ECONOMIC IMPACT ANALYSIS OF HOSTING BREEDERS' CUP

MONMOUTH PARK 2007

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PREPRARED FOR

NEW JERSEY SPORTS & EXPOSITION AUTHORITY
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TABLE OF CONTENTS

EXECUTIVE SUMMARY

The 24th annual ***Breeders' Cup World Thoroughbred Championships*** will be held at Monmouth Park Race Track in Oceanport, New Jersey, on October 27, 2007. The event will feature eight championship races with an estimated $20 million in prize money. During the Wednesday, Thursday and Friday preceding the ***Breeders' Cup,*** Monmouth Park will hold a racing festival featuring stake races and special events both on and off-track. In preparing for these events, and with a look to the long-term future, the New Jersey Sports & Exposition Authority (NJSEA) will invest about $25.7 million over the next two years to renovate Monmouth Park. Approximately $10 million of this capital investment is strictly for the benefit of the ***Breeders' Cup***' with the rest is expected to last beyond the term of the ***Breeders' Cup***.

The capital investment and efforts of the NJSEA in securing the Breeders' Cup at Monmouth Park will translate to over $57.6 million in business receipts ("Output" in the Summary Table on the following page). About half of the business receipts derive from the construction activity, a bit more than a quarter from visitor spending outside of the Monmouth Park, and the rest from activity at or near the Park in anticipation of and during ***Breeders' Cup Week***.

In return for the $25.7 million in targeted investment, people from outside of the state spend about $15.9 million on food, lodging, and other items of interest to out-of-state tourists plus they spend another $7.79 million at park. This series of spending sparked by that initial $25.7 million in investment enables the output effects mentioned in the previous paragraph.

It is important to note that the ***Breeders' Cup*** operations will occur during Monmouth Park's off season. Hence, the above will be strictly new activity to the State of New Jersey. Thus, the chain of activity is net gain to the state's economy. Even a major portion of the $25.7 million in investment itself can be counted as an economic benefit since were it not for the ***Breeders' Cup***, this construction and renovation activity would not have occurred in New Jersey. Indeed, while not folded in the present analysis, it is likely that the improvements made for to attract the ***Breeders' Cup*** may well spur future attendance at subsequent conventional activities at Monmouth Park.

Below, the Summary Table displays the quite substantive economic impacts of the ***Breeders' Cup*** and related activities on New Jersey's economy. The $25.7 million investment will yield an increase in wealth to the state of $25.9 million. The lion's share of this wealth (77.1 percent or $20.0 million) will be labor income to workers within the state (equivalent to 516 job-years). About 23 percent will in the form of taxes, some of which is included as income. About 7 percent of gross state product ($2.3 million) will be in the form state and local tax revenues, most of the state tax revenues will be in the form of sales taxes. These tax revenue amounts do not reflect changes in tax rates made during for the current budget.

While most of the output occurs in the service and retail sectors, almost every sector of New Jersey's ultimately is engaged in support of the ***Breeders' Cup***. Indeed, one sector not noticeably engaged is the agriculture industry. Nonetheless, it should be noted that the economic impacts reported are conservative in this regard.

The following report details how these findings were derived and explains them in more detail. As part of this, the various economic measures in the Summary Table below are defined and discussed.

Summary Table: Summary of the Economic Impacts of the Breeders' Cup at Monmouth Park on New Jersey

Economic Measure	Visitor Spending	Racing Operations	Renovations	Total
Jobs (full-time equivalent job-years)	164	110	241	515
Income ($ thousand)	5,033.8	3,162.6	11,764.6	19,961.0
GSP[a] ($ thousand)	7,654.6	6,177.2	15,879.7	29,711.5
Total taxes ($ thousand)	1,749.9	1,510.5	2,874.2	6,134.6
Federal ($ thousand)	1,060.7	650.0	2,125.0	3,835.7
State ($ thousand)	421.2	369.4	406.9	1,197.5
Local ($ thousand)	267.9	491.1	342.3	1,101.3
In-State wealth ($ thousand) (GSP minus federal taxes)	6,593.9	5,527.1	13,754.8	25,875.8
Output ($ thousand)	15,288.6	13,324.0	28,995.1	57,607.7

INTRODUCTION

The 24th annual ***Breeders' Cup World Thoroughbred Championships*** will be held at Monmouth Park Race Track in Oceanport, New Jersey, on October 27, 2007. The event will feature eight championship races with an estimated $20 million in prize money. Surrounding the ***Breeders' Cup,*** Monmouth Park will present a racing festival during the week of the event featuring stake races and special events on and off-track.

The location of the ***Breeders' Cup*** changes every year, and its state-level economic and fiscal impacts depend on several key factors like the location of the racetrack within the state, especially vis-à-vis urban centers, quality hotels, and airports; the area's cost of living; the extent of any racetrack rehabilitation efforts; and the particular needs and intentions of policy makers. In the case of Monmouth Park, the reasons for hosting the ***Breeders' Cup*** are, in part, to provide a boost to the state and local economy and also to enable Monmouth Park and the State of New Jersey to catch the eye of both national and international horsemen and horse-racing fans and provide for a long-term stimulus for horse racing in the state.

As part of the package to lure the ***Breeders' Cup,*** the New Jersey Sports & Exposition Authority (NJSEA) is renovating Monmouth Park's facilities. Some of these improvements include a new turf course, a refurbished main track, modernization of the elevators and escalators, roof repairs, new sound and video systems, upgraded electrical systems, improved concession and food and beverage areas, and a new wagering teletheater. Significant improvements to the backstretch stabling and dormitories are also part of this program. While the ***Breeders' Cup*** spurred much of the current capital investment program, many of the improvements will have long-lasting effects far beyond the ***Breeders' Cup*** event day and will position Monmouth Park positively for the long term.

The importance of the ***Breeders' Cup*** within the international horse racing arena is probably best exhibited through its coverage in the media. For over seven hours, Monmouth Park will be featured live on ESPN and other international media outlets when the ***Breeders' Cup*** is broadcast. Numerous media outlets in the racing and mainstream media will provide a build up to the ***Breeders' Cup*** in the days and weeks leading up to the event, and Monmouth Park will be the backdrop. This international prominence will secure Monmouth Park and the State of New Jersey a place on the international horseracing map. The ***Breeders' Cup*** will bring in more than 300 credentialed print and electronic media journalists to the event. In sum, the capital investment in the racing venue will be some of the most effective advertising dollars the State could spend to enhance tourism, spur local real estate values, and generate state and local tax revenues. In net, the overall benefits from the ***Breeders' Cup*** will well outweigh its costs.

This report documents and analyzes the economic impacts of hosting the ***Breeders' Cup*** at Monmouth Park for the venue itself and the State of New Jersey. It focuses on the costs and benefits of spending associated with the renovations at Monmouth Park made for the ***Breeders' Cup*** and with spending out-of-state attendees during the racing week. We limit the analysis to spending by out-of-state attendees simply because dollars spent by New Jerseyans at this event may well have been spent within the state even if the ***Breeders' Cup*** did not have Monmouth Park as its venue. The findings are compared with those for past ***Breeders' Cup*** events and detail their importance to local industries and New Jersey's economy.

ECONOMIC IMPACT ANALYSIS

Economic impacts are the direct and multiplier effects of site-based construction and the operations of Monmouth Park and other ***Breeders' Cup*** events on levels of employment and associated income on the State of New Jersey. For example, from the value of construction dollars, such analyses show how many jobs were created directly at the site; jobs created indirectly through suppliers of materials used in the development; and jobs created through the disposable spending of those workers from the first two categories. An analysis of economic impacts also provides a summary of the impacts this job creation would have on levels of personal income. It also estimates the amount of indirect business and household tax revenues generated on the multiplier effects. These are taxes not covered in the fiscal impact analysis. The multiple economic impacts listed above are quantified by a sophisticated input-output model.

