ECONOMIC CONTRIBUTION OF THE GOLF INDUSTRY TO THE STATE OF NEW JERSEY

PREPARED FOR

NEW JERSEY GOLF COURSE OWNERS ASSOCIATION

OCTOBER 15, 2007

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EXECUTIVE SUMMARY

Nationwide golf's popularity expanded rapidly in the late 1990s. New Jersey especially benefited from the expansion. It gained 10 new courses for a total of 294 golf courses statewide by 2006. This rate of growth in courses was faster than that experienced nationally during the same period. Such rapid growth may have been a response to that state's relatively low household participation rate in golf.

Many studies have been performed to ascertain golf's economic contributions. This is the first to focus on New Jersey's experience, however. The object of this study is to identify the golf industry's total economic contribution to the State of New Jersey. We define the golf industry as the golf courses, tourism by visitors whose main purpose is to visit the state's golf-based tourism venues, golf retailing and wholesaling, nonstandard golfing venues (e.g., miniature golf, driving ranges, chip-and-putt courses), and the businesses that support these four segments.

A main focus of the study was a survey of the revenues and spending of golf courses in the state. The survey's fining suggest annual spending at golf courses in New Jersey amounts to

- $1.37 billion, of which about $211 million is put toward capital spending and the rest toward operations including the clubhouses, catering, and pro shops.
- About $518 million of the $1.16 billion that is put toward operating expenses is applied toward payrolls. This payroll supports about 14,820 jobs.
- A substantial portion (44.3 percent) of the spending is covered by fees and dues, although golf operating revenues (25.4 percent) and charges for food and beverages (28.9 percent) are also substantial.

Sales of equipment and apparel ($225 million/year), golf tournaments and tourism ($175 million/year), and nonstandard golfing venues ($30 million/year) make up the balance of the industry. (See Summary Exhibit 1.) Thus the total size of direct spending by the golf industry is estimated at $1.8 billion annually.

Of course, this industry is supported by businesses that supply them with essential goods (e.g. sod) and services (e.g., insurance and banking). The contribution of these businesses was measured using an economic impact model produced at Rutgers University. The total contribution of the supporting industries is substantial and is shown in Summary Exhibit 1.

Summary Exhibit 1

Total Economic Contribution of Annual Golf Industry Activity on New Jersey, by Segment

	Course Operations	Tourism & Tournaments	Golf Retail & Wholesale Trade	Other Golfing Venues	Total
Direct Spending	**$1,372 million**	**$175 million**	**$225 million**	**$30 million**	**$1,802 million**
Jobs (person years)	21,528	2,308	1,953	680	26,469
Income ($millions)	822.6	65.0	67.9	14.0	969.5
Output ($millions)	2,323.6	211.8	168.7	41.7	2,745.6
GSP[a] ($millions)	1,229.5	103.3	93.6	22.5	1,448.9
Total taxes ($millions)	431.8	31.9	35.8	5.5	505.0
Federal ($millions)	227.8	20.3	21.0	3.9	273.0
State ($millions)	73.8	7.2	9.3	0.7	91.0
Local ($millions)	130.2	4.3	5.5	0.9	141.0

Note: Numbers may not add due to rounding.
[a]GSP = Gross State Product.

In short, the golf industry contributes to New Jersey:

- About 26,500 jobs and $1 billion in labor income,
- Beyond labor income, the golf industry yields another $480 million in wealth to the state (via gross state product),
- Over $500 million in taxes, of which a substantial portion ($232 million or 46 percent) is paid to state and local governments in New Jersey, and
- A lion's share of the state and local tax revenues are paid by golf courses, which maintain close to 25,000 acres of land.

Introduction

"Golf brings out your real character: It tests your fortitude, your confidence, and your humility. Your boss or client may not be impressed with your golf swing, but they will be observing your appearance and behavior. It's in this character-analysis game—not the one with the clubs and balls—where birdies and bogeys are really made."

- Rick Smith, "How to Play Business Golf," *Business Week Online*, June 24, 2002.

The task of this study is to estimate the economic contribution of the golf industry to the economy of the State of New Jersey. While at face value this might appear to be a straightforward task, it is complicated by many issues and factors. One of the most fundamental issues, at least to this study, is the scope of the golf industry—that is, where does the golf industry begin and end? When the golf industry is mentioned, people typically think of golf courses, country clubs, and golf tournaments. With some extra time, selected people might also identify golf equipment manufacturers and retailers of golf equipment and apparel as fitting under the "golf industry" rubric. While all of these segments are, indeed, part of it, the golf industry must be given even wider berth. In addition to the aforementioned, it includes turf maintenance, course designers, the construction industry associated with course and clubhouse renovation, the hospitality and travel industries that supports golf-related tourism, real estate premiums associated with residential locations near golf courses, specialized media (e.g., golf magazines, web sites, cable channels, etc.), golf video games, non-course golfing (i.e., driving ranges, pitch-and-putts, and miniature golf courses), and related wholesale trade industries.

Many studies have demonstrated the positive effect of golf on local and state economies. These effects run the gamut from the sport's large local industry linkages to the high income of its patrons and their therefore high discretionary spending. As a result, these studies show golf is a business that contributed rather heavily to local economies, generating higher economic returns than similar activities, such as skiing, as well as most manufacturing industries.

Yet, many of the golf industry's economic repercussions are difficult to ascertain. It is, for example, nearly impossible to measure the economic importance of golf's role in consummating business deals and in fostering business and support networks. Given the immeasurable quality to some of golf's impacts on local and regional economies, this report uncovers the most substantial and readily measured economic impacts of golf in New Jersey. This is done via a thorough review of national and local patterns in spending at golf courses as well as by pegging the magnitude of golf tourism within the state. The centerpiece of this study is a survey of New Jersey golf establishments, which was provides specific spending and revenue patterns for different types of golf course operations in the state.

Golf Nationwide

According to the Golf 20/20's *Golf Economy Report* (Stanford Research Institute, 2002) the national golf economy totaled over $52 billion in 2000 (see Table 1). This includes operating expenditures and capital investment made by golf facilities, money spent by golfers purchasing equipment and apparel and by media outlets (television, magazines, and books) devoted to golf, plus segments of spending by the tourism industry directly aided by golf. All told, the U.S. golf economy is nearly as large as the motion picture and music industries combined ($57.8 billion).

Table 1: U.S. Golf Economy by Segment in 2000 (Millions of Dollars)

Core Industries	**Amount**
Operating expenses of golf facilities	$20,500
Capital investment in golf courses	7,800
Golf-related manufacturing (e.g., apparel, equipment)	6,000
Media, tournaments, charities, associations	4,500
Auxiliary hospitality and tourism	13,500
Total Golf Industry	$52,300

Source: SRI International. *The Golf Economy Report*. The World Golf Foundation Golf 20/20 (2002), page 6. http://www.golf2020.com/Reports/2020_GER_F.pdf.

During the late 1990s golf expanded rather rapidly across the nation. Its growth can be attributed to a strong economy and the sport's widening popularity. From 1997 through 2002, the total number of courses in the US increased by 3.6 percent, with 12,189 courses nationwide according to the 2002 Economic Census. Golf course employment was 310,833 in 2002, increasing by an annual average of 2.4 percent from 1997.[1] Course payrolls increased even more rapidly, at 5.6 percent annually, far faster than the 2.3 percent annual increase in the CPI over the same period. Nonetheless, it appears that golf's growth slowed somewhat starting about 2000 (Newport, 2007). A Royal Canadian Golf Association (2003) study showed that of courses offering memberships, only 26 percent had a waiting list, down from 72 percent in 1998.

[1] US Census. 2002 Economic Census: US.

Moreover membership at these courses declined 23 percent during the two years following 2000. US courses experienced similar decline with the rounds played dropping 1.5 percent within two years (Golf 20/20, 2004)—from 518.4 million in 2001 to 503.4 million in 2002 and further to 494.9 million in 2003. The Golf 20/20 (2004) study noted that the dip in play was strongest in coastal regions of the nation with a particular decline in the Mid-Atlantic region, which alone waned by an estimated 4 million rounds between 2002 and 2003. Since this was a period of economic retrenchment along the coasts, it suggests that golf's success may well be dictated by the whims of local economic fortunes, although poor weather conditions in 2003 also played a major role.

How Much Do New Jerseyans Spend on Golfing? A Rough Estimate

The focus of this study, however, is to identify New Jersey's share of this activity. A rough cut at an estimate can be obtained by identifying the state's share of that spending using its share of national personal income. According to the latest Census figures, New Jersey holds 2.9 percent (8.7 million/300 million) of the nation's total population. Hence, this share could be used to roughly estimate the state's share of the national golf figures shown in Table 1 above.

According the 2002 Economic Census, however, New Jersey has been a veritable growth center for national golfing during the 1990s. As a result, a cut based on the state's national share of population could be overly rough. Between 1997 and 2002 the Economic Census shows that the number of golfing venues in New Jersey expanded by 10 courses (growth of 4.4 percent, which was higher than the national average of less than 1.0 percent). Moreover the 237 courses reporting to the Census in 2002 directly employed 7,228 people, 2.0 percent more than in 1997. Of these facilities, 161 were taxable, employing 3,816 people; 76 facilities were tax-exempt, employing 3,472 people. The total reported revenue in 2002 was $569,225,000.

Indeed, New Jersey golf receipts were 3.3 percent of total U.S. golf receipts, although New Jersey maintains just 2.0 percent of all U.S. courses. Since New Jersey had 2.9 percent of the nation's population, this indicates that New Jersey has a relatively small but wealthy share of the nation's golfers. Indeed, the data bear this out. The national golf participation rate (for those over five years of age or older) stood at about 11.7 percent, compared with 9.3 percent in the Garden State (National Golf Foundation, 2002) while New Jersey's per capita income is roughly 25 percent higher than the U.S. average.

Based on this data, we can estimate the size of the golf economy in New Jersey. If the state contains 2.9 percent of the national population and income per capita is 25 percent higher in New Jersey, then 3.7 percent of national income is earned here. Assuming that New Jersey is as likely to spend its money on golf as any other state, then the golf economy should be roughly 3.7 percent of the $52.3 billion figure stipulated in Table 1, or **$1.93 billion**. While this is a rather rough stab at an estimate of New Jersey's golf economy, more refined data presented later in this report validate the figure.

Perhaps most important of all this is that the surge in golf's popularity with the state comes at a time of relative stagnation for New Jersey's economy. For more on the state and growth of New Jersey's economy see Appendix A

Direct Economic Effects of Golf Course Expenditures

In the summer of 2004, the New Jersey Golf Course Owners Association (NJGCOA) surveyed its member clubs on their spending. The purpose of this exercise was to define the economic character of the state's golf courses to help identify the full scope of the economic impacts of golf courses on New Jersey's economy. As a result, the surveys requested a quasi-detailed accounting of operating expenditures over a twelve-month period in 2003 and/or 2004, as well as capital expenses over the last three years. (See Appendix for the list of items that was requested.) After repeated mailing and follow-up calls by the NJGCOA to its member courses and others about 34 clubs responded. Of the 34 categorized as shown in Table 1, 24 clubs provided the requisite spending detail. Only one 9-hole course and one resort were among the viable responses. Most survey responses were from obtained for 18-hole courses, both public and private courses. Fortunately during the literature review phase, the 2003 Golf Operations Survey by the Royal Canadian Golf Association (RCGA, 2004) was discovered. After some evaluation, it was deemed that many of the cumulated responses for the two studies were quite similar. As a result, where significant gaps existed in the NJGCOA survey, we extrapolated from details in the RCGA study.

Table 2: Survey Responses: Golf Courses by Size and Type

Course Size (# of Holes)	Course Type					
	Public	Private	Member Equity	Resort	Semi-Private	Totals
9	1	0	0	0	0	1
18	7	12	3	0	5	27
27	1	1	0	0	0	2
36+	1	2	0	1	0	4
Totals	10	15	3	1	5	34

At public courses, the average rate for a round of golf was $29.10 in 2004. Although rates increased with the number of holes, the difference between the average rate for an 18- and 27-hole course was only about $2. Average dues revenue increases with number of holes on the course. Exceptions to this were the few 36-hole courses that reported: one was the single reporting resort that likely does not charge annual dues. More than 70 percent of all golf courses reported having full-service clubhouses: however the share of private courses that have them is higher than that for public courses. A survey of 34 private New Jersey courses performed by Condon, O'Meara, McGinty, & Donnelly indicates average course membership stood at about 544, with 293 being regular members.

Assuming the 24 clubs that completed viable surveys are an unbiased sample, the study team extrapolated to derive total expenditures of all New Jersey golf courses. This was done simply by taking the total spending of the responding clubs and dividing it by the share of all New Jersey golf courses that they represent (24/294 = 0.0816). This resulted in an estimate of the total direct economic effects of New Jersey's golf clubs. After adjusting it to year 2006 dollars using consumer price index for New Jersey reported in the July 2006 Rutgers Economic Advisory Service's (R/ECON) forecast of the state's economy. Overall, golf course expenditures in New Jersey are estimated to be $1.37 billion.

Table 3 shows more details of the aggregate spending at New Jersey's golf courses. Note that a preponderance of expenses (85 percent) is related to course operations. Nearly half is payroll-related, while capital expenses make up a comparatively small share (15 percent). The three dominant expenditure categories are maintenance of the course and related facilities, food and beverage services, and administration and marketing. Combined, these three fields comprise more than 60 percent of overall course expenditures and 75 percent of operation costs, with payroll making up more than half of each category. Next is taxes and public insurance payments, of which 64 percent ($71 million) is property taxes paid to New Jersey localities and another 24 percent ($27 million) being sales taxes collected from consumers and paid to the state and municipal governments. Utilities expenses are largely dominated by gas and electric bills, which make up nearly $30 million (73 percent) of those costs.

