that make it unique. For instance, there are several small dirt racetracks in Oregon, such as the one-third mile oval at Sunset Park in Banks and the River City Speedway in St. Helens. These racetracks can only be used by off-road vehicles. The road course at PIR attracts motor sports events conducted on paved surfaces. PIR combines off road facilities for motorcycles with a traditional road track consisting of 1.96 miles of paved road course. There is a severe shortage of such paved tracks in the Pacific Northwest.

The nearest traditional road courses are in Renton, Washington to the north and Thunderhill in Northern California to the south. Both have very busy schedules. For many sports car and motorcycle racing enthusiasts, PIR is the only realistic choice. For drag racing, the Woodburn Dragstrip is an option. However, that facility lacks lighting for night racing, thus greatly limiting the diversity of users. Motocross racers, on the other hand, have more regional racing options. However, many of these are far away from Portland.

Methodology

Two methods were employed in the analysis of PIR. First, surveys were conducted to estimate the spending by user groups and individuals who participated in or attended PIR events. Second, economic impact modeling was used to measure the multiplier effects from spending by PIR on track operations, and local spending by event participants and visitors.

Surveys

An economic impact analysis requires expenditure data for the activities being analyzed. Since the subject of this analysis is a motor sports facility operated by the City of Portland, the measurement process is more complicated than it would be for a business or industry. For a sports facility, one must consider not just the spending by the Portland Parks Department to keep PIR operating, but also the spending by event participants and spectators.

User Group Survey Methodology

PIR directly contacted user groups and posed a brief series of questions regarding their activities at the raceway in 2004. The survey was conducted in October and November 2005. Most groups responded. The goal was to count how much money user groups spent in Multnomah County, in general, and at PIR, in particular.

The survey asked each group how many events they held at PIR, how much their group spent at the track and in Multnomah County, and how many people came to their events. They were also asked about the residency of their event visitors and whether they stayed overnight at local lodging establishments. A key question in the survey was where the group would have held its events if it could not do so at PIR. This question was crucial for identifying spending that is new or additive to Multnomah County. (See discussion on gross versus net impacts below.)

Visitor Survey Methodology

ECONorthwest developed a visitor survey, and installed it as a web page linked to the PIR website. The PIR participants and visitors survey asked questions about residency, spending habits, the types of PIR events attended, and party size. A free form comment box was included at the end of the survey. The survey was active in November 2005, and 517 completed responses were received.

Impact Modeling

A widely recognized software system, called IMPLAN, was used to build an economic impact model of the Multnomah County economy. IMPLAN provides county-level estimates on production, consumption, employment, employee compensation, business income, and taxes for each of 509 economic sectors, which include different types of businesses, non-profits, and branches of governments. An in-depth discussion of this modeling approach, its use in measuring economic impacts, and its strengths and weaknesses can be found in the Appendix to this report.

Gross Versus Net Impacts

ECONorthwest was asked to measure the contribution of PIR on the local economy. Simply citing the economic impacts that occur as a result of spending by PIR, raceway participants, and visitors would produce an upper bound estimate of economic impacts. This upper bound estimate is often referred to as a measure of the "gross" economic impacts.

Instead, this analysis measures the "net" economic impacts. To do this, only spending that is attributed to PIR and is new (or would have been foregone) to Multnomah County is included. The following adjustments were made to the inputs that drive the economic impact analysis:

1. Spending by local users or visitors that PIR diverts from other local businesses <u>is not</u> included (this is called "direct substitution").
2. Spending by local users or visitors that would have been spent outside the local economy in the absence of PIR <u>is</u> included (this is called "import substitution").
3. Spending by non-local users or visitors that occurred locally because of PIR <u>is</u> included (PIR is an "exporter" of goods and services).

These adjustments will, in effect, produce net impact estimates that are considerably smaller than gross impacts. However, this approach produces a more realistic estimate of the economic impacts of PIR. Using a net impact approach, we are better able to answer the following question: How much better off is the Multnomah County economy in 2004 because of PIR?

Survey Results

The economic impact analysis relies heavily on data gathered from surveys of user groups and individuals who participated or watched events at PIR. The methods and results of these two surveys are discussed in this section of the report.

User Group Survey

The goals of the user group survey were to measure the expenditures of user groups while conducting events at PIR and show how much of the spending came from persons living outside of Multnomah County. Big spectator events, such as the American Le Mans and Champ Car races, are not included in the survey results.

User Group Survey Results

Surveys were sent to user groups that held events or used PIR facilities during 2004. Due to the time of year that the survey was conducted (November), some groups were on hiatus and did not respond. Nevertheless, 20 of approximately 30 regular user groups responded to the survey.

Ten user groups reported total membership count of 6,256 members. Seventeen user groups conducted visitor counts at their events. Survey respondents estimate that their events generated 35,120 participant-days at the raceway and attracted 41,121 non-participants. In total, user groups that responded to the survey accounted for 34 percent of all the visitors to PIR that came for purposes other than major spectator events.

Revenues and Expenses of Responding User Groups

Respondents reported revenues of $634,714, including participation fees. User groups that responded to the survey spent a total of $831,868 to hold their events at PIR. Most of these expenditures occur in Multnomah County. Table 2, below, shows the revenue and expenditures of user groups that responded to the survey.

Table 2: Revenues and Expenses of Respondent User Groups

Revenue and Expense Item	Amount
Revenues	$634,714
Expenses	
Food	$57,765
Equipment & supplies	$39,685
Lodging	$115,630
Medical & ambulance services	$27,189
Marketing & other services	$55,281
Labor	$6,766
Rent to PIR	$407,083
Insurance	$122,468
Total Expenses	$831,868

Source: PIR/ECONorthwest survey conducted in November 2005.

In addition, user groups reported that approximately 52.4 percent of the attendees at their PIR events had come from outside of Multnomah County. This is important because PIR acts to attract groups and individuals to Portland who would otherwise spend their money elsewhere. Indeed, local spending by non-local residents represent a significant stimulus for local area businesses and is a major component of the net economic impacts measured in this analysis.

Alternative

The user groups were asked what they would have done had PIR not existed. The purpose of this question was to help differentiate between the gross and the net impacts from their spending. As discussed previously, this analysis looks only at new spending that occurred because of PIR. For user groups, this includes local spending by local residents that would have left Multnomah County had PIR not been here and local spending by non-local residents that was attracted to Multnomah County solely because of PIR. These adjustments were made to the user group expenditure data after that sample data was expanded to the total user group population.

Table 3 lists the responses to this question. Of the 20 user groups that took the survey, 13 indicated that they would not have held any events in Multnomah County, four would have relocated and/or held fewer events in the county, and three did not respond to the question.

Table 3: Answer to User Group Survey Question, "If PIR did not exist, what would your group have done or where would you have held your events?"

Name of User Group	If PIR did not exist, what would your group have done or where would you have held your events?
Veloshop Bicycle Team	Hold it at a Metro park, probably Blue Lake
Cascade Sports Car Club	Cascade would not exist
All British Field Meet	Probably look toward county fairgrounds
BMW Automobile Club of America	Probably would have to drive to Bremerton, Kent, Spokane or Thunderhill (CA)
Pacific NW Sportsmen's Show	The Pacific NW Sportsmen's show would lose approximately 1/3 of its attendance due to lack of parking
Shelby Club SAAC NW	Very good chance we would not hold this event. We would have to go to Kent, WA or father away, down to CA. If not for this track, we would not have been holding these events since 1988.
Oregon Motorcycle Road Racing Association	We would have to go out of state to hold our races. There is no other suitable track located anywhere near. The next closest would be Seattle, then Northern CA at Thunderhill. Both these sites have their own road racing association, so we would not have a "home" club at all.
Oregon Rally Group	We would likely have shortened our event to two days. Our event is the only National Rally American Championship event with competitive stage miles within a major metro area, thanks to PIR!
Pacific Super Sport Riders	We would not exist without a track. Our goal is to get people off the street to learn safe riding techniques, and there is no other area suitable for this.
Club Lotus Northwest	We would not have an opportunity to hold our club track events, or be stuck with parking lot.
Society of Vintage Racing Enthusiasts	We would not have been able to hold event.
Specialty Transport, Inc.	We would not have come to Portland for this event. PIR was our main reason to come to Portland
MotoCorsa & JMA Track Days	We would use Seattle International Raceway
Alfa Romeo Owners of Oregon	We wouldn't have track days.
Oregon Beat the Heat Racing	Move event to Woodburn or Madras dragstrip.
Oregon Bicycle Racing Association	Would not hold events
Sports Car Club of America, Oregon Region	Would have held events at Pacific Raceway in Auburn, WA; Bremerton Raceway in Bremerton, WA; or Thunderhill Park in Willows, CA.
Cascade Tracktime	No response
Oregon Bicycle Racing Association	No response
LaMesa RV	No response

Source: PIR/ECONorthwest survey conducted in November 2005.