The results of R/ECON® I-O model used include many fields of data. 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 (the State of New Jersey here) are included, even though the associated labor income of in-commuters may be spent outside of the region. It should be noted that jobs are reported in terms of the typical hours of work accumulated by the typical worker over the course of a full year. With the exception of perhaps the construction effort, which will take more than a full year, all results in this study pertain to activities that occur within the time frame of a week or so. Thus, in all cases, job figures should be read as "job-years;" i.e., several individuals will undoubtedly fulfill the actions required to accumulate one job-year for any given task.
- **Income:** *"Earned" or "labor" income—specifically, wages, salaries, and proprietors' income*. Income does not include nonwage compensation (i.e., 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).* 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 nonlabor services purchased. For an individual industry it is composed of labor income (net of taxes); taxes; nonwage labor compensation; profit (other than proprietors' income); capital consumption allowances; and net interest, dividends, and rents received.
- **In-State Wealth:** *Gross State Product (GSP) less federal tax revenues generated.*
- **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 the calculations of value added and income generated.
  - *State tax* revenues include income, excise, sales, and other state taxes, estimated from the calculations of value added and income generated (e.g., purchases by visitors).
  - *Local tax* revenues include payments to substate governments, mainly through property taxes on new worker households and businesses. Local tax revenues can also include sales and other taxes.

Direct Economic Effects

As discussed above, the economic impacts of a project, event, or program are typically bifurcated into direct effects and the combination of indirect and induced effects. Direct effects are defined by the magnitude of economic activity injected into the local economy. The local economy is defined by the context of the study. In the case of the current study, the economy represents the State of New Jersey. This is because New Jersey is nominally the relevant geography for most any study for the New Jersey Sports and Exposition Authority. Nonetheless a multiregional model was used with Monmouth County at the core for more accurate analyses of the number of jobs and associated labor compensation are estimable when with an analytical focus on a more immediate level of geography to the economic activity being investigated.

Direct effects are often the same as the dollar amount of an investment or the total amount of business activity or sales. But this is not always true. This is because some of the funds are not spent in the local economy and are, instead, spent elsewhere. For example, in the case of a construction project, while labor is defined by place of work and hence automatically a local expense item, the materials used on the construction job are often purchased from a retailer, wholesaler, or producer outside of the local economy. As a result, such purchases made outside of the area are discounted from the investment amount when defining the direct effects on a specific geography. The same will be especially true for retail spending by out-of-state attendees at the ***Breeders' Cup***. That is, many of the goods sold by Park concessionaires and most of the foodstuffs prepared by restaurants outside of it are likely to have been produced outside of New Jersey. Hence, proper accounting of the effects of interregional and international trade and tourism is important to accurate estimation of both direct and total economic effects.

In the case of the present study the key direct effects are generated from several sources. One of the main ones is the significant facelift that Monmouth Park will receive in preparation for the event. That is, a capital-spending cost element generates economic benefits in terms of jobs of construction workers and their income, as well as local retail and wholesale sales associated with building materials and meals, plus any tax revenues that New Jersey-based governments accrue in the process. The other main components of the direct effect of the event are the spending of attendees at the ***Breeders' Cup***—in particular, (1) the operations of Monmouth Park during the event, which are covered by entry fees to the event and event week; and (2) the spending of event attendees at restaurants and bars, hotels, gift shops, and related retail operations. Given that the economic benefit of from visitor spending during the ***Breeders' Cup*** is the ultimate "prize"—it is a clear net gain to New Jersey's economy—its direct effects are discussed first, then those of the operation expenditures directly associated with the event, and finally those of the capital budget.

Note that in the case of both the operations and the building effort undertaken in the spending of the capital budget that the direct effects yield short-term benefits. Those for the attendee spending during the ***Breeders' Cup*** will mostly be concentrated during that one week in October 2007. Those of the capital budget will take place during a somewhat longer period—in fact, now in mid-2006, they are already underway. These improvements will, however, help improve Monmouth Park in terms of customer satisfaction which should yield positive economic benefits in future racing seasons.

Direct Effects of Attendee Spending

The direct effects of the ***Breeders' Cup*** itself are multidimensional. Yet, they all boil down to the spending of the attendees and members of the horseracing industry. The operations of Monmouth Park during the event, which will be discussed in a following section, largely depend on attendee admission fees, parking and concession sales, and the aggregate wagers (the handle). Meanwhile both attendees and horsemen also purchase goods and services away from the racing venue, while attending events like the ***Breeders' Cup***. They eat, drink, sleep, buy gifts for themselves and others, and also visit local attractions and entertainment venues. All of these activities will induce economic transactions that otherwise would not have occurred—at least not in Oceanport, Monmouth County, or the State of New Jersey, during October 2007. This is because the last racing date for the thoroughbred racing season at Monmouth Park in 2007 is slated to be in early September. Since the ***Breeders' Cup*** will not replace any regularly scheduled event at the venue, all spending will be over and above current spending in the area. This is critical because it is only such new or extra spending that can be counted as part of the direct effects actually generated by the event.

Another critical component is estimating the proportion of attendees that stay in hotels. This is because when compared to day trippers, overnighters spend two to three times more. Also a large share of hotel customers also tend to enter the state via airports and to rent cars from agencies within the state, as opposed to driving in their own vehicles to the racing venue. Part of the air fares and car rental fees also are injections of cash into the state's economy: hence, they too must be counted. Each of these items is discussed in turn in the following subsections.

Out-of-state Attendees and Geography. Based on previously published reports, out-of-state attendance at ***Breeders' Cup*** venues located outside of the Northeast has averaged less than 50 percent. For example, the estimate for the 2004 ***Breeders' Cup*** at Lone Star Park in Grand Prairie, Texas, was that 43 percent of event attendees were out-of-state residents: the same figure for the 1998 ***Breeders' Cup*** at Churchill Downs in Louisville, Kentucky, was 39 percent. These low out-of-state attendee shares can simply be attributed to the location of the venues.

Lone Star Park is in Texas, one of the largest of the coterminous 48 states and also one of the most heavily populated. This racing venue is located within the Dallas-Fort Worth metropolitan area, which is located in the northeast Texas and some 200-300 miles to the next closest metropolitan area. This means that the most cost-effective means of arrival for out-of state visitors (and even most from within Texas) is air transportation, which raises their net the cost of attendance. This naturally dampens overnight visitation.

For its size, Kentucky has a strong, built-in horse-racing market. Unlike Grand Prairie, however, Louisville's is located at the border of a smaller state—Indiana. Like the case of Grand Prairie, the out-of-state population in close proximity to Louisville is low. Exceptions are the Cincinnati, Ohio, and Evansville, Indiana, metropolitan areas, both of which are about a 100 miles distant - easy day-trip drives away. Thus, it is not surprising that despite its border location that overnight visitors comprised a relatively small share of all ***Breeders' Cup*** attendees at Churchill Downs as well.

Monmouth Park has very different locational characteristics. It is set between two very large, relatively wealthy metropolitan areas, both close and outside of the home state's borders. Moreover, a number of other metropolitan are within half-day's drive. In essence, it drawing from experiences at Churchill Downs and Lone Star Park to estimate the expected share of visitors staying overnight is unlikely to be a robust approach. That is, Northeastern states tend to have higher shares of out-of-state attendee spending because they are both geographically smaller and more densely populated. Thus, we can assume that out-of state residents in the Northeastern region are more likely to attend an event in New Jersey because their overall travel expenses would not include the high cost of plane tickets. Another important note is that Northeastern states have higher median household incomes, making them more predisposed toward attending highly visible horseracing events.