Largest among capital expenses, which totaled $211 million, are re-designs of the course and building construction and renovation, comprising nearly three-quarters of capital costs and just under 12 percent of overall costs. Purchases or leases of electric golf carts make up most of the remaining capital expenses, with other equipment purchases and miscellaneous expenses making up the remainder.

Table 3: Estimated Spending at New Jersey's Golf Courses, 2006

Expenditure Category	Estimated Yearly State Spending ($ millions)	Share of Category's Expenses	Share of Total Expenses
Operations & Maintenance	$422	36.3%	30.8%
O&M Payroll	*247*	*21.3%*	*18.0%*
Food & Beverage	299	25.7%	21.8%
F&B Payroll	*166*	*14.3%*	*12.1%*
Administration & Marketing	162	13.9%	11.8%
A&M Payroll	*106*	*9.1%*	*7.7%*
Utilities & Cleaning	41	3.5%	3.0%
Private Insurance	27	2.3%	2.0%
Taxes & Public Insurance	110	9.5%	8.0%
Business Services	16	1.4%	1.2%
Miscellaneous	85	7.3%	6.2%
Total Payroll	*518*	*44.6%*	*37.8%*
Total Operating Expenses	$1,162	100.0%	84.7%
Course Re-design	$68	32.2%	5.0%
Building Renovation	35	16.6%	2.6%
Building Construction	56	26.5%	4.1%
Maintenance Equipment	10	4.7%	0.7%
Electric Golf Carts	32	15.2%	2.3%
Office Equipment	3	1.4%	0.2%
Other Capital Expenses	6	2.8%	0.4%
Total Capital Expenses	$211	100.0%	15.4%
TOTAL Spending	$1,372	——	100.0%

Source: NJGCOA Survey and CUPR calculations.
Note: Totals provided in tables within this report may not add up due to rounding.

Estimating employment at golf courses was not so straightforward, even though the NJGCOA survey asked for the number of employees from the responding courses. Using the same method employed to calculate expenditures, however, yields a statewide total of only 772 workers at golf courses. If this reported tally was correct, the average worker at golf courses receives more than $670,000 annually in wages. Thus we opted to abandon the use of survey's responses on this question, opting instead to base employment on an estimation process based on payroll figures. The overall payroll numbers made sense in light of information from the U.S. Economic Census, the 2003 Golf Operations Survey by the Royal Canadian Golf Association, and work performed by the research team when performing a similar study on Pennsylvania's golfing industry (National Golf Foundation, 2002).

Estimating employment based upon the aggregate payroll shown in Table 2 was not simple either, however. This is in part because many workers on most golf courses are part-time, low-wage laborers, such as caddies, groundskeepers, cashiers, and waiters. Meanwhile, a fair number of more highly paid managerial/administrative positions are also required. We estimated the number of full-time equivalent jobs using survey-based payroll estimates by job type in Table 2 and applied average salaries of $100,000 per year for administration and marketing jobs and an average of $15 per hour for 2,200 hours per year for all other payroll positions. This resulted in estimates of 8,230 jobs in operations and management positions, 5,530 food and beverage jobs, and 1,060 administrative and marketing jobs. Thus there were, in total, 14,820 full-time equivalent jobs at golf courses statewide in 2004 that paid an average of about $35,800 per job (in 2006 dollars).[2] Again, this total is partially confirmed by the golf industry study in Pennsylvania (National Golf Foundation, 2002), which tallied 30,900 full-time and part-time workers in a state with more than twice as many courses. The employment figure published in the 2002 Economic Census is only 7,228 total employees earning $216 million, but those figures are likely to greatly understate the employment figures for two reasons. First, the government undercounted the number of courses (there are 294 courses and not the 237 reported in the 2002 Economic Census) and, second, courses often hire some labor under contract and may even pay some via informal means. This second possibility clearly exacerbates the federal undercount.

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[2] Govindasamy et al. (2007) similarly report 14,450 employees at golf courses in 2001. Interestingly, given that their payroll estimate is about half that we report, the payroll per job in their study would have been close to $17,500/job. This very low pay per job, even for a job in the recreation industry, underlines a likely disjoint in that study's spending and revenue totals. For more evidence see footnote 7.

The Other Side of the Ledger: How Do Golf Courses Make Their Money?

The survey also asked questions about course revenues. Using the same procedure as before, estimates for golf course revenues are derived in Table 4. Not surprisingly, fees and dues (the majority of which is collected by private clubs) makes up nearly half of all course revenues statewide. Food and beverage services comprise a higher share of revenues than golf operations (which includes greens fees, pro shop purchases, cart rentals, etc.). The overall total of nearly $1.3 billion is more than twice the total published in the 2002 Economic Census, $569 million.[3] However, the government only counted 237 courses in New Jersey when there were, in fact, 294. It is most likely that the Federal government failed to count many smaller private clubs that have high membership and initiation fees and fine dining establishments, therefore skewing revenue numbers downward. Overall, courses in New Jersey make a total operating profit of $105 million per year, yielding a positive margin of 8.3 percent. Without the deduction of capital expenses, however, golf courses ledgers would turn red, instead losing $105 million per year.

Table 4: Revenue Estimates for New Jersey's Golf Courses, 2006

Type of Revenue	Statewide Total (in millions)	Share of Total Revenues
Fees & Dues	$561	44.3%
Golf Operations	$322	25.4%
Food & Beverage	$367	28.9%
Miscellaneous	$18	1.4%
TOTAL REVENUES	$1,267	100.0%

Source: NJGCOA Survey and CUPR calculations.

Non-Standard Golfing Alternatives

Further, while traditional 18-hole courses dominate, there is a small cadre of alternatives to this sort of venue within New Jersey. Par 3 and executive (short 9-hole) courses exist throughout the state, as do so-called "pitch and putt" courses, and driving ranges. Golf 20/20's *Alternative Facilities Report* (Sportometrics, 2001) counts 145 such facilities within New Jersey: 27 par 3s, 20 executive courses, 9 pitch & putts, and 87 driving ranges. Although by all rights not

[3] This revenue estimate also diverges substantially from that made by Govindasamy et al. (2007), who suggest total 2001 course revenues of $573 million or $1.9 million per course. Naturally, a major source of the difference (23 percent) is the number of rounds reported by the two studies. Another source is that the dollar amounts reported are for two different years 2001 and 2006. Inflation accounts for about another 20 percent of the difference. The remaining difference—nearly $421 million or a third of the total revenues we have estimated—is surmised to derive from Govindasamy et al.'s not opting to not include membership dues in their revenue estimates.

truly an alternative, the *Yellow Pages* also lists 75 miniature golf courses, although there are certainly more than that number within the state during the beach season. Combined, these facilities represent a significant ancillary market for the "golf economy," but its size and scope are not easily quantifiable, as definitive data about revenues and the like are not easily found. The only available piece of data is extracted from the 2002 Economic Census, which found a total of $397 million in revenues for miniature golf courses nationwide. This means revenues for all of the alternative forms of golfing translate to roughly $30 million in New Jersey.

Off Course: The Case of Golf Merchandising

According to Golf 20/20, $5.1 billion was spent nationwide in 2000 on golf equipment and apparel, with equipment making up over 80 percent of the total. Based on the growth of this sector and inflation, one can estimate that this is roughly $6 billion today. While it is impossible to ascertain exactly how much of this is spent in New Jersey, it is possible to produce a rough estimate. If we once again assume that residents of New Jersey spend as much per dollar as any other state (on a percentage basis) on golf-related goods, one can estimate retail sales in this area to be around $225 million in New Jersey. This represents the $6 billion national total multiplied by the 3.7 percent figure obtained earlier. One would expect the New Jersey economy to retain the vast majority of this money, with incidental leakages to out-of-state retailers and Internet sales, but anecdotal evidence indicates that there are more inflows than outflows of cross-state golf equipment purchases. Hence, our initial estimate will be used throughout.

Tourism and Tournaments

Tourism is a boon to businesses everywhere: and this is especially true for the case of golf tourism. The National Golf Foundation has found household that golf while traveling have incomes that are on average 7 percent higher than the overall golfing population. Moreover, golfing tourist have household incomes that are 25 percent higher than the national average. Hence, golf tourism locales experience spending by fairly affluent consumers and are more likely to benefit from expenditures on fine dining, luxury hotels, and the like. This is over and above on-course spending, which includes more purchases at pro shops and clubhouses than do local golfing outings. In addition, greens fees at courses identified as catering to tourists are likely to be higher than those at courses that rely upon a more localized customer base.

Also, New Jersey lures a significant share of out-of-state visitors. Although Pine Valley Golf Club has been rated as the #1 golf course in America by *Golf Digest* and *Golf Magazine*, it is a rather exclusive private club, rendering its tourism impact as minimal. In fact, all of the top fifteen courses in New Jersey, as ranked by *Golf Digest*, are private clubs. Thus, while the Garden State may be an enticing venue for golfing, it seems to by virtue of its proximity to myriad businesses and attractive vacation spots than to the number of very highly regarded public courses it houses.

Nonetheless, New Jersey itself is a very significant tourism draw. This is largely on account of its natural features (particularly, its barrier islands), extensive history, and proximity to many large metropolitan areas. According to a report by the consulting firm Global Insight, tourism contributed about $14.6 billion to the Gross State Product (GSP) of New Jersey and over 342,000 jobs to the state's economy, second only to the health services sector, in 2006. This includes those who travel to the Garden State to play and watch golf. Of the $14.6 billion, about 2.5 percent of tourism's contribution to GSP can be described as coming from "Membership Sports and Recreation Clubs," of which golf is the largest component—we can assume that it composes about 33 percent, about its share of that sector's payroll. Given these parameters, we estimate that about $125 million is spent by tourist whose main reason for visiting the New Jersey is to *play* golf.

The Garden State has some unique golf attractions, at which one need not play the game to be included as a golf tourist. Foremost among these is the United States Golf Association's Golf House and Museum, which is located at the organization's headquarters in Far Hills. This facility is home to the world's largest collection of golfing memorabilia and literature. New Jersey also hosts a top-flight professional golf tournament: the LPGA Sybase Classic, annually contested in Clinton. Additionally, the state's many championship courses attract other large tournaments without a fixed home. For example, the PGA Championship was contested at Baltusrol Golf Club in Springfield in 2005, drawing at least 50,000 fans for each of the four days of the tournament. Over the years, Baltusrol has also hosted seven U.S. Opens, the most of any course. A study conducted by the University of Florida found that a tournament of similar size and publicity, the annual Players Championship held outside Jacksonville, injected over $53 million of consumer spending into the economy of the Northeast Florida region when it was held in March 2005, of which more than 85 percent came from those who lived outside the area.

This included nearly $14 million spent on food and drink, $9 million in assorted retail purchases, and $6 million in hotel rooms. One can safely chalk up around $50 million annually in additional spending by fans at the Golf House and Museum and at professional golf tournaments in New Jersey. Thus, all tolled golf courses and other attractions enhances tourism within the state in the amount of about $175 million, over and above the amount already accounted for in previous sections that identified New Jersey spending on golf retail goods, at golf courses, and at golfing venues that are alternatives to conventional courses.

Side Benefits: Hedonic Pricing and the Climate of Business

Additionally, it would be unwise to ignore another important effect that golf courses have on the economic landscape: the increased property values that occur when a piece of land is located on or near a golf course. Intuitively, of course, this is true, but at least one study has been conducted to verify this collective hunch. Asabere and Huffman (1996) and Do and Grudnitski (1995) have found that homes located adjacent to courses were sold for prices between 7-8 percent higher than homes nearby but not adjacent to a golf course when all other attributes of the homes were taken into account. Do and Grudnitski (1995) also found that course-adjacent home benefited even more than "off-course" homes within a housing subdivision integrated with a golf course. Asabere and Huffman (1996), however, found that homes not adjacent to courses but near them tended to suffer lower prices than homes not near golf courses. They suggested that it may be traffic and noise induced by golfing activities may yield deleterious effects to nearby nongolfing households.

The higher home prices that result from adjacency and proximity can lead to two effects that would stimulate an economy. First, local governments can receive more property tax revenues from those homes than they ordinarily would. This may well lead to lower property taxes paid by those owners whose properties are not adjacent or near golf courses. If property tax payments do not decline, then necessarily the government receiving the property tax revenues would provide more public goods and services per household, e.g., better schools, more frequent garbage pick up, etc. Alternatively, homes that exist prior to the installation of a golf course will have improved homeowner equity. That is, by virtue of the price of their home rising and their indebtedness remaining constant, an owner of a pre-existing home will own a larger share of his or her home's value. This enhanced equity position enables higher levels of borrowing by those homeowners and, therefore, consumer spending. Unfortunately nay research to date has been brought to bear on the net effect that golf courses have on the local tax coffers or on spending by households in neighboring municipalities. Hence, it is not clear what the next effect of golf courses may be on all homes in municipalities surrounding or adjacent to them.

Lastly, there is an even more intangible effect provided by golf. It is widely perceived that much informal business activity takes place at country clubs. For example, many people perceive that the groundwork and trust that leads to major business decisions like mergers or investments in new technology are made while foursomes walk a course. This is, by far, the least quantifiable aspect of golf's impact on the economy, but it is certainly one of great importance. Golf courses provide an invaluable service, in that they provide executives with a less regimented environment, but one where a common interest lies and rules still exist. Further discussion would fall under the realm of sociology, but it would be fair to say that the absence of golf would lead to some deleterious effect on business in New Jersey.