Visitor Survey Results

In ideal circumstances, the preferred survey would randomly sample PIR visitors at events throughout the year. However, for this analysis, the time of the year and budget limitations prevented such a survey. Instead, ECONorthwest developed an Internet survey that was tied to the PIR website.

ECONorthwest designed the survey to be brief to avoid respondent burnout and ensure a high response rate. The web survey offered a quick and inexpensive way to obtain visitor and expenditure data to be used in the impact analysis. Its main disadvantage was that PIR website visitors in November tend to be avid users of the raceway. As such, the web survey likely does not fully represent infrequent, casual, and non-participant visitors to PIR.

Visitor Survey Response

The results of the survey were robust. There were 517 unique respondents (mechanisms in the website prevented multiple entries from single IP addresses).

Events Attended

Table 4 summarizes the events that respondents reported attending in 2004. On average, each respondent went to over three different types of events and 9.5 individual events during the year. The big spectator events, such as the Portland 200 Champ Car Race (44 percent) and the American Le Mans Series (41 percent), were the most popular events. These major events are weekend events offered once a year. Regular events such as drag races, SCCA, and motorcycle races, were attended by fewer survey respondents, but multiple times during the year.

Table 4: PIR Events Attended by Respondent Visitors

Survey Respondents That Attended These Events	Percent of Respondents*
Drags	25%
SCCA	39%
Local School	39%
Motorcycle Road Racing	31%
Bicycle Racing	2%
Car Show	22%
Kart Racing	7%
Motocross	5%
Le Mans	41%
Historic	32%
Holiday Lights	16%
Champ Car	44%
Other	23%

*Many respondents visited several different events in 2004, so the sum of the percent visiting each event exceeds 100 percent.
Source: PIR/ECONorthwest Internet survey conducted in November 2005.

Visitor Characteristics

Table 5 shows some of the basic visitor data obtained from the survey. Multnomah County residents accounted for 26.5 percent of the respondents. On average, in 2004, local residents reported that they visited PIR 10.5 times, came in groups of 3.1 persons, and spent, as a group, $449 in the county on each visit. Non-residents visited less often and spent slightly less per visit. Multnomah County residents spent more per visit because they were more likely to be race participants and, as such, incurred greater race-related or vehicle costs.

Table 5: Visitor Characteristics, by Residency

Survey Metric	Multnomah County Resident	Resident of Another County	All Survey Respondents
% of respondents	26.5%	73.5%	100.0%
PIR visits in 2004	10.5	9.1	9.5
Avg. party size per visit	3.1	3.3	3.2
Avg. spending per visit	$449	$416	$425

Source: PIR/ECONorthwest Internet survey conducted in November 2005.

Visitor Spending Characteristics

Respondents were given the opportunity to identify their three biggest expense items. Table 6 shows the results. When viewing the table, it is important to remember that most respondents were reporting how much they spent as a group. This includes spending at PIR and elsewhere in the area. For those coming from outside Multnomah County, it would also include travel expenses elsewhere.

Table 6: Visitor Spending, by Type

Expense Item	$ per Event	Respondents	$ Total	% of total
Admission costs	$140.61	231	$32,482	8.4%
Participation fees	296.91	300	90,558	23.4%
Food	90.65	270	24,657	6.4%
Lodging	415.98	86	37,022	9.6%
Other travel costs	251.53	141	37,227	9.6%
Automotive parts & service	824.34	148	122,827	31.7%
Retail (non-auto)	195.34	139	28,325	7.3%
Miscellaneous expenses	156.19	86	14,057	3.6%

Source: PIR/ECONorthwest Internet survey conducted in November 2005. Data based on those respondents that reported major expense categories.

Certain expenses are related to entering and preparing for events. These expenses can be large, which explains the high dollar amounts for participation fees and automotive service and parts. About one-in-six respondents said they paid for lodging with an average group cost of $416 (this includes multiple nights and, in some cases, multiple rooms).

Where Visitors Came From

A particularly interesting finding from the survey was the high proportion of tourists that attended PIR events in 2004. Table 7 reveals that based on zip codes, 23.2 percent of respondents reported living outside of the Portland metropolitan area. Nearly all had to drive more than 50 miles to get to PIR, which, by definition, defines them as tourists. Another 5.2 percent of the respondents did not identify their home zip code, but several of these noted they were non-locals in their comments, including some respondents from Canada and one from Germany who travels once a year to attend the Champ Car races at PIR. Thus, the estimate that 23.2 percent of the respondents are tourists is likely understated.

Table 7: Visitors by Place of Residence

Residence of Respondent	Number	Percent
Portland Metropolitan Area:		
City of Portland in Multnomah Co.	116	22.4%
Other parts of Multnomah County	21	4.1%
Washington, Clackamas, Yamhill & Columbia Co.	163	31.5%
Clark and Skamania Co., Washington	70	13.5%
Total Portland Metropolitan Area	**370**	**71.6%**
Tourism Feeder Markets:		
Oregon outside the Portland metro area	44	8.5%
Washington outside the Portland metro area	47	9.1%
California	14	2.7%
Idaho, Montana, Nevada or Arizona	15	2.9%
Total Tourism feeder markets	**120**	**23.2%**
Residence Unreported	27	5.2%
Grand Total	**517**	**100.0%**

Source: PIR/ECONorthwest Internet survey conducted in November 2005.

The results from both surveys show that PIR is effectively a tourism magnet for the city. The consequences of this are significant as spending by non-locals is a major net contributor to the economy. The raceway appears to attract large amounts of money from persons that otherwise would not visit Portland and would not spend their money in the city.

The reason for the unusually strong tourism draw is the fact that PIR has the infrastructure to host a wide range of event types and is one of the few road course tracks in the Pacific Northwest that has lighting. The nearest comparable facilities are in Renton, Washington to the north and Thunderhill, near Sacramento, California to the south.

Where, If Not for PIR?

Further evidence of the tourism impact can be found from the responses received to the question: "If PIR did not exist for your events in 2004, what would you have done?" This question helps distinguish between the gross and net impacts. That is, to the extent that people would have spent their money in Multnomah County anyway had PIR not existed, the net impact of the raceway would be small. The survey responses to this question, however, show otherwise.

As shown in Table 8, approximately 87.4 percent of the person visits[3] by non-residents would not have occurred if it were not for PIR. This result clearly indicates that PIR is the primary draw.

Table 8: Alternative Visitor Options if PIR Did Not Exist, Percent of Person-Visits by Residency

Where person would visit if PIR did not exist?	Non Residents	Residents	All
Elsewhere in County	0.3%	19.2%	6.4%
Fewer Visits in County	12.3%	27.8%	17.3%
Elsewhere or not at all	87.4%	53.0%	76.3%
Total Person Visits	100.0%	100.0%	100.0%

Source: PIR/ECONorthwest Internet survey conducted in November 2005.

In addition, approximately 80.8 percent of Multnomah County respondents reported that they would either visit fewer events at other venues in the county or visit events outside Multnomah County. This indicates that PIR causes local residents to spend more money locally than they would otherwise. This influx of spending is called import substitution, which is explained in detail in the Appendix to this report. Import substitution is another component of the net impacts attributed to PIR.

Businesses Survey Respondents Visited

The survey included the following query, "Please take a moment to list a few local businesses you visited." It was an open-ended inquiry with no prompts, such as a list of suggested businesses. The query, therefore, measured the active awareness of local businesses by respondents. In total, 319 of the 517 respondents identified local businesses they visited during their trips to PIR. Of these, 76 percent were non-residents of Multnomah County.

[3] A "person-visit" represents the number of visits times the number of people in the group. For example, a family of five that visited PIR eight times in 2004 would account for 40 person-visits.

The purpose behind this question was to determine the extent to which visits engendered by PIR cause spending elsewhere in the county and where does that spending occur? This spending effect is called the "halo effect." Tourism is an export industry and venues, such as PIR, that attract visitors who would otherwise not visit the area have a halo effect on the surrounding community. With a variety of attractions, restaurants, hotels, stores, and other amenities within its borders, Multnomah County is clearly capable of accommodating spending by tourists that PIR attracts.

Lodging data, for example, helps to illustrate the strong base of tourist amenities in the immediate area around PIR. As can be seen in Table 9, there are 1,603 commercial lodging rooms near PIR. The mix includes national chains and local independents, which range from economy properties to upscale hotels. All but two of the accommodations are less than 15 years old. Outside of downtown Portland, no other area off a major interstate in the metropolitan area comes close to matching this lodging capacity. It is a clear sign that PIR generates a demand for many hotel rooms.