Thus to estimate the share of attendees at Monmouth Park who are from out of state, data from the 2005 ***Breeders' Cup*** at Belmont Park in Elmont, New York, was used. Its location within the same Mid-Atlantic market area of New York, New Jersey, and Connecticut provided a far better foundation for estimation than Arlington Park, Lone Star Park, or Churchill Downs for which reports of economic impacts are available. We felt comfortable using Belmont Park numbers because Monmouth Park's location is similarly positioned to attract out-of-state tourists. Moreover as is the case at Belmont, Monmouth Park is sufficiently far away from other states (New York and Pennsylvania) to enable New Jersey to capture the overnight stays and dining spending of out-of-state attendees. That is, Oceanport, New Jersey, is close enough to major cities like New York City, Philadelphia, and Atlantic City to provide easy access to the event, but far enough away to ensure that many are likely to stay overnight.[1]

Belmont Park and the ***Breeders' Cup*** estimated that 70 percent of its pre-sale reservations were made by out-of-state residents. Approximately 8 percent were identified as international attendees and 35 percent from neighboring Northeastern states. This larger share of out-of-state attendees is unique to the densely populated Northeastern region. The Northeast has a high concentration of heavily populated states with high median household incomes, a developed intercity transit system, and many international airports,[2] making the event readily accessible to a large, relatively wealthy population.

Data for pre-sale ticketing by state of customer origin were available for the 2005 ***Breeders' Cup*** at Belmont Park (see Table 1). Using econometric techniques, we estimated number of reservations by state, given each state's respective distance to Belmont. A gravity model least-squares regression formulation was applied, hypothesizing that, all else being equal, customers were less likely to traverse longer distances to attend the race and that more wealthy customers would be more likely to overcome associated travel costs as well as the costs of attendance. That is, it was assumed that closer states with greater populations and per capita (or household) incomes tend to yield greater attendance at the ***Breeders' Cup*** than would other states. The model is shown and briefly discussed in Appendix A.

[1] Distance from Monmouth Park to Manhattan is 54 miles. Monmouth Park to Philadelphia is a distance of 89 miles. Monmouth Park is 82 miles from Atlantic City.

[2] Newark Liberty, LaGuardia, JFK, Philadelphia, and Atlantic City airports are all sufficiently close.

Table 1: Reservations of "Regular Attendees" by State at the 2005 *Breeders' Cup* and Projected for 2007

State	2005	2007	Share 2007
Alabama	55	86	0.3%
Alaska	3	3	0.0%
Arizona	193	193	0.8%
Arkansas	87	87	0.3%
California	1,362	1,362	5.3%
Colorado	94	94	0.4%
Connecticut	809	412	1.6%
DC	100	103	0.4%
Delaware	47	67	0.3%
Florida	891	891	3.4%
Georgia	147	147	0.6%
Idaho	20	20	0.1%
Illinois	812	812	3.2%
Indiana	149	149	0.6%
Iowa	67	67	0.3%
Kansas	69	69	0.3%
Kentucky	4,868	4,861	18.8%
Louisiana	79	79	0.3%
Maine	45	40	0.2%
Maryland	791	851	3.3%
Massachusetts	867	754	2.9%
Michigan	198	198	0.8%
Minnesota	186	186	0.7%
Mississippi	13	13	0.1%
Missouri	142	142	0.6%
Montana	22	22	0.1%
Nebraska	93	93	0.4%
Nevada	129	129	0.5%
New Hampshire	69	61	0.2%
New Jersey	1,746	2,464	9.5%
New Mexico	28	28	0.1%
New York	8,010	7,293	28.2%
North Carolina	120	121	0.5%
North Dakota	2	2	0.0%
Ohio	273	282	1.1%
Oklahoma	159	159	0.6%
Oregon	341	341	1.3%
Pennsylvania	939	1,376	5.3%
Rhode Island	1,069	80	0.3%
South Carolina	79	79	0.3%
South Dakota	2	2	0.0%
Tennessee	103	103	0.4%
Texas	774	774	3.0%
Utah	18	18	0.1%
Vermont	47	45	0.2%
Virginia	500	529	2.0%
Washington	115	117	0.45%
West Virginia	13	13	0.05%
Wisconsin	74	74	0.29%
Wyoming	10	10	0.04%
Total	26,829	25,897	100.0%

Projected admissions for 2007, assuming similar volumes of reservations by regular attendees, are shown in Table 1. Note that the origins of ***Breeders' Cup*** admissions for Monmouth Park in 2007 are not generally projected to change much from those at Belmont in 2005. Not surprisingly, more reservations are expected to come from New Jersey and Pennsylvania in 2007 and far fewer from the states of Connecticut, New York, and Rhode Island. The purpose of this analysis, however, was to secure a reasonable estimate of share of in-state versus out-of-state attendees. In the case of Belmont Park nearly 30 percent of all pre-sales reservation was made by New Yorkers in 2005. This contrasts heavily with the projection for 2007, which reveals that less than 10 percent of the equivalent ticketing will be made by New Jerseyans at Monmouth Park.

The projected difference in in-state attendance between the two venues is important. This is because the ensuing analysis of attendee spending is predicated on the working assumption that pre-sales reservations at the Belmont event were made by people who regularly attend the various ***Breeders' Cup*** events and, hence, stay overnight. Other attendees may stay overnight as well. Nonetheless, it is presumed that a larger share of other admissions purchasers will tend to live in closer to the racing venue—in this case they will tend to live in New Jersey, New York, and Pennsylvania and will tend to commute from their homes rather than stay in hotels close to Monmouth Park.

The New Jersey Sports and Exposition Authority estimates attendance at the ***Breeders' Cup*** at Monmouth Park to be 43,000 people. Given the small geographic size of New Jersey and the popularity of horse racing in nearby states, it is estimated that 33,500 attendees will come from outside of the state, as shown in Table 2. Thus, the remaining 9,500 attendees are expected to be New Jerseyans.

About 80 percent of all out-of-state visitors stayed overnight when attending ***Breeders' Cups*** at Arlington Park, Churchill Downs, and Lone Star Park. Given the proximity of the states of New York and Pennsylvania, a similar share of out-of-state attendees is expected to stay overnight in New Jersey in 2007. This amounts to an addition of nearly 3,400 overnight attendees beyond those we call "regular attendees," for a total of about 26,850 out-of-state overnight attendees to Monmouth Park. Thus, 20 percent of out-of-state visitors—about 6,700—are projected to be day-trippers, commuting to Oceanport, New Jersey.

Projected Attendance by New Jersey Residents. As mentioned earlier, of the total of 43,000 attendees on ***Breeders' Cup Day,*** about 9,500 are expected to be from New Jersey. About a third of New Jersey attendees are projected to stay in nearby hotels. This estimate was obtained by parsing out the projected number of New Jersey "regular attendees" and applying the share of New Jersey residents at the 2001 Haskell Invitational that stayed at hotels near Monmouth—about 14 percent (MMD Research, 2004)—to remaining projected New Jersey attendees to the 2007 ***Breeders' Cup***.