Summary of the New Jersey Golf Economy

The $1.37 billion in spending by New Jersey golf courses as estimated from the NJGCOA survey dominates New Jersey's golf industry. It is supplemented with spending of approximately $175 million each in golf-related tourism and golf tournament spending, $225 in purchases of golf accessories, and $30 million in spending on golf play at nonconventional venues (chip-and-putt, miniature golf, driving ranges, and so on). Together, these figures total $1.8 billion in direct effects created by the golf industry in New Jersey's economy (see Table 5).

This $1.8 billion fundamentally verifies by our initial rough cut of $1.93 billion as the size of the industry in New Jersey. Of course, it also differs somewhat from it (by 7 percent). This is largely because golf equipment or apparel is not manufactured in New Jersey, which depresses the state total vis-à-vis the projected abstraction from national data. Second, as previously noted, a lower percentage of New Jerseyans play golf compared with the nation as a whole. This is possibly because the state's climate is simply not as hospitable toward golf year-round as it is in the Sun Belt. Because of this, New Jersey experiences a net loss in golf tourism. That is, in all likelihood more New Jerseyans travel to Florida, California, and South Carolina to play golf than vice versa. Moreover, though it may be more appealing for some to golf in New Jersey than in their home states, when they leave their home states to play golf, they usually go to states with warmer weather and better-known courses.

Table 5: A Profile of New Jersey's Golf Economy

Source of Spending	Expenditures (in millions)	Share of Total
Golf Course Spending	$1,372	76.1%
Labor Wages & Benefits	*$518*	*28.7%*
Other Operating Expenses	*$644*	*35.7%*
Capital Expenditures	*$211*	*11.7%*
Equipment & Apparel Purchases	$225	12.5%
Non-Spectator Tourism	$125	6.9%
Spectator Tournaments	$50	2.8%
Alternative Golfing Venues	$30	1.7%
TOTAL	$1,802	100.0%

NOTE: Not all totals may add up due to rounding.

Measuring the Total Economic Contribution of the Golf Industry

This study examines the golf industry's total contributions to the economy of the State of New Jersey. It is, to date, the most detailed statewide analyses of golf's economic contribution. While up to this point in the report, the study has examined the *direct* economic contribution of the golf industry; it is critical that it also measure the total economic contribution: these encompass both the *direct* and *multiplier* effects. As we have shown, the *direct impact* component consists of labor, material, and service purchases made specifically for the golf activities. The *multiplier* effects incorporate what are referred to as *indirect* and *induced* economic consequences. The *indirect impact* component consists of spending for golfing activities. The *induced impact* component focuses on the spending by the households of workers involved either directly or indirectly with the activity. To illustrate, the installation of turf on a golf course is a direct impact. The production of the turf on a farm is an indirect impact. Spending by the households of workers both on the course and the turf farm are induced impacts.

One means of estimating indirect and induced impacts would be to conduct a survey of the business transactions of golf courses. While a survey was conducted during the present study, it was confined to identifying general revenue and spending amounts of New Jersey golf courses, as well as employment numbers. The business questionnaire discussed here, however, would ask for the names and addresses of courses' suppliers; what and how much of the service or commodity they supply; the names and addresses of the contractor's employees; as well as the courses' annual payrolls. A second, related questionnaire would cover household spending of the employees of the surveyed courses. It would request a characterization of each employee's household budget by detailed line items, including names and addresses of the firms from which each line item is purchased. Both questionnaires subsequently could be used to measure indirect and induced impacts of the primary suppliers' activities as well. The business questionnaire would be sent to the business addresses identified by the courses; the household questionnaire, in turn, would be sent to the homes of the employees of those businesses that responded to the survey. This "snowball-type" sampling would continue until time or money was exhausted. In order to keep each organization's or household's contribution to the project in proper perspective, its total spending would be weighted by the size of its transaction with its customers who were included in the survey activity. The sum of the weighted transaction values obtained through the surveys would be the total economic impact of the project.

This survey-based approach to estimating indirect and induced impacts consumes a great deal of money and time, however. In addition, response rates by firms and households on surveys regarding financial matters are notoriously low. Hence, in the rare cases where survey work has been conducted to measure economic impacts, the results have tended to be not statistically representative of the targeted network of organizations and households. Hence, relatively less expensive economic models based on Census data are often used to measure economic impacts.

The economic model that has proven to estimate the indirect and induced economic effects of events most accurately is the input-output model. Its advantage stems from its level of industry detail and its depiction of interindustry relations. As shown in Appendix B, a single calculation—known as the Leontief inverse—simulates the many rounds of business and household surveys. Input-output tables are constructed from nationwide Census surveys of businesses and households. The most difficult part of regional impact analysis is modifying a national input-output model so that it can be used to estimate impacts at a subnational level. Regionalization of the model typically is undertaken by the model producer and requires a large volume of data on the economy being modeled. This study specifies the total economic effects of the major components of the golf industry in New Jersey through a state-of-the-art I-O model developed by Rutgers Economic Advisory Service (R/Econ) of the Center for Urban Policy Research (CUPR). The model is termed R/Econ I-O. The results of the R/Econ I-O model include many fields of data, though the fields most relevant to this study are the total impacts of the following:

- **Jobs:** *Employment, both part- and full-time, by place of work, estimated using the typical job characteristics of each industry.* (Manufacturing jobs, for example, tend to be full-time; in retail trade and real estate, part-time jobs predominate.) All jobs generated at businesses in the region are included, even though the associated labor income of in-commuters may be spent outside of the region. In this study, all results are for activities occurring within the time frame of one year. Thus, the job figures should be read as job-years, where several individuals might fill one job-year on any given project.

- **Income:** *'Earned' or 'labor' income, specifically wages, salaries, and proprietors' income*. Income does not include non-wage compensation (such as benefits, pensions, or insurance), transfer payments; or dividends; interest, or rents.

- **Wealth**: *Value added — the equivalent at the subnational level of gross domestic product (GDP).* At the state level, this is called gross state product (GSP) or, in some government data, GDP by state. Value added is widely accepted by economists as the best measure of economic well-being. It is estimated from state-level data by industry. For a firm, value added is the difference between the value of goods and services produced and the value of goods and non-labor services purchased. For an industry, therefore, it is composed of labor income (net of taxes); taxes; non-wage labor compensation; profit (other than proprietors' income); capital consumption allowances; and net interest, dividends, and rents received.

- **Output**: Of the measures in any input-output report, perhaps the least well defined one is that labeled "output." *Output is defined as the value of shipments, which is reported in the Economic Census.* The value of shipments is very closely related to the notion of business revenues. Thus it is NOT the "output" to which most other economists refer and which is better known as "gross domestic product" (GDP).

  Within input-output analysis "output" differs from business revenues for several reasons. It is probably better defined as net business receipts, however. First, establishments often sell some of their output to themselves, so it cannot be included in the Census's tally of the value of shipments. Second, to avoid double counting in national accounts (those used to produce input-output tables), "output" in the wholesale and retail trade industries is measured simply as their margins, i.e. value added plus the costs of inputs. That is for these trade industries, "output" does NOT include the value of the items stocked on shelves.

- **Taxes**: *Tax revenues generated by the activity.* The tax revenues are detailed for the federal, state, and local levels of government. Totals are calculated by industry.

  Federal tax revenues include corporate and personal income, social security, and excise taxes, estimated from calculations of value added and income generated.

  State tax revenues include income, excise, sales, and other state taxes, estimated from calculations of value added and income generated (e.g. visitor purchases).

  Local tax revenues include payments to sub-state governments, mainly through property taxes on new worker households and businesses. Local tax revenues can also include sales and other taxes.

Golf Course Operations

Using input-output analysis, we were able to estimate the overall impact of the golf industry on the economy of New Jersey. Clearly, the majority of golf-related spending (as shown in Table 5) is the $1.37 billion that is spent by golf courses in the state. Naturally, this value includes money spent by golfers on membership fees, greens fees, and all other expenses related to the course and its amenities. This value was then broken down into its components (outlined in Table 3) and allocated to various industries so that it could its overall impacts could be calculated using the R/Econ model. These impacts are summarized in Table 6.

Overall, golf course spending generates 21,528 full-time equivalent (FTE) jobs statewide, $2.32 billion in output, $1.23 billion in gross state product (GSP), and $823 million in income. These values are markedly larger than the initial expenditure, indicating that significant indirect and induced effects reverberated throughout the economy. Specifically, through these impacts, over 6,700 jobs and $300 million in income were added in New Jersey. Multipliers ranged between 1.45 and 1.70, depending on the measure employed.

Table 6: Total Economic Contribution of Golf Course Operations and Capital Investment in New Jersey, 2006

	Components			
	Output (000 $)	Employment (FTE jobs)	Income (000$)	Gross State Product (000$)
I. TOTAL EFFECTS (Direct and Indirect/Induced)				
Private				
1. Agriculture	17,008.3	76	2,821.0	6,146.9
2. Agri. Serv., Forestry, & Fish	27,159.6	469	14,460.2	23,161.1
3. Mining	211.6	1	72.6	137.5
4. Construction	165,018.1	700	40,834.8	72,578.7
5. Manufacturing	125,015.1	450	26,493.1	29,081.8
6. Transport. & Public Utilities	87,157.6	349	22,066.9	34,708.3
7. Wholesale	46,961.5	261	19,097.0	20,170.2
8. Retail Trade	105,529.3	1,701	39,300.3	61,038.9
9. Finance, Ins., & Real Estate	188,888.5	884	59,600.1	133,443.7
10. Services	1,554,669.8	16,603	596,014.6	846,035.4
Private Subtotal	2,317,619.6	21,494	820,760.6	1,226,502.5
Public				
11. Government	5,932.2	34	1,824.2	2,949.9
Total Effects (Private and Public)	2,323,551.8	21,528	822,584.9	1,229,452.4
II. DISTRIBUTION OF EFFECTS/MULTIPLIER				
1. Direct Effects	1,372,000.0	14,820	518,000.0	751,856.0
2. Indirect and Induced Effects	951,551.8	6,708	304,584.9	477,596.4
3. Total Effects	2,323,551.8	21,528	822,584.9	1,229,452.4
4. Multipliers (3/1)	1.694	1.453	1.588	1.635
III. COMPOSITION OF GROSS STATE PRODUCT				
1. Wages--Net of Taxes				646,087.8
2. Taxes				264,757.2
a. Local				108,837.4
b. State				55,006.6
c. Federal				100,913.2
General				12,653.1
Social Security				88,260.1
3. Profits, dividends, rents, and other				318,607.4
4. Total Gross State Product (1+2+3)				1,229,452.4
IV. TAX ACCOUNTS				
		Business	**Household**	**Total**
1. Income --Net of Taxes		646,087.8	581,479.0	---------
2. Taxes		264,757.2	167,035.1	431,792.3
a. Local		108,837.4	21,411.2	130,248.5
b. State		55,006.6	18,744.6	73,751.2
c. Federal		100,913.2	126,879.3	227,792.6
General		12,653.1	126,879.3	139,532.4
Social Security		88,260.1	0.0	88,260.1
EFFECTS PER MILLION DOLLARS OF INITIAL EXPENDITURE				
Employment (Jobs)				15.7
Income				599,552
State Taxes				53,755
Local Taxes				94,933
Gross State Product				896,102
INITIAL EXPENDITURE IN DOLLARS				1,372,000,000

Note: Detail may not sum to totals due to rounding.

Significant benefits accrue to nearly every segment of the economy, though clearly the vast majority is attributable to the service sector – which is where most jobs on a golf course would be categorized. Indeed, over 16,600 jobs and nearly $600 million in income from the previous totals fall in this single sector. The second-largest sector in terms of employment is the retail trade sector (1,701 jobs), largely due to the fact that on-course food and drink establishments would fall under this category. These jobs are low-paying and add less to the economy compared to those in the finance, insurance, and real estate (FIRE) sector, however. While the number of jobs created is markedly lower (884), contributions to labor income are roughly 50 percent higher ($59.6 million versus $39.3 million) and additions to GSP are more than twice as high ($133.4 million versus $61.0 million). The average FIRE job attributable to the golf economy paid $67,421 (i.e. $59.6 million in labor income divided by 884 jobs), while the average retail job paid $23,104 and the average services job paid $35,898.

The third-largest sector in terms of output, income, and value added (GSP) is the construction sector, stemming from the capital expenses included in the calculations. There are 700 construction jobs in New Jersey attributable to the golf economy, as well as $40.8 million in labor income and $72.6 million in GSP. Manufacturing also benefits significantly from the presence of golf course spending, with estimated impacts of 450 jobs, $125.0 million in output, $26.5 million in income, and $29.1 million in GSP. Meanwhile, nearly 500 FTE jobs were added in the agricultural services sector, primarily related to the management of grasses and the like, but these positions were also of relatively low value to the state's economy. Workers in this sector earned less in labor income than those in the transportation & public utilities and wholesale trade sectors, even though those employed markedly fewer workers. Agricultural services workers related to the golf economy received mean annual pay of $30,832, compared with $58,335 in construction, $58,874 in manufacturing, $63,229 in transportation, and $73,169 in wholesale trade. Other sectoral impacts on the state's economy were marginal.