Table 9: Guest Room Counts of Major Lodging Properties in the Immediate Area Around PIR

Property	Rooms	Date Opened	Address
Red Lion	318	Jun-82	909 N Hayden Island Dr
Marriott Courtyard	132	Jun-03	1231 N Anchor Way
Best Western	146	Aug-93	1215 N Hayden Meadows Dr
Holiday Inn Express	74	May-03	2300 N Hayden Island Dr
Days Inn	212	Jun-87	9930 N Whitaker Rd
Motel 6	65	Aug-06	1125 N Schmeer Rd
Thunderbird Hotel	352	Jun-74	1401 N Hayden Island Dr
Oxford Suites	204	Apr-96	12226 N Jantzen Dr
Portlander Inn	100	Jun-04	10350 N Vancouver Way
Total	1,603		

Source: Smith Travel Research, May 2005.

Respondents identified businesses that were in close proximity to PIR. These include Baxter Auto Parts, Elmer's, Shari's, Safeway, Burger King, Union 76, and GI Joes. All but Safeway and Union 76 are Oregon-owned businesses. Many respondents mentioned specialty automotive shops found in Portland, and several identified EDR Performance—a motorcycle racing business in Beaverton.

While the immediate area around the raceway benefits greatly from the halo effect, the survey also revealed that visitors patronize a surprising number of businesses in other parts of Multnomah County. Often mentioned were establishments in downtown Portland, the Pearl District, Northwest Portland, and Kenton.

Table 10 shows that the most often mentioned businesses were locally owned restaurants, and automotive and bike shops. Fast food restaurants and gas stations were the third and fourth most often mentioned. Some are locally owned under licenses or franchise agreements, while national corporations directly own others.

Table 10: Businesses Patronized by Visitors to PIR

Multnomah County Business Mentioned	Total Mentions	Mentions per Respondent
Locally owned restaurants, bars, or coffeehouses	276	0.87
Baxter Auto Parts or other local automotive or bike shop	259	0.81
Burger King or other fast food restaurant	175	0.55
76 or other gas station	152	0.48
GI Joes, Powell's, and other local businesses	142	0.45
Local hotel or motel	63	0.20
Safeway, Zupans, Natures, or other supermarket	55	0.17
Home Depot, Fred Meyer or other specified national store	52	0.16
National restaurant or coffeehouse chain	32	0.10
Jantzen Beach Mall retail stores (unspecified)	18	0.06
OMSI, Chinese Garden, Pearl Dist., or other local attraction	14	0.04

Source: PIR/ECONorthwest Internet survey conducted in November 2005.

Respondents mentioned another 142 local businesses besides automotive, lodging, and restaurants. GI Joes, because of its proximity to PIR and large automotive department, was the most common name given. Survey respondents mentioned a surprising variety of retailers. This is a reflection of the strength of the retail sector in Portland, which is enhanced by the lack of a sales tax and a wide choice of stores.

Comments from Survey Respondents

Although not used in the impact analysis, the survey provided PIR with an opportunity to obtain opinions from website visitors. The survey ended with "Comments; we would love to hear feedback!" Of the 517 people that responded to the online survey, 345 entered comments.

Many people typed several suggestions and comments. Several major themes emerged. The comments were tallied by major theme and the results appear in Table 11.

Table 11: Visitor Comments

Comment or Suggestion	Number of Comments	% of Commenting Respondents
PIR and events are great	145	42.0%
Repave and improve the track surface	92	26.7%
Other suggestions to improve existing facility	56	16.2%
Personal notation -- no suggestions or comment on PIR	50	14.5%
Build or add a new amenity at PIR	49	14.2%
Replace the food vendor and improve food service	39	11.3%
Location with easy access to Portland makes PIR exceptional	33	9.6%
City of Portland and PIR need to promote PIR more	23	6.7%
Change schedule, add events or modify events	22	6.4%
PIR is or could become a world/national class facility	18	5.2%
Improve the restrooms or add showers	16	4.6%
Visit Portland only because of PIR	9	2.6%
Live in Portland because of PIR	5	1.4%
Do not like PIR	3	0.9%

Note: 345 of the 517 survey participants entered their comments. Many wrote multiple comments.
Source: PIR/ECONorthwest Internet survey conducted in November 2005.

The most common statements were compliments about PIR or certain events held there. Of the 345 that entered a comment, 42.0 percent made positive statements about the facility or their experience at PIR.

There were negative comments as well. Fully 26.7 percent of survey respondents said the track needed repaving or other safety improvements. The third and fifth most common comments were recommendations for fixing existing facilities or making enhancements that are seen by many to be necessary. More than one-in-nine complained about the poor service, value, and quality of PIR's food vendor. Other complaints centered on the perceived lack of promotion, bad conditions of restrooms, and the need for improved access to PIR.

On a positive note, nearly one-in-ten said that the Portland urban location made PIR a highly desirable track and unique in the west. Eighteen people said it is a world-class facility or, with improvements, could become one. Nine people wrote in their comments that without PIR they would not visit the city. Five respondents even said that they live or had moved to Portland because of PIR.

Section III

Economic Impacts

This section details the findings from the economic impact analysis. Additional discussion about economic impact analysis, the strengths and weaknesses of this modeling approach, and the IMPLAN modeling software used in this analysis can be found in the Appendix to this report.

The Modeling Process

Operated by the City of Portland's Bureau of Parks and Recreation, PIR is entirely self-financed and pays for operating and capital expenses from revenues generated at the facility. PIR has a small staff to oversee operations, and employs part-time or temporary workers to provide concessions, safety and other services at raceway events. In addition, PIR attracts thousands of users and visitors who purchase goods and services at PIR and from other local businesses. The spending associated with these two activities *directly* benefits workers and businesses in Multnomah County.

PIR also has to purchase a wide variety of goods and services necessary to keep the raceway operating. Local businesses who benefit from user and visitor spending will also have to purchase goods and services to maintain operations. These local purchases will require providing businesses and vendors to purchase additional goods and services themselves. These business purchases generate *indirect* impacts. Finally, the direct and indirect increases in jobs and income will enhance the purchasing power of households who will then be able to purchase more goods and services. Spending by households will cause *induced* impacts for workers and businesses.

The economic modeling framework that best measures the direct, indirect and induced impacts from PIR is called impact analysis. Impact models (also called input-output or "I-O" models) provide a mathematical representation of the economy and the relationships between businesses, institutions and households. Impact models enable the user to trace the effects of PIR activities, and user and visitor spending as they ripple through the economy.

ECONorthwest used a widely recognized software system, called IMPLAN, to build a model of the Multnomah County economy.[4] IMPLAN provides county-level estimates on production, consumption, employment, employee compensation, business income, and taxes for each of 509 economic sectors. It combines the study-area data with national data on the use of each commodity by each industry and the production of each commodity by each industry.

The IMPLAN model reports the following types of economic impacts:

- **Output** is the value of production by industries and is an overall measure of *economic activity*. It includes the purchases of intermediate goods from other industries as well as the value added by the owners of resources and indirect business taxes. It is roughly the same as total sales or revenues.

- **Employee compensation (wages)** includes workers' wages and salaries, as well as other benefits such as health and life insurance, and retirement payments.

- **Proprietary income (business income)** represents the payments received by small-business owners or self-employed workers. Business income would include, for example, income received by private business owners, doctors, accountants, lawyers, etc.

- **Other property income (other income)** in the IMPLAN model includes payments to individuals in the form of rents received on properties, royalties from contracts, dividends paid by corporations, and corporate profits earned by corporations.

- **Job** impacts including both full and part time employment.

- **Tax revenues** for various state and local taxing jurisdictions.

[4] IMPLAN (for Impact Analysis for PLANning) was developed by the U.S. Department of Agriculture in cooperation with the Federal Emergency Management Agency and the Bureau of Land Management of the U.S. Department of the Interior to assist federal agencies in their land and resource management planning. Applications of IMPLAN by the U.S. Government, public agencies, and private firms span a wide range of projects, from broad resource management strategies to individual projects such as proposals for developing ski areas, coal mines, transportation facilities, and harvesting timber or other resources. ECONorthwest has applied the model to a variety of public and private sector projects in the Pacific Northwest including, most recently, wind power generation facilities, federal assistance for residential care facilities, and various projects financed by new markets tax credits.

For modeling purposes, we categorized PIR activities into the following two groups: 1) PIR operations, and 2) users and visitor spending. This categorization scheme is appropriate for two reasons. First, expenditures by PIR on facility operations are fed into the economic impact model differently than those of users and visitors to the facility.[5] Second, this categorization scheme proved quite useful to identify revenues and expenditures across the two main types of activities and prevent possible double counting.

Data Relied Upon

In order to implement the IMPLAN model, the various expenditures by the PIR, and users and visitors to the facility must be attributed to the 509 industry sectors handled by the IMPLAN model. ECONorthwest relied extensively on PIR operational data for the 2004 calendar year and results from the user and visitor surveys as inputs into the economic impact model. Sometimes information came from PIR financial reports. Sometimes it came from special compilations of data that ECONorthwest requested from PIR staff. The precision and usefulness of this report's conclusions are necessarily dependent on the quality and completeness of the data and information provided by PIR staff.