Table 2: Disposition of Projected 2007 *Breeders' Cup* Attendance:
In-State versus Out-of-State and Overnight versus Daytrip

	Out of State	New Jersey	Total
Regular attendees	23,433	2,464	25,897
Other overnight attendees	3,375	1,257	4,632
Daytrip attendees	6,692	5,779	12,471
Total	33,500	9,500	43,000

Sources: Table 1, total attendance estimates from NJSEA, and information from prior *Breeders' Cups.*

Lodging Expenses. During past ***Breeders' Cups***, overnight attendees accounted for approximately 80 percent of the total out-of-state attendees; averaging 1.28 hotel rooms per person for the length the event. The estimate of 1.28 hotel room-nights per person was obtained from lodging data at the 2004 ***Breeders' Cup*** at Lone Star Park. It is equal to the average number of hotel rooms per travel party (1.68) divided by the average travel party size (3.8 people) times the average length of stay (2.9 nights) in the area (Clower and Weinstein, 2005). There is no reason to expect a different typical visit from out-of-state attendees for a ***Breeders' Cup*** at Monmouth Park since the two events have similar schedules.

For Monmouth Park, 26,808 out-of-state visitors are expected to account for approximately 34,314 hotel rooms-nights for the duration of the ***Breeders' Cup***. Assuming hotel rates of averaging $170 during this event, total hotel expenses for out-of-state attendees should be about round $5.83 million. Of course, this does not include spending by New Jersey overnighters. The 3,721 daily in-state overnighters are expected to spend in a vein similar to that of out-of-state attendees. Using the 1.28 room-nights per visitor and $170 per room night figures applied above yields adds an additional $0.81 million of spending. Thus, a total of $6.64 million in hotel spending is expected in Monmouth County and the surrounding regions in the wake of the 2007 ***Breeders' Cup*** at Monmouth Park.

Rental Car Expenses. While out-of-state attendees conceivably could travel by rail to Oceanport from Newark Liberty International Airport or New York City on New Jersey Transit's North Shore Line, it is likely that many will instead opt to rent automobiles if they do not drive to Monmouth Park in their own vehicle. The rental-car spending was about 16.3 percent of all hotel spending according to a survey at Lone Star Park for the 2004 ***Breeders' Cup*** (Clower and Weinstein, 2005). Applying this percentage to hotel spending estimates for 2007 yields attendee spending on car rentals of about $1.08 million. By assuming a rental rate of $50 per day (and, again, a travel party of 3.8 people and an average stay of 2.9 days), means that about 60 percent of all attendees will ride to the park in a rental car. In other words, about 80 percent of all out-of-state attendees will do so.

Other Spending. In addition to spending on lodging and rental cars, daytrippers and overnighters alike will spend their cash on food, gifts, and other sundry items. During the three-day ***Breeders' Cup*** event at Lone Star Park in 2004 each attendee seat at the park accounted for about $259 in local spending beyond that for rental cars and lodging. Assuming 3 percent annual increases in spending during for three years pushes this figure up to about $283 per person. Thus, spending during the same event at Monmouth Park should mean that upwards of $12.17 million (multiplying the $283 of spending per person by 43,000 attendees) is likely to be spent during the ***Breeders' Cup*** in 2007 for things other than admissions, vehicle rentals, and hotel rooms. Of course, only some of this is attributable to attendees from out of the state—about $9.13 million or nearly 75 percent of the total.

Summary of Visitor Spending. The 2007 spending in New Jersey due to the ***Breeders' Cup*** on hotels ($6.64 million), rental cars ($1.08 million), and other items ($12.17 million) is estimated to total $19.89 million. Of this spending, however, only a share will be made by people from outside of New Jersey.

For the sake of conservatism, we assume that expenditures by New Jerseyans would have made within the state anyway, albeit on other entertainment venues. Since hotels and rental cars are unlikely to be used by many New Jerseyans, estimates of these spending items are assumed to be "new spending"—that is, money that would not otherwise have been spent in the state of New Jersey. About $5.83 million of the $6.64 million total for hotel rooms is expected to be spent by out-of state visitors—a difference of $810,000. Spending for rental cars by out of state visitors can similarly be discounted to $950,000. And, finally, we have estimated that upwards of about 75 percent of the $12.17 million (or $9.13 million) in such spending is expected to be attributed to out-of-state visitors. Thus the net direct effect of visitor spending to state is estimated to be $15.91 million (about 80.0 percent of the $19.89 in estimated total visitor spending).

Direct Effects of Operating Expenses for the Breeders' Cup

While they are covered by revenues generated prior to and during the event, the expenses incurred by the New Jersey Sports & Exposition Authority (NJSEA) in sponsoring the Breeders' Cup will also support the New Jersey economy. That is, much of the spending at Monmouth Park during the event will be associated with the wages and salaries of NJSEA workers as well as materials and services provided by New Jersey firms. The National Thoroughbred Racing Association (NTRA) estimates that nearly $4.9 million will be spent in hosting the event.[3] Of this just over $832,000 is slated for the compensation and payroll taxes of workers at the park, much of which is likely to be spent by New Jersey households for whom the monies are likely to supplement their usual incomes.

Events surrounding the ***Breeders' Cup World Championships*** will extend for three extra days. Expected attendance during the week will range from 7,500 to 20,000 guests. Discussions with staff at NJSEA suggested that labor costs would rise accordingly on all activities as would just those non-labor costs associated with public safety, housekeeping, and landscaping. The resulting estimates of expenses by category are shown in Table 3. Note that they include significant amounts for marketing and advertising around the event and for hospitality events for VIPs and media, horsemen stabling facilities and racing related expenses, staffing for major operational departments including mutuels, TV, admissions, parking/traffic, maintenance; printing of racing programs and tickets and general maintenance items. The bottom line is that about $5.79 million will be spent by the NJSEA hosting the set of events. Of this total, $1.46 million (or 25.1 percent) is expected to be payroll-related.

The detail laid out above and in Table 3 is important since the different expenditure items yield different multiplier effects upon the New Jersey economy. In part the differences depend in the extent to which the various items are purchased from New Jersey firms and the degree to which their employees live within the state and, hence, spend their money their, recirculation the money within the state in terms of multiplier effects, which will be elaborated later.

Direct Effects of Capital Spending at Monmouth Park

The modern Monmouth Park opened in 1946. Maintaining a facility of that size and age can be a challenge. In late 2005, the NJSEA approved a bond of about $30 million for long-term capital projects at Monmouth Park as well as specific requirements for hosting the 2007 Breeders' Cup. This capital infusion is a significant increase over the average capital investment in Monmouth Park over the past four years ($1,350,000), most of which covered just basic maintenance requirements for operation of the facility.

[3] Kirchner, Ken. 2006. "Budget Model for Expenses," a spreadsheet of estimated expenses for the 2007 Breeders Cup, National Thoroughbred Racing Association, Lexington, Kentucky, June 30.

Table 3: Estimates of Labor and Nonlabor Operating Expenses by Type at Monmouth Park during *Breeders' Cup* and Related Events

Expense Type	Nonlabor expenses	Labor expenses	Total
Mutuel & Money Room	$747,852	$751,016	$1,498,868
Admissions	54,450	140,137	194,587
Parking	45,900	27,802	73,702
Programs & Publications	218,750	10,000	228,750
Racing Office	2,438	37,975	40,413
Guest Relations	40,000	86,382	126,382
Retail	5,000	-	5,000
Simulcasting	56,000	121,553	177,553
Television	61,500	20,836	82,336
Facilities & Maintenance	465,610	89,600	555,210
Public Safety	280,950	58,056	339,006
Housekeeping	45,000	-	45,000
Track & Turf	-	7,641	7,641
Landscaping	157,500	-	157,500
Barn & Backstretch	40,000	25,470	65,470
Marketing	2,095,000	68,460	2,163,460
Reception	21,000	11,267	32,267
Total	$4,336,950	$1,456,193	$5,793,142

Source: "Budget Model for Expenses," a spreadsheet of estimated expenses for the 2007 Breeders Cup, National Thoroughbred Racing Association, Lexington, Kentucky, June 30.