Also of note are the effects on tax revenues. Naturally, economic activity leads to added earnings and purchases that are taxed by all levels of government. Specifically, in this case, it is estimated that an additional $431.8 million is added to the coffers of the public sector. Of this, $227.8 million are estimated to go to the federal government, $73.8 million to the state, and the remaining $130.2 million is collected by various local governments statewide. Thus, in net, about $300 million is contributed to the coffers of New Jersey state and local governments.

Apparel & Equipment

As noted in Table 5, the sale of golf apparel and equipment generates direct effects to New Jersey's economy that amount to about $225 million. In performing the research for this study, it soon became apparent that the economic effects in New Jersey of golf equipment and apparel sales are limited to wholesale and retail trade activity. Other states, like Pennsylvania and Massachusetts, can also claim some economic effects that stem from the presence of manufacturers of golf apparel and equipment that is sold by the respective state's wholesalers and retailers. Thus, in New Jersey the effects of such sales are limited to those emanating via two parallel sectors: the retail sector, composed of general sporting goods and specialty golf retail stores and the like, as well as the wholesale sector, where manufacturers send their goods for distribution and delivery to retailers.

The wholesale and retail trade is not inherently linked in economic models, so we identified their interconnection prior to running the model. The first step in doing this is to determine how much of the $225 million spent by consumers is retained by wholesalers and retailers within the state. Table 7 displays the gross margins for both wholesale and retail firms involved with sporting goods and apparel reported by the U.S. Census Bureau.

Table 7: Profit Margins in Golf-Related Sectors

NAICS Code	Name of Category	Gross Margin
4239	Sporting and Recreational Goods Wholesalers	25.5%
4243	Apparel Merchant Wholesalers	32.4%
4481	Clothing and Accessory Retail Stores	45.3%
4511	Sporting Goods Retail Stores	38.0%

Sources: Annual Merchant Wholesale Trade Report, Table 2 (http://www.census.gov/svsd/www/atspur.txt), Annual Retail Trade Survey's Estimated Gross Margins (http://www.census.gov/svsd/retlann/view/table7.txt)

Notably, these margins, which show the share of receipts that is retained by the business owner to cover costs and a profit. Table 7 reveals that golf-oriented retailers sell goods that nationwide provide substantial margins. Hence, through wholesale and retail margins alone one could surmise that golf products tend to yield higher economic impacts per dollar of consumer spending than do most other combinations of wholesale and retail trade in the economy. Using the values in Table 7, we can estimate the direct local effects of spending by these sectors, from which one can estimate their total economic contribution to the State of New Jersey.

Of the $225 million figure quoted earlier, nationwide trends indicate that slightly over 80 percent of this is related to equipment, while the remainder (19.5 percent) is spent on apparel. This means that New Jerseyans spend roughly $181 million on golf equipment and $44 million on golf apparel, respectively, assuming that New Jersey's consumption patterns reflect those of the nation as a whole. $181 million is multiplied by the 38.0 percent gross margin in the equipment retail sector found in Table 5 to obtain a direct local impact value of $68.8 million. This is subtracted from the original $181 million figure to determine the size of the wholesale market (and avoid counting out-of-state activity that would overestimate the effects). The resulting value ($112.2 million) was then multiplied by the 25.5 percent wholesale margin to obtain a direct local impact in the equipment wholesale industry of $28.6 million. This process was then repeated for apparel; adding all four local impacts together generates a grand total of about $125.1 million. This was the value employed to identify their total economic contribution to the state as summarized in Table 8.

As the table shows, the total contribution of the golf apparel and equipment sectors alone to the gross state product (also known as "value added," as it reflects net addition to the economy) is over $93 million. This is the result of over $67 million in direct contributions from the sales of the material itself and approximately $26 million in indirect and induced effects. Nearly $68 million is added to the income of state residents, with the vast majority of this figure (over $53 million) categorized as net wages. Firms in this sector and their employees contribute almost $36 million to net tax receipts. Of this, about $9.3 million finds its way to Trenton through increased income and sales tax revenues, while another $5.5 million is added to the coffers of local jurisdictions statewide through increased property tax revenues. Overall, these sectors generate 1,953 full-time equivalent jobs. Dividing this into the net wage figure implies that these jobs, on average, are earning a post-tax income of over $34,768 per year, though this varies widely even by major sector (e.g. $82,046 in manufacturing versus $26,024 in retail).

It is also worth noting that the economic impacts are broken down across ten different industries within the economy as well as for the public sector. Not surprisingly, the greatest impacts are felt in wholesale and retail trade areas, where the initial impacts were registered. Combined, they account for roughly 79 percent of additions to the gross state product ($74.1 million), 90 percent of all jobs (1,758), 83 percent of labor income contributions ($56.2 million), and 77 percent of output impacts ($130.1 million).

Impacts registered in the retail sector are between two and four times as great as that in the wholesale sector, roughly equivalent to (or somewhat higher than) the proportion of initial expenditures between the retail and wholesale industries examined, which was 2.40 and 2.55 for the equipment and apparel subsectors, respectively. For example, GSP generated from equipment trade was composed of $55.3 million from retail trade and $17.2 million from wholesale trade; labor income derived from apparel was $15.6 million, of which $11.5 million came from retail. The exception, however, is employment, where the impact in retail is more than eight times greater than that in wholesale. Of the 1,953 total jobs reported in Table 8, only 168 are attributable to wholesale trade. This is because retailers generally are far more labor-intensive than wholesalers; for customer satisfaction, retail firms must employ an abundance of sales associates and other customer service positions that wholesalers, who have fewer customers and who can rely more on machinery and other capital equipment, do not. This also explains the relatively low earnings per job ratio in retail trade that was noted earlier.

Other industries are still relevant to the picture of economic impact, however. The FIRE (finance, insurance, and real estate) and services sectors are third and fourth in some order, depending upon the measure examined. Clearly, firms in the golf equipment and apparel sectors require outside contractors to handle business and financial services, plus they add to revenues of firms as diverse as restaurants and dry cleaners that happen to operate in the area of the facility. Services contribute nearly twice as many jobs to the state's economy than FIRE (100 in services, 52 in FIRE), since service industries share retail's labor intensiveness, but since many of those workers earn relatively low wages, the difference in income contributions is much smaller ($4.8 million versus $3.8 million) and FIRE contributes more in the way of labor income and gross state product ($9.0 million versus $5.8 million).

Table 8: Total Economic Contribution of $225 million in Household Spending on Golf Equipment and Apparel on New Jersey, 2006

	Components			
	Output (000 $)	Employment (FTE jobs)	Income (000$)	Gross State Product (000$)
I. TOTAL EFFECTS (Direct and Indirect/Induced)				
Private				
1. Agriculture	146.4	1	15.7	27.6
2. Agri. Serv., Forestry, & Fish	78.6	1	40.2	65.5
3. Mining	6.5	0	2.2	4.1
4. Construction	1,826.7	3	245.5	611.9
5. Manufacturing	5,237.4	13	1,066.6	1,161.7
6. Transport. & Public Utilities	6,957.9	23	1,757.7	2,775.1
7. Wholesale	36,457.6	168	14,825.6	15,658.7
8. Retail Trade	93,629.7	1,588	41,326.4	58,369.0
9. Finance, Ins., & Real Estate	12,520.1	52	3,709.7	9,022.6
10. Services	11,385.9	100	4,782.2	5,744.4
Private Subtotal	168,246.8	1,951	67,771.6	93,440.6
Public				
11. Government	427.4	2	131.1	210.8
Total Effects (Private and Public)	168,674.2	1,953	67,902.7	93,651.4
II. DISTRIBUTION OF EFFECTS/MULTIPLIER				
1. Direct Effects	118,037.3	1,620	51,555.7	67,436.7
2. Indirect and Induced Effects	50,636.9	333	16,347.0	26,214.7
3. Total Effects	168,674.2	1,953	67,902.7	93,651.4
4. Multipliers (3/1)	1.429	1.205	1.317	1.389
III. COMPOSITION OF GROSS STATE PRODUCT				
1. Wages--Net of Taxes				53,192.6
2. Taxes				21,990.3
a. Local				3,744.5
b. State				7,757.6
c. Federal				10,488.1
General				3,207.9
Social Security				7,280.2
3. Profits, dividends, rents, and other				18,468.5
4. Total Gross State Product (1+2+3)				93,651.4
IV. TAX ACCOUNTS				
		Business	**Household**	**Total**
1. Income --Net of Taxes		53,192.6	47,873.3	---------
2. Taxes		21,990.3	13,778.1	35,768.4
a. Local		3,744.5	1,766.1	5,510.6
b. State		7,757.6	1,546.2	9,303.8
c. Federal		10,488.1	10,465.8	20,953.9
General		3,207.9	10,465.8	13,673.7
Social Security		7,280.2	0.0	7,280.2
EFFECTS PER MILLION DOLLARS OF INITIAL EXPENDITURE				
Employment (Jobs)				8.7
Income				542,674
State Taxes				74,355
Local Taxes				44,041
Gross State Product				748,456
INITIAL EXPENDITURE IN DOLLARS				225,000,000

Note: Detail may not sum to totals due to rounding.

Further down the list of sectors are the transportation/public utilities and manufacturing. Clearly, wholesalers and retailers of golf apparel and equipment need to have their goods transported from points of origin, require electricity and other utilities to operate their facilities, and—in the case of wholesale firms—must acquire the goods from manufacturers, while there will be a modest impact on manufacture of goods that are either part of the production process or are used in association with golf in some way. Together, these sectors account for 2-6 percent (depending on the measure) of the economic impacts derived from these golf-related sectors: 43 jobs, $2.8 million in income, $3.9 million in GSP, and $12.2 million in output. All other sectors are only peripherally affected by the retail/wholesale element of the golf economy.

Tournaments & Tourism

Conducting a similar analysis of the estimated $175 million of annual spending generated by golf tourism—$125 million related to playing courses, $50 million from spectator events—requires no secondary calculations. The total economic contribution of this spending is detailed in Table 9.

Overall, the $175 million in spending generates 2,308 jobs, $211.8 million in output, $65.0 million in income, and $103.3 in GSP. Based on the effects per million figures at the bottom of the table, this is the least economically productive segment of the golf economy. For example, in terms of value added (GSP), $1 million in golf course spending contributes $896,102 and $1 million in golf apparel/equipment purchases contributes $748,456, $1 million in tourism-related spending contributes only $590,259. Multipliers (range: 1.26-1.54) are generally lower than those in the golf course expenses segment (1.46-1.69), but similar to or marginally higher than those in apparel and equipment (1.21-1.43)

Not surprisingly, the dominant sector in terms of employment was retail trade. This is to be expected, of course, since when one considers those who benefit most from tourism spending, it is firms that sell souvenirs, food and drink, cameras, and the like. Hence, 1,270 of the 2,308 jobs generated by this segment of the golf economy are concentrated here. Indeed, retail is even the leading contributor to output ($86.9 million), labor income ($30.2 million), and GSP ($41.6 million), though these margins are much smaller than those related to employment. In each case, the services sector places second with 564 jobs, $70.0 million in output, $21.5 million in labor income, and $34.8 million in value added. Of the remaining sectors, it is the FIRE group that reaps 83 jobs (all other sectors yield less than 50 each) and over half of the GSP not attributable to retail or services ($15.2 million). Construction, manufacturing, and wholesale trade all receive moderate gains from the presence of golf tourism in New Jersey.

Again, as one would expect, there was a dramatic disparity in the income per job values based on the sector in which the golf-related jobs were created. The overall annual pay per full-time position is a startlingly low $28,168. As noted, retail trade employment is dominant in this segment of the golf economy, a field punctuated by a marginal low-paid, part-time workforce with high turnover; its average annual pay per job comes out to $19,806. Services jobs fare substantially better ($38,183); the other sectors with 50 or more attributable jobs had even higher salaries (FIRE – nearly $53,000, wholesale trade - $73,000).

Based on the calculated economic impacts, we estimate that the public sector gains about $31.9 million in tax revenues per year. Specifically, the federal government collects the majority ($20.3 million), with the remainder going to the state level ($7.2 million) and the local level ($4.3 million). Notably, all but a miniscule amount of local taxes are derived from businesses; this is because local taxes in New Jersey are almost entirely property-related and, clearly, tourists do not purchase property in the state, or see existing property gain value, as a direct result of their visit.