Net Economic Impacts

It's important to reiterate the goal of this analysis—PIR asked ECONorthwest to measure the net impacts of the raceway on Multnomah County. Under this modeling approach, only spending that is new or additive to Multnomah County is included. This modeling approach yields impact estimates that are more conservative than those measured in a gross impact analysis, but produce a more reliable estimate of the contribution of PIR to the local economy.

[5] Impact analysis can be performed at two levels. There is a "Simple Analysis" which looks at changes in demand for some particular industry that is contained in the IMPLAN model of the region. This level of analysis is used for the user and visitor spending. There is also a "Complex Analysis" which looks at a new activity or industry not contained in the IMPLAN model of the region. The Complex Analysis requires that the user know the output, employment, income, and first round of indirect purchases. This level of analysis is used for modeling the impacts of PIR's operations.

The net economic impacts of PIR on Multnomah County are reported in Table 12 below. These economic impacts are for the 2004 calendar year.

Table 12: Economic Impacts, by Type

Impact Type	Output	Wages	Business Income	Other Income	Jobs
Direct	$21,650,000	$7,550,000	$1,580,000	$2,090,000	420
Indirect	8,680,000	3,170,000	370,000	1,590,000	100
Induced	15,010,000	6,200,000	790,000	1,900,000	170
Total	$45,340,000	$16,920,000	$2,740,000	$5,580,000	690

Source: ECONorthwest

The implication of using a net impact analysis approach can be seen, for example, in the direct output measure reported in Table 12. The direct output (or sales) attributed to PIR is largely based on net spending by track users and visitors. Based on survey results, ECONorthwest estimates that gross spending by track users and visitors was approximately $55.3 million in Multnomah County in 2004 (excluding admissions costs, participation fees, and rents paid to PIR).

After making adjustments to exclude redirected spending and spending that would have occurred without PIR, ECONorthwest estimates that net local spending by track users and visitors in 2004 was approximately $37.1 million. This estimate of net spending represents new spending in Multnomah County that would not have occurred but for PIR. It is this net spending that forms the inputs used in the impact model. (The direct output measure of $21.7 million reported in Table 12 is less than net spending because retail, wholesale, transportation, and other margins have been applied to sales generated in the various retail sectors.)

PIR employs four full time staff and approximately 50 part-time, seasonal workers. However, the direct employment impacts, as reported in the first line of Table 12, are approximately 420 full- and part-time jobs. These direct job impacts are much greater than the number of employees on PIR's payroll because they also include the jobs generated from local spending by users and visitors to PIR. PIR also directly generated approximately $7.6 million in wages and $1.6 million in income for business owners.

Almost all of the direct impacts are concentrated in the trade and service sectors of Multnomah County. However, these direct impacts filter down through the local economy. Spending by raceway visitors on lodging will generate impacts for local businesses that, for example, supply hotels with laundry or landscaping services. Indeed, purchases of intermediate goods and services from other businesses will indirectly generate another 100 full- and part-time jobs, and $3.2 million in wages for workers in other sectors of the economy.

Workers and small business owners who receive income from the PIR will spend much of it locally. This spending generates induced impacts. As shown in Table 12, the induced effects are significant. Approximately 170 jobs and $6.2 million in wages are induced by personal income generated as a result of PIR.

As seen in Table 12, spending associated with PIR has a "multiplier effect" on the Multnomah County economy. In total, approximately $45.3 million in output, $16.9 million in wages, $2.7 million in small business income, and 690 jobs were generated by PIR in 2004.

The multiplier effect measures the overall impact with which spending in one sector influences or affects jobs and incomes in other sectors of the economy. Because it measures sales, incomes, jobs or taxes, the multiplier can be assessed using various measures. For instance, the PIR employment multiplier is approximately 1.60 (690 total jobs divided by 420 direct jobs). Thus, for every ten jobs directly attributed to PIR, an additional six jobs are generated in other sectors of the local economy.

Table 13, below, provides additional details of the total economic impacts in other business sectors that are affected by the spending generated or attributed to PIR.

Table 13: Impacts by Sector, 2004

Industry Sector	Output	Wages	Business Income	Other Income	Jobs
Construction	$1,830,000	$670,000	$220,000	$80,000	20
Manufacturing	1,860,000	430,000	20,000	210,000	10
Trans, Comm, Utilities	2,300,000	710,000	80,000	350,000	20
Trade	7,600,000	3,130,000	300,000	410,000	110
FIRE[1]	3,330,000	630,000	120,000	1,130,000	20
Services	25,650,000	9,260,000	2,000,000	2,980,000	470
State & Local Govt	2,730,000	2,080,000	0	410,000	40
Total All Industries	$45,340,000	$16,920,000	$2,740,000	$5,580,000	690

Note: "FIRE" stands for Finance, Insurance and Real Estate.

Table 14 shows the local industries that benefit the most from the ripple effects—i.e., the indirect and induced impacts—of PIR. The left hand column in Table 14 shows those industries that benefit from the direct spending generated by PIR. Ranked by job impacts in descending order, food services and drinking establishments; hotels and motels; and various types of retailers benefit directly from PIR.

Table 14: Industries Affected by PIR, Top 10 in Descending Oregon

Directly Affected Industry Sectors	Industries Affected by Subsequent Spending
1. Food services and drinking places	1. State and local government
2. Hotels and motels	2. Food services and drinking places
3. Miscellaneous store retailers	3. Wholesale trade
4. General merchandise stores	4. Real estate
5. Sporting goods, hobby and other stores	5. Employment services
6. Motor vehicle parts and repair services	6. Medical services, including hospitals
7. Food and beverage stores	7. Food and beverage stores
8. Other personal services	8. Residential construction and repair
9. Gasoline stations	9. General merchandise stores
10. Insurance carriers	10. Nonprofits and community organizations

Source: ECONorthwest

The direct impacts are almost entirely within the service and trade sectors of Multnomah County. However, spending by businesses and employees in these sectors will generate impacts for others. The right hand column in Table 14 shows the multiplier process at work. It lists the top ten industries that are affected as the initial economic stimulus generated by PIR makes its way through the local economy. Ranked by job impacts in descending order, state and local government; food services and drinking establishments; and the wholesale trade sector are at the top of the list.

The economic impacts attributed to PIR will also generate tax revenues. Table 15 provides a summary of these fiscal impacts by type of tax. In total, PIR generated approximately $2.6 million in additional tax revenues for various state and local tax jurisdictions.

Table 15: State and Local Tax Impacts

Type of Tax	Amount
Income Taxes	$609,100
Property Taxes	$1,176,200
Motor Vehicle Licensing Fees	$55,300
Other Taxes	$275,900
Other NonTaxes	$423,600
Social Insurance Taxes	$37,300
Total	$2,577,400

Notes:
"Other taxes" include various types of business licenses and hunting, fishing and other licenses paid by households.
"Other non-taxes" include rents, royalties, special assessments, fines, settlements and donations paid by businesses, and fines and donations paid by households.

PIR's Contribution to the Multnomah County Economy in 2004

Using a net impact analysis framework makes it possible to examine how PIR contributed to the local economy in 2004. From any economic measure, the net contributions of PIR were positive. Indeed, even after excluding redirected spending and spending that would have occurred even in the absence of PIR, ECONorthwest estimates that Multnomah County would have had approximately 690 fewer jobs in 2004 without PIR.

Given the size of the Multnomah County economy and its workforce, the impacts of PIR in an overall context are small but not trivial. For instance, absent PIR, the number of unemployed workers in Multnomah County would have gone up 2.4 percent, and the average annual county unemployment rate in 2004 would have been 7.8 percent instead of 7.6 percent.[6]

However, much of economic impacts from PIR are concentrated in the service and trade sectors. Indeed, Multnomah County's accommodations and food service sectors receive approximately 45 percent of the total job impacts attributed to PIR. In total, the job impacts of PIR represent almost 1.0 percent of the total, private covered employment in these sectors in 2004.

Fiscally, PIR also contributes to state and local tax jurisdictions. For example, the largest type of tax generated by PIR is property taxes. In Oregon, property taxes are collected by counties and, in Multnomah County, property taxes represent the largest source of revenues for the county general fund. The general fund pays for a variety of government programs, including health and human services; school and community partnerships; community justice, the district attorney's and sheriff's office; and community and business services. PIR is self-financed and generates additional tax revenues that would have been foregone but for the existence of PIR. As such, PIR is a net contributor (approximately $1.2 million) to these county-sponsored programs, and to other programs (approximately $1.6 million) provided by other state and local government agencies.

[6] According to annual labor force statistics compiled by OLMIS, in 2004, Multnomah County's civilian labor force totaled 274,146 persons and the number of persons who were classified as unemployed was 28,532. The unemployment rate represents the percentage of the labor force that is unemployed. Therefore, the average annual unemployment in Multnomah County in 2004 was 7.6 percent (28,532 divided by 274,146). Absent PIR, the estimated unemployment rate of 7.8 percent is calculated by including the 690 jobs attributed to PIR in both the numerator, (e.g., [28,532+690] divided by 274,146).