Note: Labor expenses and nonlabor expenses associated with public safety, landscaping, and housekeeping were modified from those in the above source to reflect costs for three extra days to serve about one fourth of attendees at the championship races each day.

The 2006-2007 capital budget is the largest renovation project in the park's history. The projects will focus on infrastructure needs to the main grandstand facility (plumbing, upgraded electrical services, new sound and video systems), extensive renovations to the backstretch stable areas including barns and dormitories, a new turf race course and a refurbishment of the main dirt track, a new simulcast wagering teletheater, new wagering equipment, upgrades to the press box area and improvements to the roofing system. Capital funds will also handle specific requirements of handling the ***Breeders' Cup*** including seating, parking and hospitality areas needed to put on the event. Approximately 38 percent of the planned capital improvements are specifically for the 2007 ***Breeders' Cup***. That is, they are improvements that will be dismantled or removed after the event.

About $25.7 million was earmarked to improve Monmouth Park in preparation for the ***Breeders' Cup***. In fact, Monmouth Park's winning bid to host the 2007 ***Breeders' Cup*** was contingent upon Monmouth Park meeting the requirements set by ***Breeders' Cup*** officials to bring the facility up to world-class horse-racing standards.

Details of the capital spending plan are summarized in Table 4. The most important items on the budget are the $5.4 million Grandstand/Clubhouse upgrades, followed by the $4.6 million addition of temporary seating accommodations, and the $3.3 million reconstruction of the patio terrace/simulcast teletheater. In total, $21.7 million dollars, or 84.5 percent, will be spent on more permanent structural alterations. Approximately $3.9 million, or 15.5 percent, was spent on improvements like upgrading technology systems like a sound and video system and wagering machines.

The detail laid out earlier and in Table 4 is important to the effort to estimate the economic and fiscal impacts of this aspect of the ***Breeders' Cup*** contribution since the different capital items require very different types of materials and those materials are purchased from various vendors, many of whom many not be from New Jersey, thus inducing great amount of economic leakage from the state's economy. Moreover, each project type requires different share of spending upon labor, and some specialized construction labor may need to commute from outside of New Jersey. The circulation of the money within the state in terms of multiplier effects, which is largely determined by the extent of economic leakage and use of labor from outside of the state, will be elaborated later.

Total Economic Effects

Introduction and Methodology

Total economic impacts encompass both direct and multiplier effects. The latter incorporate indirect and induced impacts. The character of the direct impacts is derived as discussed in the previous section, where it is presented in some detail. The process for estimating a given project's indirect and induced economic impacts, however, is more roundabout. By definition, a project's first round of indirect impact includes the purchases of any supplies and/or services that are required to produce the direct effects. Subsequent purchases of supplies and services generate other rounds of indirect impacts. The induced impacts are the purchases that arise, in turn, from the increase in aggregate labor income of households. Aggregate labor income is defined as the sum of wages, salaries, and proprietors' income earned by workers. Both the indirect and induced economic impacts demonstrate how the demand for direct requirements reverberates through an economy.

Table 4: Details of the 2006-2007 Capital Budget for Monmouth Park

Budget Category	**Cost**
Structural alterations/additions/reconstruction	$14,049,200
Seating/tents	$5,026,200
Barn/stables area	$2,261,700
Press	$353,500
Total Long-Term Structural Improvements	$21,690,600
General electrical systems upgrade	$3,018,600
Aesthetics/beautification	$952,100
Total Nonstructural Systems Upgrades	$3,970,700
Total	**$25,661,300**

Source: NJSEA. 2005. "Total – Monmouth Capital Budget," a spreadsheet provided by the New Jersey Sports and Exposition Authority, October.

EXHIBIT 1
Examples of Direct and Multiplier Effects
(Indirect and Induced Impacts) of Construction

	MULTIPLIER EFFECTS	
DIRECT IMPACTS	**INDIRECT IMPACTS**	**INDUCED IMPACTS**
Purchases for: • Architectural design • Site preparation • Construction labor • Building materials • Machinery & tools • Finance & insurance • Inspection fees	Purchases of: • Lumber & wood products • Machine components • Stone, clay, glass, & gravel • Fabricated metals • Paper products • Retail & wholesale services • Trucking & warehousing	Household spending on: • Food, clothing, day care • Retail services, public transit, utilities, car(s), oil & gasoline, property & income taxes, medical services, and insurance

Exhibit 1 details the economic impacts of construction of a new property. The direct impact component consists of purchases made specifically for the construction project. Direct impacts on the local economy are composed only of purchases from local organizations.

The indirect impact component consists of spending on goods and services by industries that produce the items purchased by the general contractors. Among his many business relationships, for example, a contractor might purchase windows from “Jerry’s Home Improvement Inc.” (JHI), which makes custom windows. In order to produce windows, JHI must hire craftsmen as well as contract with firms that supply glass, adhesives, paints and coatings, glazing, and wood products. JHI also hopes to make a profit for its owners/shareholders. In order to meet JHI’s needs, its suppliers must also hire workers and obtain materials and specialized services. The same process is repeated for their suppliers, and so on. Thus, an extensive network of relationships is established based upon round after round after round of business transactions that emanate from a single preservation project. It is this network of transactions that describes the set of indirect impacts. Of course, a firm’s net indirect contribution to the construction activity largely depends on (1) the total value of its transactions in the network; and (2) the proximity of its business relationship(s) to the construction contractor within the project’s business network. Similar to direct impacts, local indirect impacts are composed only of indirect business transactions that occur in the local economy.

Finally, induced impacts are a measure of household spending. They are a tally of the expenditures made by the households of the construction workers on a development, such as the renovation of Monmouth Park, as well as the households of employees of the supplying industries.

One means of estimating indirect and induced impacts would be to conduct a survey of the business transactions of the primary contractor. The business questionnaire for this survey would ask for the names and addresses of the contractor’s suppliers; what and how much they supply; the names and addresses of the contractor’s employees; and the annual payroll. A related questionnaire would cover the household spending of the employees of the surveyed firms. It would request a characterization of each employee’s household budget by detailed line items, including names and addresses of the firms or organizations from which each line item is purchased.

Both questionnaires (which are expensive to effect) subsequently could be used to measure indirect and induced impacts of the primary contractor's activity. The business questionnaire would be sent to the business addresses identified by the primary contractor; 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. Consequently, relatively less expensive economic models based on Census data are typically used to measure economic impacts.

The economic model that has proven to estimate the indirect and induced economic effects of events most accurately, and the one used in the current study, is the input-output model. Its advantage stems from its level of industry detail and its depiction of interindustry relations. As shown in Appendix A to this chapter, 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 employs a multiregional input-output model composed of Monmouth County, the rest of northern New Jersey, southern New Jersey, and of the non-New Jersey components of both New York City and Philadelphia consolidated metropolitan areas to estimate the extent of the indirect and induced economic effects of the ***Breeders' Cup***-induced operations, visitor spending, and capital investment. The split between north and south New Jersey is made at the northern border of Burlington County. Trade between the regions is estimated using a gravity model formulation, which are largely based on estimates of average travel times for freight among the regions.