Table 9: Total Economic Contribution of Golf Tournaments and Golf-Related Tourism on New Jersey, 2006

	Components			
	Output (000 $)	**Employment (FTE jobs)**	**Income (000$)**	**Gross State Product (000$)**
I. TOTAL EFFECTS (Direct and Indirect/Induced)				
Private				
1. Agriculture	371.2	3	33.2	61.1
2. Agri. Serv., Forestry, & Fish	230.4	4	108.0	193.6
3. Mining	9.5	0	3.0	5.9
4. Construction	2,777.6	7	379.3	927.7
5. Manufacturing	13,928.3	33	2,395.9	2,833.7
6. Transport. & Public Utilities	9,046.4	39	2,260.2	3,670.0
7. Wholesale	8,621.4	48	3,505.9	3,703.0
8. Retail Trade	86,934.8	1,524	30,183.6	41,581.0
9. Finance, Ins., & Real Estate	19,131.9	83	4,398.3	15,215.7
10. Services	70,024.8	564	21,535.0	34,766.8
Private Subtotal	211,076.5	2,303	64,802.4	102,958.6
Public				
11. Government	679.0	4	208.6	336.7
Total Effects (Private and Public)	211,755.5	2,308	65,011.0	103,295.2
II. DISTRIBUTION OF EFFECTS/MULTIPLIER				
1. Direct Effects	143,551.4	1,837	45,008.6	67,130.1
2. Indirect and Induced Effects	68,204.1	471	20,002.4	36,165.1
3. Total Effects	211,755.5	2,308	65,011.0	103,295.2
4. Multipliers (3/1)	1.475	1.256	1.444	1.539
III. COMPOSITION OF GROSS STATE PRODUCT				
1. Wages--Net of Taxes				64,880.1
2. Taxes				20,411.5
a. Local				4,339.6
b. State				5,749.7
c. Federal				10,322.2
General				3,352.0
Social Security				6,970.2
3. Profits, dividends, rents, and other				18,003.7
4. Total Gross State Product (1+2+3)				103,295.2
IV. TAX ACCOUNTS				
		Business	**Household**	**Total**
1. Income --Net of Taxes		64,880.1	65,011.0	-------
2. Taxes		20,411.5	11,507.6	31,919.1
a. Local		4,339.6	7.2	4,346.8
b. State		5,749.7	1,480.3	7,230.0
c. Federal		10,322.2	10,020.1	20,342.3
General		3,352.0	10,020.1	13,372.1
Social Security		6,970.2	0.0	6,970.2
EFFECTS PER MILLION DOLLARS OF INITIAL EXPENDITURE				
Employment (Jobs)				13.2
Income				371,491
State Taxes				41,315
Local Taxes				24,839
Gross State Product				590,259
INITIAL EXPENDITURE IN DOLLARS				175,000,000

Note: Detail may not sum to totals due to rounding.

Alternative Golf Venues

Driving ranges, miniature golf, chip-and-putt courses, also provide unique contribution to the total economy of the state. The estimated $30 million of annual spending, which is beyond that counted via golf tourism, is estimated to yield an additional 680 jobs, $14 million in labor income, and $22.5 million in gross state product to New Jersey's economy (see Table 10). Of this, a large share can be attributed to the activities directly— 606 jobs (89.1 percent), $10.3 million in labor income (73.5 percent), and $16.3 million in gross state product (72.6 percent). At, $16,941, the average direct annual pay for this segment of the golf industry is understandably lower than it is for the others we have covered. This is because most of the jobs are seasonal and temporary, being connected largely with the spending of sunbathers at the Jersey Shore. The 74 jobs estimated to support this segment have annual pay amounts that are substantially higher, averaging close to $50,000.

Detailed Summary of the Total Measurable Economic Contribution

Table 11 is a summation of figures in Tables 6 and 8 through 10. That is, in Table 11 we have added together the figures for the total economic contribution to New Jersey of golf course operations, golf retail and whole trade activity, golf tourism and tournament activity, and of other entertainment-oriented golfing activities. It shows that the golf industry contributes about 26,500 jobs, $970 million in labor income, and close to $1.5 million in annual wealth (gross state product) to New Jersey. About $308.9 million of the $1.5 million in wealth accumulation is government tax revenues. A lion's share of those tax revenues, $186.4 million, is estimated to be collected by state and local governments, much of it (about $117.5 million) in the form of property taxes paid to local governments.

Table 11 shows that the bulk of the golf economy is concentrated in the services industry (of which it is directly a part) and retail trade. Nonetheless, all major sectors of the New Jersey economy are to some extent involved, although mining's role likely is relegated to providing gravel and sand.

Table 10: Total Economic Contribution of Alternative Golfing Venues on New Jersey, 2006

	Components			
	Output (000 $)	**Employment (FTE jobs)**	**Income (000$)**	**Gross State Product (000$)**
I. TOTAL EFFECTS (Direct and Indirect/Induced)				
Private				
1. Agriculture	73.7	0	7.4	21.2
2. Agri. Serv., Forestry, & Fish	59.2	1	31.2	50.2
3. Mining	1.8	0	0.6	1.1
4. Construction	627.9	2	130.0	253.2
5. Manufacturing	1,215.7	3	254.4	273.4
6. Transport. & Public Utilities	1,579.2	5	385.0	625.1
7. Wholesale	585.8	3	238.2	251.6
8. Retail Trade	1,722.4	23	643.4	1,001.7
9. Finance, Ins., & Real Estate	2,685.3	11	725.2	2,011.9
10. Services	33,009.4	632	11,558.2	17,939.0
Private Subtotal	41,560.4	679	13,973.5	22,428.6
Public				
11. Government	104.4	1	32.2	52.2
Total Effects (Private and Public)	41,664.8	680	14,005.7	22,480.8
II. DISTRIBUTION OF EFFECTS/MULTIPLIER				
1. Direct Effects	30,000.0	606	10,266.2	16,329.3
2. Indirect and Induced Effects	11,664.8	74	3,739.5	6,151.5
3. Total Effects	41,664.8	680	14,005.7	22,480.8
4. Multipliers (3/1)	1.389	1.122	1.364	1.377
III. COMPOSITION OF GROSS STATE PRODUCT				
1. Wages--Net of Taxes				12,811.9
2. Taxes				2,695.5
a. Local				533.6
b. State				424.8
c. Federal				1,737.1
General				235.5
Social Security				1,501.6
3. Profits, dividends, rents, and other				6,973.4
4. Total Gross State Product (1+2+3)				22,480.8
IV. TAX ACCOUNTS				
		Business	**Household**	**Total**
1. Income --Net of Taxes		12,811.9	0.0	-------
2. Taxes		2,695.5	2,841.9	5,537.4
a. Local		533.6	364.3	897.9
b. State		424.8	318.9	743.7
c. Federal		1,737.1	2,158.7	3,895.8
General		235.5	2,158.7	2,394.2
Social Security		1,501.6	0.0	1,501.6
EFFECTS PER MILLION DOLLARS OF INITIAL EXPENDITURE				
Employment (Jobs)				22.7
Income				466,857
State Taxes				24,789
Local Taxes				29,929
Gross State Product				749,359
INITIAL EXPENDITURE IN DOLLARS				30,000,000

Note: Detail may not sum to totals due to rounding.

Table 11: Total Economic Contribution of the Golf Industry in New Jersey, 2006

	Components			
	Output (000 $)	**Employment (FTE jobs)**	**Income (000$)**	**Gross State Product (000$)**
I. TOTAL EFFECTS (Direct and Indirect/Induced)				
Private				
1. Agriculture	17,599.6	80	2,877.3	6,256.8
2. Agri. Serv., Forestry, & Fish	27,527.8	475	14,639.6	23,470.4
3. Mining	229.4	1	78.4	148.6
4. Construction	170,250.3	712	41,589.6	74,371.5
5. Manufacturing	145,396.5	499	30,210.0	33,350.6
6. Transport. & Public Utilities	104,741.1	416	26,469.8	41,778.5
7. Wholesale	92,626.3	480	37,666.7	39,783.5
8. Retail Trade	287,816.2	4,836	111,453.7	161,990.6
9. Finance, Ins., & Real Estate	223,225.8	1,030	68,433.3	159,693.9
10. Services	1,669,089.9	17,899	633,890.0	904,485.6
Private Subtotal	2,738,503.3	26,427	967,308.1	1,445,330.3
Public				
11. Government	7,143.0	41	2,196.1	3,549.6
Total Effects (Private and Public)	2,745,646.3	26,469	969,504.3	1,448,879.8
II. DISTRIBUTION OF EFFECTS/MULTIPLIER				
1. Direct Effects	1,663,588.7	18,883	624,830.5	902,752.1
2. Indirect and Induced Effects	1,082,057.6	7,586	344,673.8	546,127.7
3. Total Effects	2,745,646.3	26,469	969,504.3	1,448,879.8
4. Multipliers (3/1)	1.650	1.402	1.552	1.605
III. COMPOSITION OF GROSS STATE PRODUCT				
1. Wages--Net of Taxes				776,972.4
2. Taxes				309,854.5
a. Local				117,455.1
b. State				68,938.7
c. Federal				123,460.6
General				19,448.5
Social Security				104,012.1
3. Profits, dividends, rents, and other				362,053.0
4. Total Gross State Product (1+2+3)				1,448,879.8
IV. TAX ACCOUNTS				
		Business	**Household**	**Total**
1. Income --Net of Taxes		776,972.4	694,363.3	---------
2. Taxes		309,854.5	195,162.7	505,017.2
a. Local		117,455.1	23,548.8	141,003.8
b. State		68,938.7	22,090.0	91,028.7
c. Federal		123,460.6	149,523.9	272,984.6
General		19,448.5	149,523.9	168,972.4
Social Security		104,012.1	0.0	104,012.1
EFFECTS PER MILLION DOLLARS OF INITIAL EXPENDITURE				
Employment (Jobs)				14.7
Income				569,584
State Taxes				53,479
Local Taxes				82,840
Gross State Product				851,218
INITIAL EXPENDITURE IN DOLLARS				1,802,126,100

Note: Detail may not sum to totals due to rounding.

Overall Summary

New Jersey's golf industry is more than just country clubs. It is a fast-growing industry within the state, and one that has many aspects. Although golf courses are a large and critical part of the industry, it also includes a significant portion of the state's tourist trade, retailers who sell golfing equipment and apparel, and golf's informal recreational formats like miniature golf, driving ranges, chip and putt courses, and so on. Naturally, each of these aspects is supported by a myriad of other businesses. We used the R/Econ I-O model—our own regional input-output model—to estimate their contribution.

Before applying the R/Econ I-O model, the size of the direct effects of each segment of the golf industry was ascertained. A survey conducted by the NJGCOA was used to measure the spending of golf courses. A viable sample of about 10 percent of the state's courses was obtained. By assuming that the sample was representative of the state's population of courses, we were able to estimate the total spending of the state's 294 golf courses. We next carved out golf's share of the state's annual tourism spending based on its share of recreational payroll. We also estimated state retail spending based on its share of national labor income. Finally based on the number of enumerable establishments in New Jersey, we estimated the annual revenues of nonstandard golfing venues. In making the estimates, we erred on the side of conservatism to assure that no double-counting across them was evident. We estimated annual receipt for New Jersey's golf industry at about $1.8 billion annually—Table 12 below provides a summary of the breakout.

Table 12: A Profile of New Jersey's Golf Economy

Source of Spending	Expenditures (in millions)	Share of Total
Golf Course Spending	$1,372	76.1%
Labor Wages & Benefits	*$518*	*28.7%*
Other Operating Expenses	*$644*	*35.7%*
Capital Expenditures	*$211*	*11.7%*
Equipment & Apparel Purchases	$225	12.5%
Non-Spectator Tourism	$125	6.9%
Spectator Tournaments	$50	2.8%
Alternative Golfing Venues	$30	1.7%
TOTAL	$1,802	100.0%

NOTE: Not all totals may add up due to rounding.

Table 13 summarizes the findings of the economic contributions of the four major segments of the golf industry. The $1.8 billion in annual golf-oriented activity yields $2.7 billion in net receipts across all industries statewide. About 85 percent of these receipts can be attributed to the golf course segment. About 81 percent of the 26, 460 jobs produced by all segments can be attributed to the courses as well. In fact, it is the case golf courses produce the preponderance of the economic activity as judged from all of the measures. Indeed, we estimate that as much as 92 percent of the local tax revenues generated are derived from the more than 23,000 acres of golf courses in the state (Godvindasamy et al., 2007), even though a substantial amount of this acreage is publicly owned.

Table 13
Total Economic Contribution of
Annual Golf Industry Activity on New Jersey, by Segment

	Course Operations	Tourism & Tournaments	Golf Retail & Wholesale Trade	Other Golfing Venues	Total
Direct Spending	**$1,372 million**	**$175 million**	**$225 million**	**$30 million**	**$1,802 million**
Jobs (person years)	21,528	2,308	1,953	680	26,469
Income ($millions)	822.6	65.0	67.9	14.0	969.5
Output ($millions)	2,323.6	211.8	168.7	41.7	2,745.6
GSP[a] ($millions)	1,229.5	103.3	93.6	22.5	1,448.9
Total taxes ($millions)	431.8	31.9	35.8	5.5	505.0
Federal ($millions)	227.8	20.3	21.0	3.9	273.0
State ($millions)	73.8	7.2	9.3	0.7	91.0
Local ($millions)	130.2	4.3	5.5	0.9	141.0

Note: Numbers may not add due to rounding.
[a]GSP = Gross State Product.

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APPENDIX A

A Brief Description of the New Jersey Economy

As shown in Exhibit A-1, New Jersey's economy was bolstered by 3.34 million nonfarm jobs in 2006. Not quite 10 percent were in manufacturing and a full quarter of these jobs were in Trade, Transportation and Utilities. The bulk of the remaining jobs were in other service sectors, particularly professional and business services, education and health services, and leisure and hospitality services.

Exhibit A-1
Employment by Nonfarm Industry in New Jersey, 2006

Industry	Employment	Share
Total, all industries	3,341,795	100.0%
Natural Resources and Mining	12,064	0.4%
Construction	172,785	5.2%
Manufacturing	321,940	9.6%
Trade, Transportation, and Utilities	864,091	25.9%
Information	97,069	2.9%
Financial Activities	266,706	8.0%
Professional and Business Services	596,186	17.8%
Education and Health Services	522,380	15.6%
Leisure and Hospitality	335,379	10.0%
Other Services	124,222	3.7%
Unclassified	28,973	0.9%

During the first eight months of 2007, New Jersey's economy added 15,500 jobs (projected to 28,500 for the year), as opposed to 35,900 jobs in 2006 and 40,000 in 2005. To place this in perspective, figures from the Bureau of Labor Statistics (BLS) indicate that roughly 4.02 million residents of New Jersey were employed by the state's 283,000 employers in December 2006. Recent job growth was dominated by the professional and business services and educational and health services sectors. The leisure and hospitality services sector gained far fewer jobs this year than last, largely due to job losses in Atlantic City. Financial services and retail trade had been doing better this year although this could change as the fall-out from the sub-prime mortgage market implosion spreads. There have been more losses in manufacturing jobs in 2007 while construction, wholesale trade, transportation, and information industries also weakened in New Jersey. The state's job growth for that period – 0.6 percent – trailed the 1.2 percent figure for the nation as a whole, but is projected through 2027 to be roughly 0.8 percent per year.