Appendix A Economic Impact Analysis

This appendix provides a detailed discussion of the modeling tools and analysis methods used to estimate economic impacts. The appendix begins with a discussion of what economic impacts are and how they can be measured using an input-output modeling framework. It then discusses the limitations of input-output analysis, with recommendations on when an input-output model should be used. This appendix concludes with a discussion of the IMPLAN modeling software, which is a widely used model for estimating economic impacts. It is the input-output modeling software used to measure the economic impacts reported in this analysis.

Economic Impacts

Simply put, *economic impacts* are changes in economic activity as a result of some initial change in the economy. Although the initial stimuli can vary, economic impacts are typically measured as changes in output (or sales), income (value added), and jobs. These economic impact measures are described in greater detail below.

- **Output** is the broadest measure of economic activity. It represents the total value of production or, alternatively, business revenues. Output includes the costs of materials and labor, net business income (profits), and indirect business taxes.

- **Income** represents the total payments to workers (wages) and business owners (proprietor and corporate income). Together, wages and business income are often referred to as personal income. Corporate income represents net business income or profits. These may be reinvested or paid as dividends to shareholders. Income excludes payments from one industry to another for the purchase of intermediate goods, and is often used as a measure of the value added during production.[7]

- **Jobs** represent the number of additional jobs gained or lost as a result of some economic activity. Job impacts are the most popular measure of economic impacts because they are easy to understand.

Economic impacts often lead to changes in government revenues and expenditures. These *fiscal impacts* occur as changes in output, income, and jobs, lead to changes in the regional tax base and demand for government services. These fiscal impacts represent an additional dimension or measure of economic impacts.

[7] Alternatively, value added is measured as total output less purchases of intermediate goods and services. In either case, the measure of value added will be the same. However, to the extent that owners of corporations live outside the relevant study area, including corporate income will tend to overestimate the measure of value added in production.

Economic impacts should not be confused with *user benefits* or *social impacts*. For example, a roadway improvement project may produce user benefits such as faster travel times and improved safety. The same road improvement project may generate additional benefits for others[8] in the form or lower pollution or noise abatement. These broader benefits or impacts can certainly be measured or monetized using, for instance, a "willingness to pay" approach. However, they are not economic impact measures.

Economic impacts are often revealed by changes in property values. However, including changes in property values with changes in personal or business income would double count impacts. For example, increases in personal and business income may lead to an increase in the demand for property. This increase in demand, all else considered, would cause property values to increase. Hence, the initial change in personal and business incomes are reflected or captured by the increase in property values.

Purpose of Measuring Economic Impacts

There are a number of reasons economists conduct economic impact analysis. An example is the estimation of the employment and income that result from a new manufacturing facility. Community leaders use these estimations to weigh the costs and benefits of the project. Policy makers use the forecast of additional tax revenue to evaluate permitting options.

An alternative task may involve considering the optimal course of action given a set of pending decisions. Land managers frequently conduct analyses of development alternatives to determine which yields the highest return. Land use planners use economic impact analysis to consider appropriate geographical placement for commercial zoning.

Impact analysis is also used to evaluate the effectiveness of an ongoing or completed project. These types of post-project analyses typically contrast actual outcomes (*e.g.*, number of jobs created or amount of income generated) with projected outcomes. The results can indicate if the project was as effective as anticipated and the reasons why.

Key Issues Affecting Economic Impact Analysis

Economic impact analysis is sometimes viewed with disapproval and impact measures are often criticized as being exaggerated and/or unreliable. Much of the uncertainty regarding economic impact analysis centers on two inter-related aspects of the modeling process. The first issue involves the general type of impact analysis being prepared. Is the analysis intended to measure the linkages between industries or the contribution of an industry to a region? The second issue involves specifying the relevant geographic area under consideration. Is the analysis intended to measure economic impacts on a city or a state? Both of these issues are discussed in greater detail in the following sections.

[8] In economics, benefits received or costs imposed on others are called *externalities*.

In the next section, we will show that the input-output modeling framework is, itself, quite sophisticated in both construction and specification. The input-output model does have limitations, but used correctly and in the proper setting, it can produce reliable measures of economic impacts.

Gross Versus Net Economic Impacts

Simply citing the economic impacts that occur as a result of some activity would produce an upper bound estimate of economic impacts. This upper bound estimate is often referred to as a measure of the "gross" economic impacts. Gross economic impacts offer a perspective on the magnitude of overall economic impacts that can be traced back to the activity. Gross economic impacts, however, do not accurately reflect the creation of new jobs or income as they do not take into account the jobs or income creation that would have occurred in absence of the activity being analyzed.

This problem is addressed by analyzing the "net" economic impacts of a given activity. An analysis of the net economic impacts requires that only economic stimuli that are new or additive to the local economy be counted. To do this, the impact analysis must include a "base case" or "counterfactual" scenario that describes what would have happened in the absence of a change in the economy.

Establishing a base case affects an analyst's ability to properly identify cause-and-effect relationships. Attributing effects to causes, and doing so only once (i.e., avoiding double counting) is essential to an evaluation of net economic impacts. In impact analysis, this base case scenario is typically implemented by positing a counterfactual argument that only counts spending that "but for" the project or activity would not have occurred.

To get a better understanding of how this base case scenario affects the impact analysis, the three components of the counterfactual argument related to a net impact analysis of a new business activity, for example, are described below:

1. Net impacts include expenditures by non-local sources that would have gone to non-local businesses *but for* the local presence of the new business. (The new business is an "exporter" of goods and services. In this sense, the new business brings in new spending to the community.)
2. Net impacts include expenditures by local sources that would have been spent outside of the local economy *but for* the local presence of the new business. (This is called "import substitution." The new business keeps local spending in the community.)
3. Net impacts would make deductions for expenditures by local sources that would have gone to other local businesses *but for* the new business. (This is a form of "direct substitution." The new business may actually divert spending away from other local businesses. This spending should not be included in the impact analysis.)

Net impacts are often considerably smaller than gross impacts, but provide a truer picture of the benefits from a stimulus. Using a net impact approach, the analyst is better able to answer the following question: How much better off is the local economy because of the activity or project relative to the base case alternative?

At the outset, one should decide whether the question being posed for analysis requires that net or gross impacts be determined. A common mistake is to use the results from a gross impact analysis to answer a question about the benefits or improvement to an economy due to a project or activity. This often leads to unrealistic claims about economic impacts.

Definition of the Relevant Study Area

The economic impacts of an activity will differ depending on how the area being evaluated is defined. When measuring economic impacts, it is crucial that the analyst carefully select the relevant region or study area. Is the study area a neighborhood, a county, a combination of counties, or the entire state? Once chosen, it is important that the analyst clearly explain the rationale underlying selection of the relevant study area.

A simple example illustrates the implications of the study area definition for the measurement of economic impacts. Suppose a business relocates from a central city location to a suburb outside of the city. With a narrowly defined study area, the suburb clearly benefits from the new jobs and income that come into the region. These benefits come at the expense of economic activity in the city. However, with a larger study area—say a metropolitan or state definition—there is simply a shift in economic activity from one area to another. Thus, with the larger study area, the net economic impacts are minimal or even zero.

The study area must be carefully selected. If the study area is too small, then important impacts that occur just outside of the selected area will be ignored. If the study area is too large, then important shifts in economic activity within the region will be masked. Definition of the relevant study area for economic impact analysis should be guided by:[9]

- **The area of project influence.** The study area should consider the location of impacted industries and households. This involves consideration of the initial impact site, location of the labor force and supporting industries, and travel corridors.

- **The sponsoring agency's area of jurisdiction.** The study area may be defined so that consideration is given to the agencies that are funding the project or activity. Is the agency a county agency or state agency?

[9] See, for example, Weisbrod, Glen and Weisbrod, Burton, "Measuring Economic Impacts of Projects and Programs," Economic Development Research Group, Boston, MA, 1997.

- **The distributional impacts.** Some projects are undertaken to reallocate investment within a region, such as economic development programs designed to generate jobs and income in historically economically depressed areas. In this instance, the study area could be configured to show the economic impacts to the target region even though the net benefits for a larger region may approximate zero.

Input-Output Modeling for Impact Analysis

To conduct an economic impact analysis, a model should be constructed that considers the relationships between local industries, with households as suppliers of the factors of production, with industries outside of the region, and with final users of goods and services. The most widely used modeling framework for economic impact analysis is known as input-output modeling.[10]

The most accurate regional input-output models are constructed from survey data acquired from local businesses. The survey helps to determine what goods and services are being purchased, and whether local or non-local sources are being used. Conducting these surveys is expensive and time consuming. Indeed, survey based input-output models place significant demands on data, and are uneconomical to use in most situations. As a result, very few input-output models have been developed using surveys or what is called primary source data.