R/ECON® I-O, the model of choice for this study, expresses the resulting jobs, income, and wealth impacts in various levels of industry detail. The most convenient application breaks the industry-level results at the one-digit standard industrial code (SIC) or division level. This level has 11 industry divisions:

1. Agriculture
2. Agricultural, Fishing, and Forestry Services
3. Mining
4. Construction
5. Manufacturing
6. Transportation, Communications, and Public Utilities (TCPU)
7. Wholesale Trade
8. Retail Trade
9. Finance, Insurance, and Real Estate (FIRE)

10. Services
11. Government

R/ECON® I-O provides results in two other industry breakdowns that detail subcategories under each of these eleven groups. These breakdowns use an 86-industry specification and the full industry specification of the input-output model (517 industries).

The model results, however, are only as good as the data that go into them. Thus, when the direct requirements are estimated, as earlier done in this report with respect to Monmouth Park and the ***Breeders' Cup***, and the industry-level purchases are also estimated (as is the case in this study), care should be taken in interpreting model results, especially when they contain extreme categorical detail. Hence, the main body of this chapter focuses on rather aggregated sectoral results, but tables with more detailed results and job impacts by occupation are made available as exhibits. The purpose of providing such detail is to enable a better idea of the quality of jobs that are likely to be created and of the types of industries that are most likely to be affected by construction activities.

Total Economic Impacts of Visitor Spending

Table 5 summarizes the total economic impacts of the visitor spending due to the ***Breeders' Cup*** upon the State of New Jersey. Recall that $15.91 million of the $19.89 million in total visitor spending is attributable to out-of-state attendees at the event and that spending by New Jersey attendees is not a clear addition to the state's economy. The nearly $16 million in tourist spending during the Breeders' Cup is expected to generate $5.03 million in income for state-based workers--the equivalent of 164 job-years of work. In addition to the labor income, the activities of out-of-state attendees during race—including spending upon hotel, meals, and rental car—will generate about another $2.6 million in wealth to business owners and government tax coffers, for a total of $7.65 million in wealth.

Direct Economic Effects of Visitor Spending on New Jersey. Recall, that it is the $15.91 million to be spent by out-of-state visitors that generated the above impacts. Actually, only about $10.89 million of that will be spent directly on the goods and services of firms within the state (see line II.1) generated them. The remaining $5.01 million leaks out of New Jersey's economy and is spent primarily on food goods and gift items not manufactured within the state and, hence, has no effect on New Jersey's economy. Producing the nearly $11 million's worth of tourism goods and services requires about $3.70 million worth of labor from state workers and creates $5.56 million in overall wealth (gross state product).

Multiplier Effects. The difference between the total economic effects and direct economic effects are called multiplier effects. Note that the multipliers themselves vary with the economic measure of focus. Since the income multiplier is lower than the jobs multiplier (see line II.4) it is clear that the direct jobs created pay less than the jobs expected to be generated to support them. This is further evidenced by the income per job for the two categories of effects. The direct jobs created by tourism activities—largely retail, hotel and personal service jobs—are expected to have fairly low average pay rates—on the order of $28,300. The jobs supporting them are expected to pay somewhat more, about $40,700 annually. In net, the multiplier effects should amount to about $1.3 million in labor income (or the equivalent pay for about 33 full-year jobs). It will also generate another $700 thousand in wealth to New Jersey business owners and government tax coffers.

Table 5: Economic and Tax Impacts on the State of New Jersey of $15.9 Million in Visitor Spending from the 2007 Breeders' Cup

	Economic Component			
	Output (000 $)	**Employment (jobs)**	**Income (000$)**	**Gross State Product (000$)**
I. TOTAL EFFECTS (Direct and Indirect/Induced)*				
1. Agriculture	111.2	1	9.0	17.6
2. Agri. Serv., Forestry, & Fish	22.3	1	10.7	17.7
3. Mining	8.2	0	1.3	4.1
4. Construction	179.3	0	24.7	59.8
5. Manufacturing	1,647.5	6	289.7	333.2
6. Transport. & Public Utilities	1,752.6	14	559.6	780.7
7. Wholesale	917.0	4	372.9	393.8
8. Retail Trade	4,014.1	68	1,497.5	2,254.3
9. Finance, Ins., & Real Estate	920.3	5	250.6	662.7
10. Services	5,692.5	64	2,010.6	3,118.6
11. Government	23.5	0	7.3	11.9
Total Effects (Private and Public)	15,288.6	164	5,033.8	7,654.6
II. DISTRIBUTION OF EFFECTS/MULTIPLIER				
1. Direct Effects	10,896.6	131	3,700.0	5,561.8
2. Indirect and Induced Effects	4,391.9	33	1,333.8	2,092.8
3. Total Effects	15,288.6	164	5,033.8	7,654.6
4. Multipliers (3/1)	1.403	1.251	1.360	1.376
III. COMPOSITION OF GROSS STATE PRODUCT				
1. Wages--Net of Taxes				4,180.1
2. Taxes				1,186.6
a. Local				253.9
b. State				350.5
c. Federal				582.1
General				249.2
Social Security				332.9
3. Profits, dividends, rents, and other				2,287.9
4. Total Gross State Product (1+2+3)				7,654.6
IV. TAX ACCOUNTS		**Business**	**Household**	**Total**
1. Income --Net of Taxes		4,180.1	3,105.0	---------
2. Taxes		1,186.6	563.3	1,749.9
a. Local		253.9	14.0	267.9
b. State		350.5	70.7	421.2
c. Federal		582.1	478.6	1,060.7
General		249.2	478.6	727.8
Social Security		332.9	0.0	332.9
EFFECTS PER MILLION DOLLARS OF INITIAL EXPENDITURE				
Employment (Jobs)				10.3
Income				316,392.4
State Taxes				26,476.8
Local Taxes				16,841.6
Gross State Product				481,118.8
INITIAL EXPENDITURE IN DOLLARS				15.910,000.0

Source: Rutgers University, Center for Urban Policy Research, R/Econ I-O model estimates.

In total, direct visitor spending on $10.89 million in New Jersey goods and services generates another $4.39 million in gross receipts ("output" in Table 5, line II.2). Thus, a total of $15.3 million in economic activity is generated in the state via the out-of-state visitors' spending during ***Breeders' Cup Week***. Importantly, about half of this total ($7.7 million/$15.3 million) is in the form of wealth to New Jerseyans!

Tax Revenues. Section IV.2 of Table 5 summarizes a rough estimate of expected tax revenue outcomes as a result of the visitor activity. Close to $420,000 in state tax revenues (mostly through sales tax) are expected to be generated from this visitor activity. Another $250,000 in local tax revenues are also expected to be raised through property improvements made by workers in the state.

Total Economic Impacts of Operations Spending

Table 6 summarizes the total economic impacts of ***Breeders' Cup*** operations upon the State of New Jersey. Operating Monmouth Park for the ***Breeders' Cup*** will generate $3.16 million in income for state workers. We see in Table 6 that this will generate the equivalent of 110 job-years of work. In addition to the labor income, the race will generate $6.2 million in wealth.

Direct Economic Effects of Racing Operations. The full $7.79 million in operating expenses were assigned not only to be spent New Jersey but specifically in Monmouth County. As mentioned in the section on direct effects, the operations of Monmouth Park are expected to generate about $1.46 million in labor income to state workers (about 68 person-years of work) and create $3.46 million in overall wealth (gross state product). The difference between the direct wealth created (gross state product and labor income is the net sum of wagers retained by NJSEA.

Multiplier Effects. The multipliers effects on New Jersey's economy of the operations of Monmouth Park are about $1.7 million in labor income, which is equivalent to 43 job years, in other businesses is expected to be generated. It will also generate another $1.0 million in wealth to New Jersey business owners and government tax coffers for a total of $2.7 million in gross state product.