Similarly, in the last 18 months, real gross state product (GSP) in New Jersey has grown at a sluggish rate of 1.1 percent per year, while real gross domestic product (GDP) has grown at 2.4 percent per year nationally in the same time period. This is despite population growth of 0.6 percent per year over the last ten years, which is slightly lower than the national average. New Jersey's population is projected to expand by 0.4 percent per year through 2027, adding 735,000 residents in the next 20 years for a total population at that time of 9.5 million. Overall, according to the Bureau of Economic Analysis, total personal income (TPI) in the state in 2006 was roughly $404.1 billion, which registered seventh in the nation (New Jersey's population is 11th largest), which was 7.2 percent higher than the previous year (national TPI grew by 6.6 percent); slightly more than half of this value – $204.1 billion – was earned through wages (not including benefits). Based on these values, average pay for a New Jersey worker was $51,637.

Although employment growth has been extremely slow so far this year, New Jersey's unemployment rate has stayed well below the U.S. rate since late in 2006, even though employment has grown only half as fast in the Garden State as in the nation as a whole. The state rate has averaged 4.3 percent from January to August 2007, just less than the U.S. average rate of 4.5 percent. A look behind the rates in New Jersey indicates that this year's low unemployment rate has occurred for the "wrong" reason. That is, the number of employed residents declined over most of the year while the number of unemployed members of the labor force has changed very little. This implies that a fair number of New Jerseyans are getting discouraged by the conditions in the state's labor market and as a result are dropping out of the labor force instead of continuing to seek jobs. Meanwhile, the state's consumer inflation rate rose 3.9 percent in both 2005 and 2006, primarily because of high energy prices and increasing wage rates, but this is expected to be an aberration. Again, this is somewhat worse than the nation as a whole, where inflation clocked in at an average of 3.0 percent in that period.

A useful way to describe the composition of the New Jersey economy relative to that of the nation as a whole is the location quotient, which is a calculation that compares the proportion of state employees in an industry with that of the overall economy. A value less than 1.00 indicates that less workers are employed in that field in New Jersey, meaning that the products of that industry are "imported" from elsewhere in the country, while a value greater than 1.00 indicates that New Jersey is over-weighted in that industry and its products are "exported" from the state, bringing outside wealth into the state's economy. Despite the fact that New Jersey's industrial sector is in a decline – both within the United States and globally, due to outsourcing – the state's highest location quotient (LQ) is found in the chemical manufacturing sector (2.76), owing to the state's position in high-tech pharmaceuticals production. Other high LQs are found in transit and ground passenger transportation (2.28); securities, commodity trading, and investments (2.11); and other information services (1.76). Overall, a majority of wholesale and retail trade industries had LQs above 1.00, as did the various industries in the professional and administrative services fields. Clearly, industries with low LQs were primarily concentrated in industries related to raw materials and most types of manufacturing; not surprisingly, many recreation- and media-related industries had low LQs as well, as the preponderance of that activity is diverted to New York City and Philadelphia. The location of those cities, however, also drives the high concentrations of transportation and financial employment.

As was the case in 2006, well over half of the state's new jobs in 2007 were added in the education/health services and professional/business services sectors, the two largest in New Jersey, generating roughly 10,000 new jobs each in the last twelve months. Given the aging population, it is clear that growth in the health care sector will only increase in the near future; perhaps surprisingly, though, school enrollment will also grow faster than the population as a whole, leading to growth in education as well. Meanwhile, increases in high-tech white-collar management jobs in the state have spurred disproportionately high growth in administrative and technical services fields. Overall, service jobs increased by 44,000 jobs (2.9 percent) between August 2005 and August 2006 and 23,800 jobs (1.3 percent) from August 2006 to August 2007. Other sectors saw job gains this year: retail trade, public administration, and finance.

Non-services employment has fallen overall statewide in the past year: 6,700 jobs were lost in manufacturing due to outsourcing and corporate reorganization. Employment losses were incurred in most manufacturing industries; major losses were in the fabricated metals (2,500), computer and electronic equipment (1,500), and rubber and plastics (1,400). Further, the number of construction jobs has fallen by 5,500 since the sector's peak in February 2006, largely due to a 30 percent decline in the number of residential building permits in the period since. It is expected that construction employment will stabilize in the wake of major investments in new corporate facilities, extensive planned development at the Meadowlands, and widening of the New Jersey Turnpike. Other sectors that saw job losses included transportation & warehousing (2,300), wholesale trade (1,700 jobs), and information (600).

Exhibit A-2: Employment Change in New Jersey's Service Sectors

	2005 to 2007			
	Aug. 2005 to Aug.2006		Aug. 2006 to Aug.2007	
	Change Thousands	%Change	Change Thousands	%Change
Private Services	**44.0**	**2.9%**	**23.8**	**1.3%**
Professional and Business Services	**13.2**	**2.2%**	**10.1**	**1.6%**
Professional, Scientific and Technical	**11.9**	**4.5%**	**7.1**	**2.5%**
Management of Companies	**-1.3**	**-1.9%**	**0.8**	**1.2%**
Adminstrative Support and Waste Management	**2.6**	**1.0%**	**2.2**	**0.8%**
Educational and Health Services (1)	**-19.9**	**-2.3%**	**12.7**	**1.5%**
Private Educational Services	**-2.2**	**-2.6%**	**0.5**	**0.6%**
Private Health Services	**5.8**	**1.4%**	**7.8**	**1.9%**
Ambulatory Services	**4.2**	**2.5%**	**3.9**	**2.2%**
Hospitals	**-0.1**	**-0.1%**	**1.4**	**0.9%**
Nursing and Residential Care Facilities	**1.7**	**0.9%**	**2.5**	**2.6%**
Social Assistance	**1.5**	**2.2%**	**2.4**	**3.4%**
Leisure and Hospitality Services	**20.1**	**5.8%**	**0.6**	**0.2%**
Arts, Entertainment and Recreation	**10.8**	**20.3%**	**0.6**	**0.9%**
Accommodations	**4.5**	**6.1%**	**-4.8**	**-6.2%**
Food Services and Drinking Places	**4.8**	**2.2%**	**4.8**	**2.1%**
Other Services	**5.6**	**3.6%**	**2.4**	**1.5%**
(1) Including Change in Public Educational Services and Public Hospitals				
Public Education Services	**-30.0**	**-10.3%**	**2.8**	**1.1%**
State	**-2.2**	**-4.9%**	**0.1**	**0.2%**
Local	**-27.8**	**-11.3%**	**2.7**	**1.2%**
Public Hospitals	**0.1**	**0.9%**	**0.3**	**2.6%**

Source: N.J. DOL, *www.wnjpin.state.nj.us, September 2007.*

APPENDIX B

INPUT-OUTPUT ANALYSIS: TECHNICAL DESCRIPTION AND APPLICATION

This appendix discusses the history and application of input-output analysis and details the input-output model, called the R/Econ™ I-O model, developed by Rutgers University. This model offers significant advantages in detailing the total economic effects of an activity (such as historic rehabilitation and heritage tourism), including multiplier effects.

ESTIMATING MULTIPLIERS

The fundamental issue determining the size of the multiplier effect is the "openness" of regional economies. Regions that are more "open" are those that import their required inputs from other regions. Imports can be thought of as substitutes for local production. Thus, the more a region depends on imported goods and services instead of its own production, the more economic activity leaks away from the local economy. Businessmen noted this phenomenon and formed local chambers of commerce with the explicit goal of stopping such leakage by instituting a "buy local" policy among their membership. In addition, during the 1970s, as an import invasion was under way, businessmen and union leaders announced a "buy American" policy in the hope of regaining ground lost to international economic competition. Therefore, one of the main goals of regional economic multiplier research has been to discover better ways to estimate the leakage of purchases out of a region or, relatedly, to determine the region's level of self-sufficiency.

The earliest attempts to systematize the procedure for estimating multiplier effects used the economic base model, still in use in many econometric models today. This approach assumes that all economic activities in a region can be divided into two categories: "basic" activities that produce exclusively for export, and region-serving or "local" activities that produce strictly for internal regional consumption. Since this approach is simpler but similar to the approach used by regional input-output analysis, let us explain briefly how multiplier effects are estimated using the economic base approach. If we let $\mathbf{x}$ be export employment, $\mathbf{l}$ be local employment, and $\mathbf{t}$ be total employment, then

$$\mathbf{t} = \mathbf{x} + \mathbf{l}$$

For simplification, we create the ratio a as

$$\mathbf{a} = \mathbf{l}/\mathbf{t}$$

so that $\mathbf{l} = \mathbf{at}$

then substituting into the first equation, we obtain

$$\mathbf{t} = \mathbf{x} + \mathbf{at}$$

By bringing all of the terms with t to one side of the equation, we get

$$\mathbf{t} - \mathbf{at} = \mathbf{x} \text{ or } \mathbf{t}\,(1\text{-}\mathbf{a}) = \mathbf{x}$$

Solving for **t,** we get $\mathbf{t} = \mathbf{x}/(1\text{-}\mathbf{a})$

Thus, if we know the amount of export-oriented employment, x, and the ratio of local to total employment, a, we can readily calculate total employment by applying the economic base multiplier, 1/(1-a), which is embedded in the above formula. Thus, if 40 percent of all regional employment is used to produce exports, the regional multiplier would be 2.5. The assumption behind this multiplier is that all remaining regional employment is required to support the export employment. Thus, the 2.5 can be decomposed into two parts the direct effect of the exports, which is always 1.0, and the indirect and induced effects, which is the remainder—in this case 1.5. Hence, the multiplier can be read as telling us that for each export-oriented job another 1.5 jobs are needed to support it.

This notion of the multiplier has been extended so that x is understood to represent an economic change demanded by an organization or institution outside of an economy—so-called final demand. Such changes can be those effected by government, households, or even by an outside firm. Changes in the economy can therefore be calculated by a minor alteration in the multiplier formula:

$$\Delta\mathbf{t} = \Delta\mathbf{x}/(1\text{-}\mathbf{a})$$

The high level of industry aggregation and the rigidity of the economic assumptions that permit the application of the economic base multiplier have caused this approach to be subject to extensive criticism. Most of the discussion has focused on the estimation of the parameter **a**. Estimating this parameter requires that one be able to distinguish those parts of the economy that produce for local consumption from those that do not. Indeed, virtually all industries, even services, sell to customers both inside and outside the region. As a result, regional economists devised an approach by which to measure the *degree* to which each industry is involved in the nonbase activities of the region, better known as the industry's *regional purchase coefficient*. Thus, they expanded the above formulations by calculating for each ***i*** industry

$$\mathbf{l}_i = \mathbf{r}_i\mathbf{d}_i$$

and

$$\mathbf{x}_i = t_i - \mathbf{r}_i\mathbf{d}_i$$

given that $\mathbf{d}_i$ is the total regional demand for industry ***i***'s product. Given the above formulae and data on regional demands by industry, one can calculate an accurate traditional aggregate economic base parameter by the following:

$$\mathbf{a} = \mathbf{l/t} = \Sigma\mathbf{l}_{ii}/\Sigma\mathbf{t}_i$$

Although accurate, this approach only facilitates the calculation of an aggregate multiplier for the entire region. That is, we cannot determine from this approach what the effects are on the various sectors of an economy. This is despite the fact that one must painstakingly calculate the regional demand as well as the degree to which they each industry is involved in nonbase activity in the region. As a result, a different approach to multiplier estimation that takes advantage of the detailed demand and trade data was developed. This approach is called input-output analysis.

REGIONAL INPUT-OUTPUT ANALYSIS: A BRIEF HISTORY

The basic framework for input-output analysis originated nearly 250 years ago when François Quesenay published *Tableau Economique* in 1758. Quesenay's "tableau" graphically and numerically portrayed the relationships between sales and purchases of the various industries of an economy. More than a century later, his description was adapted by Leon Walras, who advanced input-output modeling by providing a concise theoretical formulation of an economic system (including consumer purchases and the economic representation of "technology").

It was not until the twentieth century, however, that economists advanced and tested Walras's work. Wassily Leontief greatly simplified Walras's theoretical formulation by applying the Nobel prize–winning assumptions that both technology and trading patterns were fixed over time. These two assumptions meant that the pattern of flows among industries in an area could be considered stable. These assumptions permitted Walras's formulation to use data from a single time period, which generated a great reduction in data requirements.

Although Leontief won the Nobel Prize in 1973, he first used his approach in 1936 when he developed a model of the 1919 and 1929 U.S. economies to estimate the effects of the end of

World War I on national employment. Recognition of his work in terms of its wider acceptance and use meant development of a standardized procedure for compiling the requisite data (today's national economic census of industries) and enhanced capability for calculations (i.e., the computer).

The federal government immediately recognized the importance of Leontief's development and has been publishing input-output tables of the U.S. economy since 1939. The most recently published tables are those for 1987. Other nations followed suit. Indeed, the United Nations maintains a bank of tables from most member nations with a uniform accounting scheme.

