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Assessing Evaluation Methodologies for Performance-Based Incentives

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Introduction:

This report is a user's guide in selecting, understanding, and operating economic and fiscal impact models. State and local economic development agencies are increasingly being asked to estimate the returns on public expenditures for economic development incentives. It is not an easy estimation to make. While conceptually easy to understand, properly calculating the public costs and revenues generated by an economic development project is a difficult task.

Disturbing "success" stories of economic development projects that proved to be extremely costly to the public have renewed interest in economic and fiscal impact modeling. Researchers estimate Pennsylvania spent $28,000 per job to attract the long-closed Volkswagen Plant in Westmoreland Township near Pittsburgh, Pennsylvania (McEntee, 1996) in 1978. The new Mercedes-Benz plant in Alabama is costing the state, according to one estimate, as much as $160,000 per job. It is unclear whether the states' offers would have remained on the table, if policy decision-makers and the public knew the full magnitude of the costs the states were accepting in attracting these plants. Moreover, in Alabama, early, overly-inflated estimates of the potential economic benefits of the plant contributed to the state offering a seemingly too generous incentive package.

Four options are available to state and local officials when considering how to evaluate the economic and fiscal impact of economic development projects.

1. **Do Nothing.** For small projects, both the positive and negative impacts may be so

small that it may not be prudent to expend the time and resources necessary to measure the project's net impact. This is especially true if the development is located in a community with excess public service capacity.

2. **Hire a consultant.** Consultants stand ready to estimate the economic and fiscal impacts of economic development projects. The end product may vary in quality, however. Moreover, a larger issue arises: by constantly relying on consultants the governmental unit will not be expanding the capacity of its staff. Several states rely, not on private consultants, but on university research staff who are knowledgeable about conducting economic regional analyses. For example, the Michigan Job Commission contracts the University of Michigan to evaluate the economic impact of new plants accepting economic incentive packages from the state.

3. **Buy a model.** Several models reviewed in this report are for sale or lease. This route should be taken with caution, however. Most of the models are very complex, especially the better ones. It is frightfully easy for an operator to unknowingly make errors in running these models. Second, some less-expensive models require the user to supply inputs into the model that are nearly impossible to produce without an additional model! For example, several fiscal impact models that are available require the user to estimate the local supplier structure of the economy. Estimating the local provision of supplies and the percent of retail sales made locally are two of the more difficult problems facing modeling and yet the users are expected to come up with these estimates on their own.

4. **Build a model.** Building a model is the final option that an economic development agency can entertain. Several states have taken this route. One avenue is to build a hybrid model by modifying or adding to a purchased model. The Maryland Resource Allocation Model builds off an IMPLAN economic model and the New

York State model incorporates a REMI economic impact model. A word of warning, however: model construction often is more expensive than first estimated. Many problems face regional economists in constructing fiscal and economic impact models and most do not have easy answers. Data limitations are the root to most problems. Efforts to collect primary data (surveying firms for example) are expensive and the data collected become out-of-date rapidly. In addition, these models may not be user-friendly.

This report is to serve as a guide to help researchers and policy decisionmakers choose which modeling approach meets their needs. This report:

- Provides a non-technical description of the structure of economic and fiscal impact models,
- Discusses their strengths and weaknesses,
- Reviews twelve of the most used and readily available models or handbooks available, and
- Identifies the pitfalls of using or constructing these models.

Economic and fiscal impact models attempt to quantify the impact of new economic development on an area. Most of the models approach the problem similarly. The direct and, often, the indirect economic impacts of a new plant or increase in output at an existing plant are estimated using an economic impact model. After these direct and indirect impacts, in terms of jobs, earnings, and population are estimated, the fiscal impact model calculates the resulting streams of public costs and revenues. Finally, the analyst compares the calculated discounted streams of future costs and revenues to the initial cost of the economic incentive package offered to the business to determine the potential return-to-investment in granting the economic incentives.

This task is not easy, however, and researchers face many difficulties. In particular, the models or approaches used should address the following issues:

- **Determining if the jobs being created do more than serve the needs of the local economy.** If economic incentives are provided to firms that sell primarily to the local market, then they could result in providing these new businesses with an unfair advantage over similar firms in the area (Bartik and Bingham, 1995). The only ways this does not become a zero-sum game are if the new business offers a vastly improved service or product, serves an ignored, economically-distressed population or provides employment to economically disadvantaged persons.

- **Estimating the long- and short-run population effects of development.** Bartik (1993, 1991) estimates that for every 10 jobs created in a metropolitan area eight will, in the long run (approximately five years), be taken by in-migrants. This increase in population will put additional demands on public services and make the employment benefits of economic development less robust for local residents.

- **Estimating the indirect economic impact of new economic development.** It is common for "back of the envelope" estimates to be based on employment multipliers of the project's impact that are too robust. Only in the most extreme cases, where a firm provides high-paying wages to individuals living in the area and maintains a strong local supplier base, will each new job at the firm generate more than one additional job in the area.

- **Measuring the marginal impact on both costs and revenues of the new development on public services.** Measuring the fiscal impact of new economic development using average costs will be accurate in only a small subset of communities or states. In fast growing areas, marginal costs associated with development are more likely to be higher than average due to increased congestion and capacity cost. On the other hand, in areas that have experienced stagnant economic conditions, the marginal cost of new development may be well below the average cost and near to zero.

- **Determining the labor market impacts of economic development.** Research suggests that most new jobs are filled by either in-migrants (Bartik, 1993) or residents entering the work force (Eberts and Stone, 1992), but not by the area's unemployed.