Fortunately, special data techniques have been developed to estimate the necessary empirical relationships and regional measures of economic activity using secondary source data. This non-survey approach means that input-output models can be economically constructed using commercially available economic impact modeling software that relies on secondary source data collected by government agencies.

Several important points about input-output models:

- An input-output model provides a reasonably comprehensive picture of the economic activities within a region, and can be constructed for almost any region or study area.

- Input-output models use a simple, rectangular accounting framework called double-entry accounting. This results in a model structure that is well ordered, symmetric, and where, by definition, inputs must be equal to outputs. This important aspect of the input-output modeling framework allows the analyst to "shock" an economy, and trace the impacts from one sector to another as the economy goes from one equilibrium to another.

[10] Although initially inspired by Quesnay's "Tableau Economique," and the Marxian and Walrasian analysis of general equilibrium, input-output analysis was first put to practical use by Wassily Leontief in the late 1930's. While at Harvard, Leontief used his input-output system to construct an empirical model of the United States economy. This research gave rise to his 1941 classic, "Structure of American Industry, 1919-1929." For his research, Leontief was awarded the Nobel Prize in Economics in 1973.

- In order to provide a common unit of measure, all transaction flows in an input-output model are stated in dollars.

Features of Input-Output Models

Input-output models serve two general purposes. First, the input-output framework is useful for organizing information about the structure of a regional economy. Using standard accounting conventions, input-output models describe the flow of commodities between producing and consuming sectors, the flow of income between businesses and institutions, and the trade in commodities between regions. In this manner, the input-output modeling framework can be used for *descriptive* purposes. For instance, researchers can evaluate the relative importance of various industry sectors to the local economy, e.g., the number of jobs or purchases from other local industries.

Once the information on the various transactions within an economy has been gathered and organized using the input-output framework, the data can be manipulated using a special field of mathematics called matrix algebra. This phase of input-output modeling produces "multipliers" and allows researchers to use the input-output model for *prescriptive* purposes. For example, a researcher can estimate the "ripple" effect that a change in one sector has on the entire economy.

Economic Linkages

An input-output model begins with a transactions table that provides a reasonably comprehensive description of an economy and linkages between economic sectors. Table A-1 shows a hypothetical transactions table for an economy with three industry sectors. For exposition purposes, the table has been divided into four quadrants.

Table A-1: A Transactions Table for a Hypothetical Economy

		INTERMEDIATE DEMANDS			FINAL DEMANDS			
	Buyer / Seller	Agriculture	Manufacturing	Services	Household Demand	Other Demand	Exports	Total Outputs
	Agriculture	$600	$100	$400	$700	$100	$1,300	$3,200
	Manufacturing	$200	$700	$800	$1,400	$600	$300	$4,000
	Services	$200	$400	$1,500	$1,600	$200	$1,000	$4,900
FINAL PAYMENTS	Wages	$900	$600	$1,000				
	Other Earnings	$500	$400	$600				
	Imports	$800	$2,200	$1,200				
	Total Inputs	$3,200	$4,000	$4,900				

NONMARKET TRANSFERS

The top left quadrant of the transactions table describes the production relationships between industries in the economy. This portion of the table describes the way raw materials and intermediate goods are provided by some industries ("sellers") and used by other industries ("buyers") to produce final goods and services. Because industries are buying from other industries, it describes the *intermediate demands* for goods and services.

The upper right quadrant of the transactions table shows who consumes the final goods and services. In this simple hypothetical transactions table, the *final demand* sectors consist of households, others,[11] and exports. In more sophisticated input-output models, the final demand sectors are more extensive and explicitly identified in the model.

By combining the top two quadrants of the transactions table, researchers can trace the flow of goods and services from producing industries to other industries and final consumers. The sum of each row shows the total output or production of each industry. For instance, the value of total output produced by the agriculture sector is $3,200. Of this amount, $1,100[12] is used in production by other industries. The remainder is sold to final consumers—households consume $700 worth of agricultural output; government and businesses consume $100 worth of agricultural output; and $1,300 of the total agricultural output is sold to entities outside of the region. The rows in the transactions table describe the "forward linkages" in an economy.

The lower left quadrant of the transactions table describes the transactions between businesses and the suppliers of factors of production. Labeled *final payments*, this section of the input-output model depicts the flow of income from businesses to households (wages), others,[13] and imports. The income components, excluding imports, are the elements of value added.

[11] "Other demand" consists of government and business spending, including additions to business inventories.

[12] This amount represents the sum of the intermediate demands across all sectors, i.e., $600 agriculture, $100 manufacturing, and $400 services.

[13] "Other earnings" includes small business income, corporate profits, and indirect business taxes paid to government.

The left side of the transactions table shows the purchases and payments by industries to other industries and other institutions within the economy. The sum of the entries for each column represents the total purchases by that industry. The agricultural sector shows large intra-sector purchases ($600) from others within the agriculture sector, e.g., to produce milk the dairy must buy significant quantities of feed. Firms in the agriculture sector will also hire workers and pay wages ($900). In addition, firms will pay taxes and earn profits ($500), and purchase imported goods and services ($800). From this example, we can trace all of the purchases for each sector of the economy. The columns in the transactions table describe the "backward linkages" in the economy.

As discussed previously, the input-output model is based on a double-entry accounting convention where inputs must be equal to outputs. Because government and businesses are implicitly included in Other Demand (government purchases, capital investment and inventories) and Other Earnings (taxes and profits), inputs must be equal to outputs. The agriculture sector of this economy produces $3,200 in output. To do this, the agriculture sector must purchase $3,200 in inputs from other industries, households, government, businesses and foreigners. The input-output model, thus, is a balanced or symmetrical model because total sales (outputs) of each industry equal the total purchases (inputs) by each industry.

In order to emphasize the relationships among businesses and institutions, the lower right hand quadrant of the transactions table labeled "Non-Market Transfers" has been left blank. This section of the transactions table contains information regarding inter-institutional transfers or non-market financial flows between households, businesses, government and foreigners.

Economic Multipliers

The transactions table provides a reasonably comprehensive description of the economy at a given point in time. Using annual data, it shows how much an industry produces, what it purchases, and to whom the final output is sold. It also distinguishes local from non-local sources of spending and production. In this form, the transactions table fully describes the linkages between the various sectors of the economy, but has no predictive or analytical capabilities.

The information contained in the transaction table can be expanded and then manipulated using matrix algebra to construct *multipliers* that measure the total impacts from a change in final demand on all industries in an economy. It is through this matrix operation that the input-output model is converted from a descriptive to a prescriptive model.

Economic impact multipliers allow researchers to follow the initial change in economic activity as it "ripples" through each industry sector. For any given type of change in economic activity, the impacts on the economy can be reported on one of three levels.

- **Direct** impacts represent the initial change in final demand for the industry sector(s) in question. Direct impacts describe the changes in economic activity for sectors that first experiences a change in demand because of a project, policy decision, or some other stimuli.

- **Indirect** impacts represent the response as supplying industries increase output in order to accommodate the initial change in final demand. These indirect beneficiaries will then spend money for supplies and services, which results in another round of indirect spending, and so on.

- **Induced** impacts are generated by the spending of households who benefit from the additional wages and business income they earn through all of the direct and indirect activity. The increase in income, in effect, increases the purchasing power of households.

The following example illustrates how these types of impacts affect overall economic activity. Suppose that a new manufacturing facility comes to a region. The direct impacts would consist of the value of output produced at the facility, and the number of employees working at the facility and their payroll.

In order to operate, the manufacturing facility will purchase a host of goods and services including, for example, spare parts and equipment, repair services, electricity, water and sewer, etc. This spending generates the first round of indirect impacts. Suppliers and vendors to the manufacturing facility will also have to purchase additional goods and services. The local special trade contractor hired to repair a component on the manufacturing floor will purchase welding equipment and gases, lease equipment, and fuel their vehicles. This spending leads to another round of indirect impacts.

The direct and indirect increases in employment and income enhance the overall purchasing power in the economy. Workers at the manufacturing facility will use their income to purchase groceries or take their family to the theater. Workers at businesses who supply the manufacturing facility will do the same. This spending will generate induced economic impacts for workers and businesses in other sectors of the economy.

This cycle of spending does not go on forever. It continues until the spending eventually leaks out of the local economy as a result of taxes, savings, or purchases of non-locally produced goods and services or “imports”. As discussed previously, we can now see how the definition of the study area affects the impact analysis. A larger study area will have greater economic linkages between businesses and institutions, and a smaller propensity to import. As a result, the initial economic stimulus filters throughout the economy more than it would for a smaller study area, and the multipliers are larger than they would be for a smaller study area.

Limitations of Input-Output Modeling

The input-output modeling framework for economic impact analysis has grown in popularity. Much of this growth is due to significant improvements in computer technology that now make it possible to quickly perform the complex matrix operations. Some of this growth is due to improvements in government data collection efforts. Lastly, the growth in input-output modeling has been fueled by the desire of policy makers, industry officials, and others to obtain information that will help them to better understand and respond to economic change.