Framework

Input-output modeling focuses on the interrelationships of sales and purchases among sectors of the economy. Input-output is best understood through its most basic form, the *interindustry transactions table* or matrix. In this table (see Exhibit B-1 for an example), the column industries are consuming sectors (or markets) and the row industries are producing sectors. The content of a matrix cell is the value of shipments that the row industry delivers to the column industry. Conversely, it is the value of shipments that the column industry receives from the row industry. Hence, the interindustry transactions table is a detailed accounting of the disposition of the value of shipments in an economy. Indeed, the detailed accounting of the interindustry transactions at the national level is performed not so much to facilitate calculation of national economic impacts as it is to back out an estimate of the nation's gross domestic product.

EXHIBIT B-1
Interindustry Transactions Matrix (Values)

	Agriculture	Manufacturing	Services	Other	Final Demand	Total Output
Agriculture	10	65	10	5	10	$100
Manufacturing	40	25	35	75	25	$200
Services	15	5	5	5	90	$120
Other	15	10	50	50	100	$225
Value Added	20	95	20	90		
Total Input	100	200	120	225		

For example, in Exhibit B-1, agriculture, as a producing industry sector, is depicted as selling $65 million of goods to manufacturing. Conversely, the table depicts that the manufacturing industry purchased $65 million of agricultural production. The sum across columns of the interindustry transaction matrix is called the *intermediate outputs vector*. The sum across rows is called the *intermediate inputs vector*.

A single *final demand* column is also included in Exhibit B-1. Final demand, which is outside the square interindustry matrix, includes imports, exports, government purchases, changes in inventory, private investment, and sometimes household purchases.

The *value added* row, which is also outside the square interindustry matrix, includes wages and salaries, profit-type income, interest, dividends, rents, royalties, capital consumption allowances, and taxes. It is called value added because it is the difference between the total value of the industry's production and the value of the goods and nonlabor services that it requires to produce. Thus, it is the *value* that an industry *adds* to the goods and services it uses as inputs in order to produce output.

The value added row measures each industry's contribution to wealth accumulation. In a national model, therefore, its sum is better known as the gross domestic product (GDP). At the state level, this is known as the gross state product—a series produced by the U.S. Bureau of Economic Analysis and published in the Regional Economic Information System. Below the state level, it is known simply as the regional equivalent of the GDP—the gross regional product.

Input-output economic impact modelers now tend to include the household industry within the square interindustry matrix. In this case, the "consuming industry" is the household itself. Its spending is extracted from the final demand column and is appended as a separate column in the interindustry matrix. To maintain a balance, the income of households must be appended as a row. The main income of households is labor income, which is extracted from the value-added row. Modelers tend not to include other sources of household income in the household industry's row. This is not because such income is not attributed to households but rather because much of this other income derives from sources outside of the economy that is being modeled.

The next step in producing input-output multipliers is to calculate the *direct requirements matrix*, which is also called the technology matrix. The calculations are based entirely on data from figure 1. As shown in Exhibit B-2, the values of the cells in the direct requirements matrix are derived by dividing each cell in a column of Exhibit B-1, the interindustry transactions matrix, by its column total. For example, the cell for manufacturing's purchases from agriculture is 65/200 = .33. Each cell in a column of the direct requirements matrix shows how many cents of each producing industry's goods and/or services are required to produce one dollar of the consuming industry's production and are called *technical coefficients*. The use of the terms "technology" and "technical" derive from the fact that a column of this matrix represents a recipe for a unit of an industry's production. It, therefore, shows the needs of each industry's production process or "technology."

EXHIBIT B-2
Direct Requirements Matrix

	Agriculture	Manufacturing	Services	Other
Agriculture	.10	.33	.08	.02
Manufacturing	.40	.13	.29	.33
Services	.15	.03	.04	.02
Other	.15	.05	.42	.22

Next in the process of producing input-output multipliers, the *Leontief Inverse* is calculated. To explain what the Leontief Inverse is, let us temporarily turn to equations. Now, from figure 1 we know that the sum across both the rows of the square interindustry transactions matrix (**Z**) and the final demand vector (**y**) is equal to vector of production by industry (**x**). That is,

$$\mathbf{x} = \mathbf{Zi} + \mathbf{y}$$

where **i** is a summation vector of ones. Now, we calculate the direct requirements matrix (**A**) by dividing the interindustry transactions matrix by the production vector or

$$\mathbf{A} = \mathbf{ZX}^{-1}$$

where $\mathbf{X}^{-1}$ is a square matrix with inverse of each element in the vector **x** on the diagonal and the rest of the elements equal to zero. Rearranging the above equation yields

$$\mathbf{Z} = \mathbf{AX}$$

where **X** is a square matrix with the elements of the vector **x** on the diagonal and zeros elsewhere. Thus,

$$\mathbf{x} = (\mathbf{AX})\mathbf{i} + \mathbf{y}$$

or, alternatively,

$$\mathbf{x} = \mathbf{A}\mathbf{x} + \mathbf{y}$$

solving this equation for **x** yields

$$\mathbf{x} = (\mathbf{I}-\mathbf{A})^{-1} \mathbf{y}$$

Total Output	=	Total Requirements *	Final Demand

The Leontief Inverse is the matrix $(\mathbf{I}-\mathbf{A})^{-1}$. It portrays the relationships between final demand and production. This set of relationships is exactly what is needed to identify the economic impacts of an event external to an economy.

Because it does translate the direct economic effects of an event into the total economic effects on the modeled economy, the Leontief Inverse is also called the *total requirements matrix.* The total requirements matrix resulting from the direct requirements matrix in the example is shown in Exhibit B-3.

Exhibit B-3
Total Requirements Matrix

	Agriculture	Manufacturing	Services	Other
Agriculture	1.5	.6	.4	.3
Manufacturing	1.0	1.6	.9	.7
Services	.3	.1	1.2	.1
Other	.5	.3	.8	1.4
Industry Multipliers	.33	2.6	3.3	2.5

In the direct or technical requirements matrix in Exhibit B-2, the technical coefficient for the manufacturing sector's purchase from the agricultural sector was .33, indicating the 33 cents of agricultural products must be directly purchased to produce a dollar's worth of manufacturing products. The same "cell" in Figure 3 has a value of .6. This indicates that for every dollar's worth of product that manufacturing ships out of the economy (i.e., to the government or for export), agriculture will end up increasing its production by 60 cents. The sum of each column in the total requirements matrix is the *output multiplier* for that industry.

Multipliers

A *multiplier* is defined as the system of economic transactions that follow a disturbance in an economy. Any economic disturbance affects an economy in the same way as does a drop of water in a still pond. It creates a large primary "ripple" by causing a *direct* change in the purchasing patterns of affected firms and institutions. The suppliers of the affected firms and institutions must change their purchasing patterns to meet the demands placed upon them by the firms originally affected by the economic disturbance, thereby creating a smaller secondary "ripple." In turn, those who meet the needs of the suppliers must change their purchasing patterns to meet the demands placed upon them by the suppliers of the original firms, and so on; thus, a number of subsequent "ripples" are created in the economy. The multiplier effect has three components—direct, indirect, and induced effects. Because of the pond analogy, it is also sometimes referred to as the *ripple effect*.

- A *direct effect* (the initial drop causing the ripple effects) is the change in purchases due to a change in economic activity.
- An *indirect effect* is the change in the purchases of suppliers to those economic activities directly experiencing change.
- An *induced effect* is the change in consumer spending that is generated by changes in labor income within the region as a result of the direct and indirect effects of the economic activity. Including households as a column and row in the interindustry matrix allows this effect to be captured.

Extending the Leontief Inverse to pertain not only to relationships between *total* production and final demand of the economy but also to *change*s in each permits its multipliers to be applied to many types of economic impacts. Indeed, in impact analysis the Leontief Inverse lends itself to the drop-in-a-pond analogy discussed earlier. This is because the Leontief Inverse multiplied by a change in final demand can be estimated by a power series. That is,

$$(\mathbf{I}-\mathbf{A})^{-1}\,\Delta\mathbf{y} = \Delta\mathbf{y} + \mathbf{A}\,\Delta\mathbf{y} + \mathbf{A}(\mathbf{A}\,\Delta\mathbf{y}) + \mathbf{A}(\mathbf{A}(\mathbf{A}\,\Delta\mathbf{y})) + \mathbf{A}(\mathbf{A}(\mathbf{A}(\mathbf{A}\,\Delta\mathbf{y}))) + \ldots$$

Assuming that $\Delta\mathbf{y}$—the change in final demand—is the "drop in the pond," then succeeding terms are the ripples. Each "ripple" term is calculated as the previous "pond disturbance" multiplied by the direct requirements matrix. Thus, since each element in the direct requirements matrix is less than one, each ripple term is smaller than its predecessor. Indeed, it has been shown that after calculating about seven of these ripple terms that the power series approximation of impacts very closely estimates those produced by the Leontief Inverse directly.

In impacts analysis practice, $\Delta\mathbf{y}$ is a single column of expenditures with the same number of elements as there are rows or columns in the direct or technical requirements matrix. This set of elements is called an *impact vector*. This term is used because it is the *vector* of numbers that is used to estimate the *economic impacts* of the investment.

There are two types of changes in investments, and consequently economic impacts, generally associated with projects—*one-time impacts* and *recurring impacts*. One-time impacts are impacts that are attributable to an expenditure that occurs once over a limited period of time. For example, the impacts resulting from the construction of a project are one-time impacts. Recurring impacts are impacts that continue permanently as a result of new or expanded ongoing expenditures. The ongoing operation of a new train station, for example, generates recurring impacts to the economy. Examples of changes in economic activity are investments in the preservation of old homes, tourist expenditures, or the expenditures required to run a historical site. Such activities are considered changes in final demand and can be either positive or negative. When the activity is not made in an industry, it is generally not well represented by the input-output model. Nonetheless, the activity can be represented by a special set of elements that are similar to a column of the transactions matrix. This set of elements is called an economic disturbance or impact vector. The latter term is used because it is the vector of numbers that is used to estimate the impacts. In this study, the impact vector is estimated by multiplying one or more economic *translators* by a dollar figure that represents an investment in one or more projects. The term translator is derived from the fact that such a vector *translates* a dollar amount of an activity into its constituent purchases by industry.

One example of an industry multiplier is shown in figure 4. In this example, the activity is the preservation of a historic home. The *direct impact* component consists of purchases made specifically for the construction project from the producing industries. The *indirect impact* component consists of expenditures made by producing industries to support the purchases made for this project. Finally, the *induced impact* component focuses on the expenditures made by workers involved in the activity on-site and in the supplying industries.

FIGURE 4
Components of the Multiplier for the
Historic Rehabilitation of a Single-Family Residence

DIRECT IMPACT	INDIRECT IMPACT	INDUCED IMPACT
Excavation/Construction Labor Concrete Wood Bricks Equipment Finance and Insurance	Production Labor Steel Fabrication Concrete Mixing Factory and Office Expenses Equipment Components	Expenditures by wage earners on-site and in the supplying industries for food, clothing, durable goods, entertainment

REGIONAL INPUT-OUTPUT ANALYSIS

Because of data limitations, regional input-output analysis has some considerations beyond those for the nation. The main considerations concern the depiction of regional technology and the adjustment of the technology to account for interregional trade by industry.

In the regional setting, local technology matrices are not readily available. An accurate region-specific technology matrix requires a survey of a representative sample of organizations for each industry to be depicted in the model. Such surveys are extremely expensive.[4] Because of the expense, regional analysts have tended to use national technology as a surrogate for regional technology. This substitution does not affect the accuracy of the model as long as local industry technology does not vary widely from the nation's average.[5]

Even when local technology varies widely from the nation's average for one or more industries, model accuracy may not be affected much. This is because interregional trade may mitigate the error that would be induced by the technology. That is, in estimating economic impacts via a regional input-output model, national technology must be regionalized by a vector of regional purchase coefficients,[6] **r**, in the following manner:

[4]The most recent statewide survey-based model was developed for the State of Kansas in 1986 and cost on the order of $60,000 (in 1990 dollars). The development of this model, however, leaned heavily on work done in 1965 for the same state. In addition the model was aggregated to the 35-sector level, making it inappropriate for many possible applications since the industries in the model do not represent the very detailed sectors that are generally analyzed.

[5]Only recently have researchers studied the validity of this assumption. They have found that large urban areas may have technology in some manufacturing industries that differs in a statistically significant way from the national average. As will be discussed in a subsequent paragraph, such differences may be unimportant after accounting for trade patterns.

[6]A regional purchase coefficient (RPC) for an industry is the proportion of the region's demand for a good or service that is fulfilled by local production. Thus, each industry's RPC varies between zero (0) and one (1), with one implying that all local demand is fulfilled by local suppliers. As a general rule, agriculture, mining, and manufacturing industries tend to have low RPCs, and both service and construction industries tend to have high RPCs.

$$(\mathbf{I}\text{-}\mathbf{rA})^{-1}\,\mathbf{r}\cdot\Delta\mathbf{y}$$

or

$$\mathbf{r}\cdot\Delta\mathbf{y} + \mathbf{rA}\,(\mathbf{r}\cdot\Delta\mathbf{y}) + \mathbf{rA}(\mathbf{rA}\,(\mathbf{r}\cdot\Delta\mathbf{y})) + \mathbf{rA}(\mathbf{rA}(\mathbf{rA}\,(\mathbf{r}\cdot\Delta\mathbf{y}))) + \ldots$$

where the vector-matrix product **rA** is an estimate of the region's direct requirements matrix. Thus, if national technology coefficients—which vary widely from their local equivalents—are multiplied by small RPCs, the error transferred to the direct requirements matrices will be relatively small. Indeed, since most manufacturing industries have small RPCs and since technology differences tend to arise due to substitution in the use of manufactured goods, technology differences have generally been found to be minor source error in economic impact measurement. Instead, RPCs and their measurement error due to industry aggregation have been the focus of research on regional input-output model accuracy.