In total, direct spending of $7.79 million in New Jersey goods and services on operations in preparation of and during ***Breeders' Cup Week*** generates another $5.53 million in gross receipts ("output" in Table 6, line II.2). Thus, a total of $13.3 million in economic activity is generated due to activities at Monmouth Park. About 46 percent of this total ($6.1 million/$13.3 million) is in the form of wealth to New Jerseyans!

Tax Revenues. Section IV.2 of Table 6 summarizes a rough estimate of expected tax revenue outcomes as a result of the operations during the ***Breeders' Cup***. Close to $369,400 in state tax revenues (mostly through sales tax) are expected to be generated from activity in support of the ***Breeders' Cup*** operations. Another $491,000 in local tax revenues are also expected to be raised through property improvements.

Table 6: Economic and Tax Impacts on the State of New Jersey of $7.79 Million of Operating Expenses for the Breeders' Cup at Monmouth Park

	Economic Component			
	Output (000 $)	**Employment (jobs)**	**Income (000$)**	**Gross State Product (000$)**
I. TOTAL EFFECTS (Direct and Indirect/Induced)*				
1. Agriculture	29.6	0	2.2	7.0
2. Agri. Serv., Forestry, & Fish	160.3	6	85.5	136.5
3. Mining	2.8	0	0.6	1.2
4. Construction	648.1	1	91.1	215.4
5. Manufacturing	774.3	4	202.2	227.9
6. Transport. & Public Utilities	808.6	4	245.3	336.2
7. Wholesale	226.7	1	92.2	97.4
8. Retail Trade	356.3	5	131.7	201.8
9. Finance, Ins., & Real Estate	884.6	5	201.4	677.9
10. Services	9,425.0	83	2,107.9	4,272.0
11. Government	7.8	0	2.4	4.0
Total Effects (Private and Public)	13,324.0	110	3,162.6	6,177.2
II. DISTRIBUTION OF EFFECTS/MULTIPLIER			0	
1. Direct Effects	7,793.1	68	1,456.2	3,456.2
2. Indirect and Induced Effects	5,530.9	43	1,706.4	2,721.0
3. Total Effects	13,324.0	110	3,162.6	6,177.2
4. Multipliers (3/1)	1.710	1.631	2.172	1.787
III. COMPOSITION OF GROSS STATE PRODUCT				
1. Wages--Net of Taxes				2,236.1
2. Taxes				1,142.8
a. Local				480.1
b. State				323.5
c. Federal				339.2
General				122.9
Social Security				216.3
3. Profits, dividends, rents, and other				2,798.3
4. Total Gross State Product (1+2+3)				6,177.2
IV. TAX ACCOUNTS		**Business**	**Household**	**Total**
1. Income --Net of Taxes		2,236.1	1,510.7	---------
2. Taxes		1,142.8	367.8	1,510.5
a. Local		480.1	11.0	491.1
b. State		323.5	45.9	369.4
c. Federal		339.2	310.9	650.0
General		122.9	310.9	433.8
Social Security		216.3	0.0	216.3
EFFECTS PER MILLION DOLLARS OF INITIAL EXPENDITURE				
Employment (Jobs)				14.2
Income				405,821.2
State Taxes				47,402.6
Local Taxes				63,013.3
Gross State Product				792,639.7
INITIAL EXPENDITURE IN DOLLARS				7,793,142.0

Source: Rutgers University, Center for Urban Policy Research, R/Econ I-O model estimates.

Total Economic Impact of Capital Spending

Table 7 summarizes the total economic impacts of capital spending due to the ***Breeders' Cup*** upon the State of New Jersey. Renovations in preparation for the ***Breeders' Cup*** will generate $11.8 million in income for workers in New Jersey—the equivalent of 241 job-years of work. In addition to the labor income, the renovations activity will generate about another $4.1 million in wealth to business owners and government tax coffers, for a total of $15.9 million in wealth.

Direct Economic Effects of Capital Spending. The full $25.7 million in construction was attributable to the ***Breeders' Cup***. About $20.1 million or 78.5 percent of this total will in spent on the materials and construction services produced by firms within the state (see line II.1). The remaining $5.6 million leaks out of New Jersey's economy and is spent primarily on construction materials, new seating, and other goods and services not produced within the state and, hence, has no effect on New Jersey's economy. Producing the $20.1 million's worth of renovation goods and construction services requires about $8.8 million worth of labor from workers in the state and creates $11.6 million in overall wealth (gross state product).

Multiplier Effects. The difference between the total economic effects and direct economic effects are called multiplier effects. Note that the multipliers themselves vary with the economic measure of focus. In this case, they are fairly close in size (see line II.4). Thus, one should expect that the direct jobs created will pay about the same as the jobs supporting them. Income per job for the two categories of effects reveals a slightly different picture, however. The direct jobs created by the renovation activity—largely construction jobs—are expected to have pay rates on the order of $50,500. The jobs supporting them are expected to pay somewhat more, about $44,200 annually. In net the multiplier effects should be close to about $3.0 million in labor income (or the equivalent pay for about 67 full-year jobs). It will also generate another $1.3 million in wealth to New Jersey business owners and government tax coffers.

In total, direct spending of $20.1 million in New Jersey goods and services during the effort to physically improve Monmouth Park for the ***Breeders' Cup*** generates another $8.8 million in gross receipts ("output" in Table 6, line II.2). Thus, a total of $29.0 million in economic activity is generated due to activities at Monmouth Park. Over half (about 55 percent) of this total ($15.9 million/$29.0 million) is in the form of wealth to New Jerseyans!

Tax Revenues. Section IV.2 of Table 7 summarizes a rough estimate of expected tax revenue outcomes as a result of the renovations to Monmouth Park. Close to $406,000 in state tax revenues (mostly through sales tax) are expected to be generated from this activity. Another $342,000 in local tax revenues are also expected to be raised through property improvements.

Table 7: Economic and Tax Impacts on the State of New Jersey of $26.7 Million of Renovations to Monmouth Park in Preparation for the Breeders' Cup

	Economic Component			
	Output (000 $)	**Employment (jobs)**	**Income (000$)**	**Gross State Product (000$)**
I. TOTAL EFFECTS (Direct and Indirect/Induced)*				
1. Agriculture	72.3	0	9.0	19.4
2. Agri. Serv., Forestry, & Fish	988.7	38	526.8	842.9
3. Mining	80.0	1	24.7	50.2
4. Construction	11,763.1	100	6,096.5	8,431.9
5. Manufacturing	7,734.7	34	1,873.4	2,274.1
6. Transport. & Public Utilities	1,310.7	6	333.2	527.8
7. Wholesale	1,618.5	7	658.2	695.1
8. Retail Trade	1,174.9	17	439.1	683.3
9. Finance, Ins., & Real Estate	1,143.9	7	368.5	808.6
10. Services	3,080.5	31	1,426.6	1,532.5
11. Government	27.8	0	8.6	13.9
Total Effects (Private and Public)	28,995.1	241	11,764.6	15,879.7
II. DISTRIBUTION OF EFFECTS/MULTIPLIER				
1. Direct Effects	20,147.9	175	8,807.5	11,622.4
2. Indirect and Induced Effects	8,847.2	67	2,957.1	4,257.3
3. Total Effects	28,995.1	241	11,764.6	15,879.7
4. Multipliers (3/1)	1.439	1.383	1.336	1.366
III. COMPOSITION OF GROSS STATE PRODUCT				
1. Wages--Net of Taxes				10,837.6
2. Taxes				1,648.8
a. Local				307.8
b. State				253.6
c. Federal				1,087.4
General				365.7
Social Security				721.8
3. Profits, dividends, rents, and other				3,393.4
4. Total Gross State Product (1+2+3)				15,879.7
IV. TAX ACCOUNTS		**Business**	**Household**	**Total**
1. Income --Net of Taxes		10,837.6	5,138.5	---------
2. Taxes		1,648.8	1,225.4	2,874.2
a. Local		307.8	34.5	342.3
b. State		253.6	153.3	406.9
c. Federal		1,087.4	1,037.6	2,125.0
General		365.7	1,037.6	1,403.2
Social Security		721.8	0.0	721.8
EFFECTS PER MILLION DOLLARS OF INITIAL EXPENDITURE				
Employment (Jobs)				9.4
Income				458,456.6
State Taxes				15,854.6
Local Taxes				13,339.9
Gross State Product				618,820.6
INITIAL EXPENDITURE IN DOLLARS				25,661,300.0

Source: Rutgers University, Center for Urban Policy Research, R/Econ I-O model estimates.