Like many quantitative tools, input-output models rely on a set of assumptions. Indeed, without simplifying assumptions it would be impossible for researchers to model something as complex and dynamic as a regional economy. The use of simplifying assumptions, however, also imposes certain limitations on the use of input-output modeling. These limitations should be fully understood and guide its use.

Input-Output Modeling—Static Models

Input-output models are static models in that they measure the flow of inputs and outputs in an economy at a point in time. With this information and the balanced accounting structure of an input-output model, an analyst can: 1) describe an economy at one time period, 2) introduce a change to the economy, and then 3) evaluate the economy after it has fully accommodated that change.

This type of analysis is called "partial equilibrium" analysis. Input-output models are just one of many economic models that fall under the rubric of partial equilibrium analysis. The logic of partial equilibrium analysis is straightforward: take a snapshot of an economy, posit a change to the economy, and then take another snapshot to measure what happened. Measurement in this sense is really a before and after comparison.

Partial equilibrium analysis permits comparison of the economy at two points in time, but yields little information about how the economy actually moves from one equilibrium to the next. In fact, in partial equilibrium analysis, other than the initial economic stimulus, the researcher assumes that all other relationships in the economy remain the same.

Their point-in-time construction and the assumption that nothing else changes, make static input-output models very different than dynamic models. Dynamic models have feedback effects that allow the events of one year to change the linkages in future years. In so doing, dynamic models simulate the expected long-term changes in the structure of the economy. Contrary to dynamic models, static models assume that there are no changes in wage rates, input prices, and property values. In addition, underlying economic relationships in input-output models are assumed constant, i.e., there are no changes in the productivity of labor and capital, and no changes in population migration or business location patterns.

The assumptions and their implications for input-output modeling are discussed below.

Fixed Production Relationships

Input-output models are a representation of economic relationships that exist at a moment in time. For industries, this means that input-output models are based on production relationships that are fixed. This assumption results in:

- **Constant Returns to Scale** means that an industry's production function is linear, and an increase in output requires all inputs to increase proportionately. If the demand for milk doubled, for instance, then the demand for all of the inputs used to produce milk would also double. In the long run, production processes exhibit economies and diseconomies of scale that vary with the level of output. An industry with scale economies would be able to double production without necessarily doubling all inputs.

- **Fixed Commodity Input Structure** means that input-output models do not allow changing input prices to affect the production decisions of businesses. Input-output models assume that changes in an economy will affect the output of industries but not the mix of inputs that they use. Using the previous example, dairies respond to the increase demand for milk by simply increasing production of milk. Input-output models, in effect, ignore possible changes in the prices of inputs used to produce milk. Depending on the size of study area and the economic stimulus, an increase in demand for output could cause one or more input prices to increase. If the increase in demand for milk caused the wage of dairy workers to increase, then economic theory suggests that dairy farmers would have an incentive to substitute other inputs for labor.

No Supply Constraints

Input-output models show how local industries respond to some initial change in final demand, but assume that supplies of raw materials and intermediate goods are unlimited, i.e., perfectly elastic. Under an assumption of no supply constraints, an industry simply responds to a change in final demand by increasing output, and it increases output by acquiring inputs that are readily available at current prices.

Sector Homogeniety

An industry consists of businesses producing goods and services—these are called commodities in input-output modeling. Businesses can produce more than one type of commodity, i.e., they produce a primary commodity, but can also produce secondary commodities or by-products.

In input-output modeling, industry sectors are assumed to be homogenous. That is, all businesses within an industry sector 1) produce commodities in fixed proportions and 2) produce identical commodities that are perfectly substitutable. Using the previous example, an increase in demand for milk will cause dairy farms to increase production of milk as well as other by-products such as buttermilk, cottage cheese, and sour cream. If the demand for milk doubled causing milk production to double, then the output of by-products will also double. In addition, dairy farms are assumed to produce milk that is perfectly identical across farms.

Input-Output Modeling—Practical Considerations

Apart from the limitations imposed by the static nature of input-output models, there are also some very practical considerations that should also guide their use. These practical considerations are discussed below.

Lag Between Data Collection and Modeling

Input-output models can be constructed for almost any geographic region. Typically, their structure is based on a national input-output model[14] that is then combined with national and regional economic data to tailor the model to a specific study area. However, there is often a lag between actual data collection and incorporation of that data into the modeling software. With this implementation lag, changes in the structure of an economy—such as improvements in technology, changes in demand, and changes in regional trade patterns—will affect the multipliers and make the results less reliable. Obviously, input-output models constructed with the most current data available will provide the most accurate results.

Time

Economic impacts occur over time. As discussed previously, depending on their occurrence, impacts can be categorized as direct, indirect, and induced. These impacts are far from instantaneous. The implications for impact analysis are two-fold.

First, sometimes the effects of a large project can span several decades. The direct hires and payment of wages and benefits will also span that period of time. In this context, the researcher must consider the fact that inflation erodes purchasing power over time. If economic impacts are to be reported accurately, each dollar needs to be presented in terms of its economic value today. Economists must use a base year when conducting input-output analysis. All transactions that occur after that base year should be discounted by some factor to account for expected changes in the relative value of the dollar.

[14] The U.S. Bureau of Economic Analysis constructs national benchmark input-output accounts every five years. The most current version available is the 1997 benchmark accounts. BEA estimates that the 2002 benchmark accounts will be completed by the summer of 2007.

The inflation assumptions that are built into an input-output analysis can have a profound impact on its results. Underestimating inflation by just one percent will inflate the net present value of a multi-million dollar project by a wide margin.

Second, the indirect and induced impacts take time to filter through the economy. Researchers use economic multipliers calculated in input-output analysis as a mathematical short cut for providing an estimate of final impacts. These final impacts are generated as spending cycles between businesses, consumers, governments and foreigners. This multiplier process takes time.

When to Use Input-Output Models

Input-output modeling does have limitations, but, used correctly and in the proper setting, can produce reliable measures of economic impacts. Obviously, from a practical standpoint, input-output models constructed with the most current data available will produce the most reliable results. This will tend to minimize any changes that occurred in an economy between the time the data was collected and actually used.

From a modeling perspective, the input-output framework is suitable for analysis of economic changes that do not threaten the underlying assumptions embedded in the model. This suggests that the economic change being evaluated should be short-run in duration and of modest size relative to the economy under consideration. A large project, for instance, may affect an economy's production possibilities or involve supply constraints. This, in turn, may cause equilibrium prices to change resulting in substitutions in production and/or imports.

The IMPLAN Input-Output Modeling Software

One of the most common software packages used to conduct input-output analyses is IMPLAN (IMpact analysis for PLANning). IMPLAN was developed by the US Forest Service in cooperation with the Federal Emergency Management Agency and the Bureau of Land Management to assist federal agencies in their land and resource management planning. Since 1993, IMPLAN has been maintained and distributed by the Minnesota IMPLAN Group, Inc.[15] Currently there are over 1,500 public and private users of the IMPLAN modeling software.

Applications of IMPLAN by the US Government, public agencies, and private firms span a wide range of projects. Examples include new factories, resorts, proposals for developing coal mines, and harvesting timber. IMPLAN can also be applied to a variety of policy issues. Predicting the effects of a tourism marketing campaign or measuring the importance of an existing industry on a local community are common examples.

[15] For additional information, see the Minnesota IMPLAN Group's website at www.implan.com.

The Structure of the Input-Output Model in IMPLAN

IMPLAN uses a commodity/industry accounting framework that corresponds closely to that used in the Bureau of Economic Analysis "Input-Output Study of the U.S. Economy," and those recommended by the United Nations.

IMPLAN Database

IMPLAN uses a large database of regional and national data to forecast economic activity. The main sources of data are:

- US Bureau of Economic Analysis 1997 Benchmark I/O Accounts
- US Bureau of Economic Analysis Output Estimates
- US Bureau of Economic Analysis REIS Program
- US Bureau of Labor Statistics Covered Employment and Wages or ES202 data
- US Bureau of Labor Statistics Consumer Expenditure Survey
- US Census Bureau County Business
- US Census Bureau Decennial Census and Population Surveys
- US Census Bureau Economic Censuses and surveys
- US Department of Agriculture Crop and Livestock Statistics
- US Geological Survey

In IMPLAN, the process that develops county-level input-output models generates coefficients that are internally consistent, in that county data sum to state totals and state data sum to national totals. This generally is not the case with survey-based input-output models, which limits their applicability to large-scale projects that affect a number of interrelated regions.[16]

Sectors

A sector consists of industries that produce similar products or services. IMPLAN breaks an economy down to 509 separate industry sectors based on the North American Industrial Classification System ("NAICS").

Final Demands

Final demand is sum of all purchases of goods and services for final consumption within an economy. In the IMPLAN model, final demands are in producer prices and are allocated among industry sectors. In addition, final demands are adjusted or "margined" to reflect the transportation, wholesale, and retails costs of getting products from industries to consumers.