A COMPARISON OF THREE MAJOR REGIONAL ECONOMIC IMPACT MODELS

In the United States there are three major vendors of regional input-output models. They are U.S. Bureau of Economic Analysis's (BEA) RIMS II multipliers, Minnesota IMPLAN Group Inc.'s (MIG) IMPLAN Pro model, and CUPR's own R/Econ™ I–O model. CUPR has had the privilege of using them all. (R/Econ™ I–O builds from the PC I–O model produced by the Regional Science Research Corporation's (RSRC).)

Although the three systems have important similarities, there are also significant differences that should be considered before deciding which system to use in a particular study. This document compares the features of the three systems. Further discussion can be found in Brucker, Hastings, and Latham's article in the Summer 1987 issue of *The Review of Regional Studies* entitled "Regional Input-Output Analysis: A Comparison of Five Ready-Made Model Systems." Since that date, CUPR and MIG have added a significant number of new features to PC I–O (now, R/Econ™ I–O) and IMPLAN, respectively.

Model Accuracy

RIMS II, IMPLAN, and RECON™ I–O all employ input-output (I–O) models for estimating impacts. All three regionalized the U.S. national I–O technology coefficients table at the highest levels of disaggregation (more than 500 industries). Since aggregation of sectors has been shown to be an important source of error in the calculation of impact multipliers, the retention of maximum industrial detail in these regional systems is a positive feature that they share. The systems diverge in their regionalization approaches, however. The difference is in the manner that they estimate regional purchase coefficients (RPCs), which are used to regionalize the technology matrix. An RPC is the proportion of the region's demand for a good or service that is fulfilled by the region's own producers rather than by imports from producers in other areas. Thus, it expresses the proportion of the purchases of the good or service that do not leak out of the region, but rather feed back to its economy, with corresponding multiplier effects. Thus, the accuracy of the RPC is crucial to the accuracy of a regional I–O model, since the regional multiplier effects of a sector vary directly with its RPC.

The techniques for estimating the RPCs used by CUPR and MIG in their models are theoretically more appealing than the location quotient (LQ) approach used in RIMS II. This is because the former two allow for crosshauling of a good or service among regions and the latter does not. Since crosshauling of the same general class of goods or services among regions is quite common, the CUPR-MIG approach should provide better estimates of regional imports and exports. Statistical results reported in Stevens, Treyz, and Lahr (1989) confirm that LQ methods tend to overestimate RPCs. By extension, inaccurate RPCs may lead to inaccurately estimated impact estimates.

Further, the estimating equation used by CUPR to produce RPCs should be more accurate than that used by MIG. The difference between the two approaches is that MIG estimates RPCs at a more aggregated level (two-digit SICs, or about 86 industries) and applies them at a desegregate level (over 500 industries). CUPR both estimates and applies the RPCs at the most detailed industry level. The application of aggregate RPCs can induce as much as 50 percent error in impact estimates (Lahr and Stevens, 2002).

Although both RECON™ I–O and IMPLAN use an RPC-estimating technique that is theoretically sound and update it using the most recent economic data, some practitioners question their accuracy. The reasons for doing so are three-fold. First, the observations currently used to estimate their implemented RPCs are based on 20-years old trade relationships—the Commodity Transportation Survey (CTS) from the 1977 Census of Transportation. Second, the CTS observations are at the state level. Therefore, RPC's estimated for substate areas are extrapolated. Hence, there is the potential that RPCs for counties and metropolitan areas are not as accurate as might be expected. Third, the observed CTS RPCs are only for shipments of goods. The interstate provision of services is unmeasured by the CTS. IMPLAN relies on relationships from the 1977 U.S. Multiregional Input-Output Model that are not clearly documented. RECON™ I–O relies on the same econometric relationships that it does for manufacturing industries but employs expert judgment to construct weight/value ratios (a critical variable in the RPC-estimating equation) for the nonmanufacturing industries.

The fact that BEA creates the RIMS II multipliers gives it the advantage of being constructed from the full set of the most recent regional earnings data available. BEA is the main federal government purveyor of employment and earnings data by detailed industry. It therefore has access to the fully disclosed and disaggregated versions of these data. The other two model systems rely on older data from *County Business Patterns* and Bureau of Labor Statistic's ES202 forms, which have been "improved" by filling-in for any industries that have disclosure problems (this occurs when three or fewer firms exist in an industry or a region).

Model Flexibility

For the typical user, the most apparent differences among the three modeling systems are the level of flexibility they enable and the type of results that they yield. R/Econ™ I–O allows the user to make changes in individual cells of the 515-by-515 technology matrix as well as in the 11 515-sector vectors of region-specific data that are used to produce the regionalized model. The 11 sectors are: output, demand, employment per unit output, labor income per unit output, total value added per unit of output, taxes per unit of output (state and local), nontax value added per unit output, administrative and auxiliary output per unit output, household consumption per unit of labor income, and the RPCs. Te PC I–O model tends to be simple to use. Its User's Guide is straightforward and concise, providing instruction about the proper implementation of the model as well as the interpretation of the model's results.

The software for IMPLAN Pro is Windows-based, and its User's Guide is more formalized. Of the three modeling systems, it is the most user-friendly. The Windows orientation has enabled MIG to provide many more options in IMPLAN without increasing the complexity of use. Like R/Econ™ I–O, IMPLAN's regional data on RPCs, output, labor compensation, industry average margins, and employment can be revised. It does not have complete information on tax revenues other than those from indirect business taxes (excise and sales taxes), and those cannot be altered. Also like R/Econ™, IMPLAN allows users to modify the cells of the 538-by-538 technology matrix. It also permits the user to change and apply price deflators so that dollar figures can be updated from the default year, which may be as many as four years prior to the current year. The plethora of options, which are advantageous to the advanced user, can be extremely confusing to the novice. Although default values are provided for most of the options, the accompanying documentation does not clearly point out which items should get the most attention. Further, the calculations needed to make any requisite changes can be more complex than those needed for the R/Econ™ I–O model. Much of the documentation for the model dwells on technical issues regarding the guts of the model. For example, while one can aggregate the 538-sector impacts to the one- and two-digit SIC level, the current documentation does not discuss that possibility. Instead, the user is advised by the Users Guide to produce an aggregate model to achieve this end. Such a model, as was discussed earlier, is likely to be error ridden.

For a region, RIMS II typically delivers a set of 38-by-471 tables of multipliers for output, earnings, and employment; supplementary multipliers for taxes are available at additional cost. Although the model's documentation is generally excellent, use of RIMS II alone will not provide proper estimates of a region's economic impacts from a change in regional demand. This is because no RPC estimates are supplied with the model. For example, in order to estimate the impacts of rehabilitation, one not only needs to be able to convert the engineering cost estimates into demands for labor as well as for materials and services by industry, but must also be able to estimate the percentage of the labor income, materials, and services which will be provided by the region's households and industries (the RPCs for the demanded goods and services). In most cases, such percentages are difficult to ascertain; however, they are provided in the R/Econ™ I–O and IMPLAN models with simple triggering of an option. Further, it is impossible to change any of the model's parameters if superior data are known. This model ought not to be used for evaluating any project or event where superior data are available or where the evaluation is for a change in regional demand (a construction project or an event) as opposed to a change in regional supply (the operation of a new establishment).

Model Results

Detailed total economic impacts for about 500 industries can be calculated for jobs, labor income, and output from R/Econ™ I–O and IMPLAN only. These two modeling systems can also provide total impacts as well as impacts at the one- and two-digit industry levels. RIMS II provides total impacts and impacts on only 38 industries for these same three measures. Only the manual for R/Econ™ I–O warns about the problems of interpreting and comparing multipliers and any measures of output, also known as the value of shipments.

As an alternative to the conventional measures and their multipliers, R/Econ™ I–O and IMPLAN provide results on a measure known as "value added." It is the region's contribution to the nation's gross domestic product (GDP) and consists of labor income, nonmonetary labor compensation, proprietors' income, profit-type income, dividends, interest, rents, capital consumption allowances, and taxes paid. It is, thus, the region's production of wealth and is the single best economic measure of the total economic impacts of an economic disturbance.

In addition to impacts in terms of jobs, employee compensation, output, and value added, IMPLAN provides information on impacts in terms of personal income, proprietor income, other property-type income, and indirect business taxes. R/Econ™ I–O breaks out impacts into taxes collected by the local, state, and federal governments. It also provides the jobs impacts in terms of either about 90 or 400 occupations at the users request. It goes a step further by also providing a return-on-investment-type multiplier measure, which compares the total impacts on all of the main measures to the total original expenditure that caused the impacts. Although these latter can be readily calculated by the user using results of the other two modeling systems, they are rarely used in impact analysis despite their obvious value.

In terms of the format of the results, both R/Econ™ I–O and IMPLAN are flexible. On request, they print the results directly or into a file (Excel® 4.0, Lotus 123®, Word® 6.0, tab delimited, or ASCII text). It can also permit previewing of the results on the computer's monitor. Both now offer the option of printing out the job impacts in either or both levels of occupational detail.

RSRC Equation

The equation currently used by RSRC in estimating RPCs is reported in Treyz and Stevens (1985). In this paper, the authors show that they estimated the RPC from the 1977 CTS data by estimating the demands for an industry's production of goods or services that are fulfilled by local suppliers (*LS*) as

$$LS = D^{e(-1/x)}$$

and where for a given industry $x = k\, Z_1^{a1} Z_2^{a2}\, \Pi_j\, Z_j^{aj}$ and D is its total local demand. Since for a given industry **RPC** = ***LS***/***D*****,** then

$$\ln\{-1/[\ln(\ln LS/\ln D)]\} = \ln k + a_1 \ln Z_1 + a_2 \ln Z_2 + S_j\, a_j \ln Z_j$$

which was the equation that was estimated for each industry.

This odd nonlinear form not only yielded high correlations between the estimated and actual values of the RPCs, it also assured that the RPC value ranges strictly between 0 and 1. The results of the empirical implementation of this equation are shown in Treyz and Stevens (1985, table 1). The table shows that total local industry demand (Z_1), the supply/demand ratio (Z_2), the weight/value ratio of the good (Z_3), the region's size in square miles (Z_4), and the region's average establishment size in terms of employees for the industry compared to the nation's (Z_5) are the variables that influence the value of the RPC across all regions and industries. The latter of these maintain the least leverage on RPC values.

Because the CTS data are at the state level only, it is important for the purposes of this study that the local industry demand, the supply/demand ratio, and the region's size in square miles are included in the equation. They allow the equation to extrapolate the estimation of RPCs for areas smaller than states. It should also be noted here that the CTS data only cover manufactured goods. Thus, although calculated effectively making them equal to unity via the above equation, RPC estimates for services drop on the weight/value ratios. A very high weight/value ratio like this forces the industry to meet this demand through local production. Hence, it is no surprise that a region's RPC for this sector is often very high (0.89). Similarly, hotels and motels tend to be used by visitors from outside the area. Thus, a weight/value ratio on the order of that for industry production would be expected. Hence, an RPC for this sector is often about 0.25.

The accuracy of CUPR's estimating approach is exemplified best by this last example. Ordinary location quotient approaches would show hotel and motel services serving local residents. Similarly, IMPLAN RPCs are built from data that combine this industry with eating and drinking establishments (among others). The results of such aggregation process is an RPC that represents neither industry (a value of about 0.50) but which is applied to both. In the end, not only is the CUPR's RPC-estimating approach the most sound, but it is also widely acknowledged by researchers in the field as being state of the art.

Advantages and Limitations of Input-Output Analysis

Input-output modeling is one of the most accepted means for estimating economic impacts. This is because it provides a concise and accurate means for articulating the interrelationships among industries. The models can be quite detailed. For example, the current U.S. model currently has more than 500 industries representing many six-digit North American Industrial Classification System (NAICS) codes. The CUPR's model used in this study has 517 sectors. Further, the industry detail of input-output models provides not only a consistent and systematic approach but also more accurately assesses multiplier effects of changes in economic activity. Research has shown that results from more aggregated economic models can have as much as 50 percent error inherent in them. Such large errors are generally attributed to poor estimation of regional trade flows resulting from the aggregation process.

Input-output models also can be set up to capture the flows among economic regions. For example, the model used in this study can calculate impacts for a county as well as the total Ohio state economy. The limitations of input-output modeling should also be recognized. The approach makes several key assumptions. First, the input-output model approach assumes that there are no economies of scale to production in an industry; that is, the proportion of inputs used in an industry's production process does not change regardless of the level of production. This assumption will not work if the technology matrix depicts an economy of a recessional economy (e.g., 1982) and the analyst is attempting to model activity in a peak economic year (e.g., 1989). In a recession year, the labor-to-output ratio tends to be excessive because firms are generally reluctant to lay off workers when they believe an economic turnaround is about to occur.

A less-restrictive assumption of the input-output approach is that technology is not permitted to change over time. It is less restrictive because the technology matrix in the United States is updated frequently and, in general, production technology does not radically change over short periods.

Finally, the technical coefficients used in most regional models are based on the assumption that production processes are spatially invariant and are well represented by the nation's average technology. In a region as diverse as New Jersey, this assumption is likely to hold true.