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Table 8: Economic and Tax Impacts on the State of New Jersey of the 2007 Breeders' Cup at Monmouth Park

	Economic Component			
	Output (000 $)	**Employment (jobs)**	**Income (000$)**	**Gross State Product (000$)**
I. TOTAL EFFECTS (Direct and Indirect/Induced)*				
1. Agriculture	213.1	1	20.2	44.1
2. Agri. Serv., Forestry, & Fish	1,171.3	45	623.0	997.2
3. Mining	91.0	1	26.7	55.5
4. Construction	12,590.6	102	6,212.3	8,707.0
5. Manufacturing	10,156.5	44	2,365.3	2,835.2
6. Transport. & Public Utilities	3,871.9	23	1,138.2	1,644.6
7. Wholesale	2,762.2	12	1,123.3	1,186.4
8. Retail Trade	5,545.3	91	2,068.3	3,139.4
9. Finance, Ins., & Real Estate	2,948.8	18	820.5	2,149.2
10. Services	18,198.0	179	5,545.1	8,923.0
11. Government	59.0	0	18.2	29.8
Total Effects (Private and Public)	57,607.7	516	19,961.0	29,711.5
II. DISTRIBUTION OF EFFECTS/MULTIPLIER				
1. Direct Effects	38,837.7	374	13,963.7	20,640.4
2. Indirect and Induced Effects	18,770.0	142	5,997.3	9,071.1
3. Total Effects	57,607.7	516	19,961.0	29,711.5
4. Multipliers (3/1)	1.483	1.381	1.429	1.439
III. COMPOSITION OF GROSS STATE PRODUCT				
1. Wages--Net of Taxes				17,253.8
2. Taxes				3,978.1
a. Local				1,041.8
b. State				927.6
c. Federal				2,008.7
General				737.7
Social Security				1,270.9
3. Profits, dividends, rents, and other				8,479.6
4. Total Gross State Product (1+2+3)				29,711.5
IV. TAX ACCOUNTS		**Business**	**Household**	**Total**
1. Income --Net of Taxes		17,253.8	9,754.3	---------
2. Taxes		3,978.1	2,156.4	6,134.5
a. Local		1,041.8	59.5	1,101.3
b. State		927.6	269.9	1,197.5
c. Federal		2,008.7	1,827.0	3,835.7
General		737.7	1,827.0	2,564.8
Social Security		1,270.9	0.0	1,270.9
V. EFFECTS PER MILLION DOLLARS OF INITIAL EXPENDITURE				
Employment (Jobs)				20.1
Income				777,864.6
State Taxes				46,666.0
Local Taxes				42,918.3
Gross State Product				1,157,832.8
INITIAL EXPENDITURE IN DOLLARS				25,661,300.0

Source: Rutgers University, Center for Urban Policy Research, R/Econ I-O model estimates.

APPENDIX A:

GRAVITY MODEL ESTIMATING THE

POPULATION OF OUT-OF-STATE ATTENDEES

In estimating the expectations for overnight stays for the 2007 ***Breeders' Cup*** at Monmouth Park, we obtained data on early ticket sales at the 2005 ***Breeders' Cup*** at Belmont Park at Elmont, New York, on Long Island. The data were provided by the state of origin of the customers. The second column of Table 1 in the main body of the report summarizes pre-sales reservations made by prospective attendees by state for the 2005 ***Breeders' Cup*** at Belmont Park.

The study team collected other data to estimate a gravity model of attendance, hypothesizing that, all else being equal, customers were less likely to traverse longer distances to attend the race and that more wealthy customers would be more likely to overcome associated travel costs as well as the costs of attendance. Naturally, then, we assumed that closer states with greater populations and per capita (or household) incomes would be more likely to attend the Breeders' Cup. We then created a variable of that reflected a rough estimate of the lowest estimated travel costs en route (the minimum of either the lowest-cost airfare or auto costs, which include a cost of $0.35 per mile plus a daily cost of $150 for a hotel and meals). After examining both the distributions of the attendance by state and of the other variables, notably transportation costs, we opted for a log-log functional form for estimating the model. Table A-1 shows the resulting model, where the dependent variable is the natural log of a state's pre-sales reservations.

To derive estimates for 2007, travel costs were re-estimated based on the venue moving from Belmont Park to Monmouth Park. After taking the natural log of those values, the new data were entered into the equation in Table A-1, and estimates of attendance were obtained. The results are shown in the third column of Table 1 in the text.

Table A.1: A Gravity Model of Attendance at the 2005 *Breeders' Cup*, by State

Variable	Coefficient	Standard error	$p>\|t\|$ (two-tailed)
Intercept	-41.6112	9.22646	0.000
Income per capita	3.272997	0.846457	0.000
Population	0.928019	0.0938868	0.000
Transportation costs	- 0.2092519	0.0985447	0.039
State with track & High horses per capita	2.569675	0.3424277	0.000
New York or Kentucky	1.194899	0.2708643	0.000
Adjusted R^2 = .942,	root mean squared error = 0.3669		

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 construction and business operations in Newport), 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 $\mathbf{a}$ as

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

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

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

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

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:

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

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 $$\mathbf{x}_i = \boldsymbol{t}_i - \mathbf{r}_i\mathbf{d}_i$$

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:

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

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.

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.

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		

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 exhibit B.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 figure 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."

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 exhibit B.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

$$\mathbf{A} = \mathbf{Z}\mathbf{X}^{-1}$$

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

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

$$\mathbf{Z} = \mathbf{A}\mathbf{X}$$

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

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

or, alternatively,

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

solving this equation for **x** yields

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

Total = Total * Final
Output Requirements 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 exhibit B.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,

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

Assuming that **Δy**—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, **Δy** 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 exhibit B.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.

Exhibit B.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:

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

or

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

[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.

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 REcon™ 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 replies 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 non-manufacturing 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, non-monetary 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

$x = \mathbf{k}\, Z_1^{\mathbf{a}_1} Z_2^{\mathbf{a}_2}\, \mathbf{P}_j\, Z_j^{\mathbf{a}_j}$ and D is its total local demand.

Since for a given industry RPC = LS/D then

$$\ln\{-1/[\ln(\ln LS/\ln D)]\} = \ln \mathbf{k} + \mathbf{a}_1 \ln Z_1 + \mathbf{a}_2 \ln Z_2 + \mathbf{S}_j\, \mathbf{a}_j \ln Z_j$$

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 large and diverse as Ohio, this assumption is likely to hold true.