The IMPLAN model has the following major categories of final demand:

[16] Arguably, however, an input-output model estimated from survey data has more accurate coefficients, because the survey can be customized to the problem at hand. In contrast, IMPLAN *derives* its coefficients using a combination of the national input-output survey model and local activity data; conceivably, this will produce somewhat different results from a direct, local survey. Given the difficulty and expense of input-output surveys, however, the disadvantages of the IMPLAN approach are slight.

- **Personal Consumption Expenditures.** The largest component of final demand comes from household spending. Households consume a wide variety of goods and services, including food, energy, housing, and transportation. They also use some of their personal income to pay taxes, save for the future, pay debts, or purchase new housing. In IMPLAN, households are disaggregated by income levels to account for different spending patterns across income levels.

- **Federal Government Purchases.** Government purchases are broken down into two categories: military and non-military. Military expenditures include any purchases made in the interest of national defense. Non-military expenditures include all other purchases made by the federal government for the remaining services it provides.

- **State and Local Government Purchases.** State and local government purchases are also broken down into two categories: education and non-education. Spending on public education goes primarily to compensate teachers, but also includes things like textbooks and supplies. Non-education spending includes anything not spent for public education such as police, fire and emergency servicees, and state-sponsored healthcare.

- **Inventory Purchases.** Inventories accumulate anytime an industry fails to sell all of its output in a given year. Goods can be sold out of inventory any time sales exceed production. Industries rarely sell exactly what they produce each year, so this category is a widely used tool for reconciling economic activities.

- **Capital Formation.** A large component of productive capability is capital. Industries use varying quantities of capital depending on the nature of goods and services they provide. The manufacturing sector, for example, tends to require large investments in property, plant, and equipment for the goods it produces. This category of final demand contains all spending on capital equipment.

- **Foreign Exports.** Just as some economies must import goods and services from outside their borders, other economies sell a significant portion of their output overseas. Demand for final goods and services that come from beyond a region's borders falls into this category. Although the consumption happens elsewhere, input-output analysis is concerned with where the goods and services are produced.

Types of impacts

IMPLAN reports economic impacts as measured by changes in output, incomes (value added), jobs and taxes. The value added or income measure is broken out into four categories. These measures of economic impacts consist are:

Output: The total value of the production of a sector is its output. For most sectors, output approximately equal to sales. The notable exceptions are government and the trade sectors. The output of government sectors is approximately equal to revenues. For the trade sector, which consists of firms that buy goods and re-sell them, output is roughly the difference between what they sell goods for and what they paid to procure them. The trade sector consists of wholesalers and retailers.

Value Added: This is a measure of the value added to the economy by a sector. It equals the sum of the wages, proprietor income, other income, and indirect business taxes.

- **Wages** represent the total cash and non-cash compensation of workers on payroll. This includes the value of benefits.

- **Proprietor Income**, sometimes called small business income, is the amount earned by self-employed workers and the working owners of small businesses.

- **Other Income** counts all other sources of income. The largest source of income is usually rents, but it may also include royalties, dividends, and corporate profits.

- **Indirect business taxes** are the excise and sales taxes paid by individuals to businesses.

Employment: The total number of payroll employees, including part time workers. The self-employed are not counted, however, their earnings are captured under proprietor income.

Taxes: Total Federal, state, and local tax revenues.

Modeling

The process of modeling in IMPLAN involves three steps:

1. Creation of study area database;
2. Customization of IMPLAN coefficients; and
3. Estimating the impact of an activity on the model of the study area economy.

The IMPLAN model allows substitution and incorporation of primary data at each stage of the model-building process, greatly increasing the model's accuracy and flexibility. In addition to being able to directly modify the IMPLAN database statistics, the user can alter import and export relationships, utilize modified input-output functions, and change industry groupings. IMPLAN allows the creation of aggregate models consisting of industries grouped together for a specific purpose.

The key to input-output analysis is the construction of the input-output or transactions table, which shows the flow of commodities from each of a number of producing industries to all consuming industries and final demand (ultimate consumers). Given that many industries produce more than one commodity, production information is often tabulated on an industry-by-commodity basis into a "Make" matrix, containing the value of commodities produced by different industries, and a "Use" matrix, containing the value of commodities used by each industry in the production process. These matrices are combined to produce the input-output transactions table showing each industry buying and selling from other industries.

From these industry flows, two other structural tables are developed: (1) a table of technical coefficients or direct requirements and (2) a table of direct and indirect coefficients or total requirements. The entries in the former are interpreted as the dollar value of the minimal requirements from each of the contributing industries in order for each producing industry to produce one dollar's worth of output. The entries in the latter table are to be interpreted as the amount of output from the contributing industries required, both directly and indirectly, to deliver one dollar's worth of the producing industry's output to final demand.

Defining the Study Area

The IMPLAN program uses an ordered series of steps to build the model. We describe them here to provide the interested reader with a view of the sequence of steps employed, and the types of data needed to model the impacts.

The first step is the definition of the study area or study areas. Study area databases are created corresponding to these areas. These databases contain the representation of the behavior of the study area economies, but do not contain any information about the specific project under study.

Customizing the IMPLAN Coefficients

The process of customizing the IMPLAN model does not stop with the development of the study area databases. Part of the expertise of input-output practitioners is in the customization of the model coefficients. Depending on the type of analysis, this enables the analyst to:

- Vary structural, technological, and/or trade factors within the model. For instance, the user may add or remove sectors from the model, or change the size of an industry, or the user may change production functions, or make changes in commodity imports and exports.

- Exclude expenditures that do not generate current economic activity, such as depreciation and amortization.

- Exclude expenditures that are known to occur outside the local economy. The IMPLAN model contains purchasing assumptions[17] for each industry sector that are specific to the study area. Instead of relying entirely on these purchasing assumptions, the analyst can identify and remove spending that is known to occur outside of local economy.

- The IMPLAN system permits a sector-by-sector breakout of transportation, wholesale, and retail margins, and allows the user to over-ride these margin assumptions using primary source data if available. For instance, instead of the estimated retail margin embedded in the IMPLAN model, the analyst can use actual retail margins for the activity.

Estimating Multipliers

The last step in building the model is to estimate the multipliers. Multiplier analysis is used to estimate the regional economic impacts resulting from a change in final demand. Impacts can be in terms of direct and indirect effects (commonly known as Type I multipliers), or in terms of direct, indirect, and induced effects (Type II and Type SAM multipliers).

More specifically, direct effects are production changes associated with the immediate effects of final demand changes. Indirect effects are production changes in backward-linked industries caused by the changing input needs of directly affected industries. Induced effects are the changes in regional household spending patterns caused by changes in household income—generated from the direct and indirect effects.

IMPLAN calculates two types of multipliers for each of the five impact measures. The first output multiplier represents the value of production, from indirect and direct effects, required from all sectors by a particular sector in order to deliver one dollar's worth of output. The second output multiplier adds in the induced requirements. The size of the multiplier is not a measure of the amount of activity or the importance of a given industry for the economy. It is an estimation of what would happen if that industry's sales to final demand increased or decreased. In other words, output multipliers can be used to gauge the interdependence of sectors; the larger the output multiplier, the greater the interdependence of the sector on the rest of the regional economy.

Performing Impact Analysis

Once the input-output model is built, impact analysis can be performed on the model. There are two general types of impact analysis. At a very simple level, an analyst can evaluate economic changes using industry sectors contained in the IMPLAN model. In this case, business revenues or employment are used to model changes in demand in the relevant industry sector.

[17] These purchasing assumptions are called "Regional Purchase Coefficients." They specify the ability of local suppliers to meet or satisfy a change in demand for a good or service.

In some cases, such as the entry of a new business, the industry sector may not be represented in the IMPLAN model of that region. This type of analysis is more complicated and requires the use of expenditure and revenue data to develop a spending pattern (or "production function") that is specific to the activity. Under this type of analysis:

- The **direct effects** are based on output, employment and personal income data supplied by the client.

- The **indirect effects** are measured by identifying changes in output for each industry from which goods and services are purchased. What is specified as direct impacts in this model are more precisely described as the first round of indirect impacts. Subsequent rounds of indirect impacts occur as vendors and suppliers purchase goods and services from other businesses, who will also need to buy goods and services. The indirect impacts of the activity are what the IMPLAN model reports as direct and indirect impacts in this model.

- The **induced impacts** are based, in part, on estimates of the direct personal income generated in production. This data is fed into a consumption function specific for that household income group and region. What is specified as direct impacts in this model are actually the first round of induced impacts, so what is reported as induced impacts are the total impacts from this model plus the induced impacts from the model inter-industry expenditures.

The IMPLAN model is perhaps the most popular input-output modeling system in use today. Of course, any software is susceptible to the "garbage in—garbage out" phenomenon. Thus, the accuracy of its results is dependent on the quality of the data used in the modeling process as well as the skills of the analyst in conducting the analysis.