In addition, users must make several important assumptions and estimates before they can even use any model. The first is estimating the role the economic incentive played in attracting the company into the area. Too often, analysts quickly assume that the offered economic incentives are absolutely necessary for the project to occur and, therefore, the total benefits that are calculated can offset the cost of the incentives. However, the potential for business to hold out for incentives that are not necessary is large. If market conditions, and not the incentives offered, determined the site location decision, then the resulting benefits cannot offset the cost of the incentives.

This study reviews the following models/handbooks:

Georgia Technology Institute's LOCI-2 Fiscal Impact Model
Regional Economic Models Inc. (REMI) economic impact model
Utah's Multiregional Input-Output (UMRIO-92) and fiscal impact model
MIG Incorporated's IMPLAN System
New York's Empire State Development Cost-Benefit Evaluation Model
Urban Land Institute's *Development Impact Assessment Handbook, 1994.*
Burchell and Listokin's *The Fiscal Impact Handbook, 1983* and *The New Practitioner's Guide to Fiscal Impact Analysis, 1986*
Chicago Region Econometric Input-output Model (CREIM)
Maryland Department of Economic Development's Maryland Resource Allocation Model.
U.S. Department of Commerce's Regional Input-Output Modeling System (RIMS II)
Arthur Andersen Economic Impact Analysis II (Insight Model)

This report starts with a warning. Be aware that users' errors are far more common than model errors. Edwin Mills, a well-respected regional economist, voices strong concerns about regional models being too often misused. He worries that these models are used to capture only the beneficial impacts of development without including the negative impact of increased taxes or public indebtedness required to pay for the public capital improvements or economic incentives provided to the new company (Mills, 1993). Mills reports one instance where two analysts examining the impact of a new convention center came up with sharply contrasting estimates. One study neglected to examine both the displacement impact of a new convention center on the area's existing convention facilities and the negative impact of required new local taxes to finance the project. The erroneous study reported a net gain in employment of 6,000, while the other showed a net loss of nearly 350 jobs. Mills strongly argues that the models used to estimate publicly funded projects are often misused because they neglect to model the offsetting public expenses.

> "By ignoring the need of state and local governments to raise money to finance capital costs of proposed projects, and by counting construction wages as benefits instead of costs, the models permit users to make it appear to the public that there are benefits to government projects that would not flow from similar private projects." (Mills, 1993 pg 38)

However, others argue that, even if a government project brings no new funds into the area so that its net benefit is near zero, it can increase the quality of life in the neighborhood and therefore have major effects on future development, even if they are nearly impossible to measure. (Riall, 1991).

Errors do not have to be as obvious as forgetting to include costs or benefits associated with the project to have a significant impact on the findings, however. In a recent study that compared the results of two well-known models (REMI and IMPLAN) in estimating the impact of an auto assembly plant, the authors erred by not entering the employment data into the right industry classification (Grimes et al 1992). In what at first appeared to be a minor issue, the authors decision to enter the new jobs in SIC 37, transportation equipment, instead of the more refined SIC 371, automotive and truck assembly, seriously affected their findings (Crihfield and Campbell 1991, 1992).

Finally, state and local economic development programs are moving into more non-traditional attraction efforts than just offering tax abatements or low-interest rate loans. As pointed out by Bartik (1996) economic development efforts now "include joint applied research projects conducted by universities and local businesses; industrial extension to help local manufacturers determine how to modernize; employee training customized to the needs of individual firms; and small business assistance." Given this wider array of economic development programs, it will become more difficult to measure the effectiveness of these programs with the traditional economic and fiscal impact models.

It is not the intent of this user's guide to discourage economic development practitioners from trying to estimate the economic and fiscal impact of economic development policies. Since public funds are being used to encourage state and local economic growth, it is in the public interest to determine if these economic development policies are beneficial. This guide is meant to help the practitioner avoid over or underestimating the impact of economic development policies.

This report is presented in three sections. The first examines the strengths and weaknesses of economic impact models while the second tackles fiscal impact models. In each section, the general problems challenging the user of both types of models are discussed. I focus on the problems that will most likely challenge the user and only briefly discuss the more technical or academic issues. The last section offers my concluding comments.

Section II.

Economic Impact Models:

Common features and limitations:

Economic impact models estimate the effect of a new plant, increased tourism, or any other economic activity, positive or negative, on an area's employment, income or output levels. Their most common purpose is to generate the spillover effects of attracting a new manufacturer, convention center or tourist attraction. However, more sophisticated models can also measure the impact of improved productivity due to training programs or better management practices or a change in an area's relative production costs.

In the simplest sense, economic impact models measure the impact of the new plant on the area's residents and on the area's other business sectors. The connections that the new plant has to the local community are:

1. Its impact on the local supplier-base.
2. The increase in the personal consumption expenditures of its workers.
3. The second, third and later rounds of activities generated in the local area as the workers employed at the new plant's suppliers spend their earnings and/or when the new retail workers spend theirs.
4. The positive and negative spillover effects such as increase in wage rates due to the new firm's impact on the area's labor market.

Most economic impact models are based on a very simple base versus non-base separation of area jobs. In short, base jobs or export jobs produce goods or services sold or purchased by customers living outside the area of study. An office furniture manufacturer, an oil refinery, an auto plant, a convention center, check processing center, a telecommunication center or a large amusement park are all examples of economic base activities. Non-base jobs provide goods and services to the immediate population. Examples include retailers, personal services, small entertainment centers, e.g., movies and bowling, and health providers.

The lines defining base versus non-base jobs can become murky very quickly and cannot be properly estimated by using a manufacturing versus nonmanufacturing approach. In manufacturing, print shops that specialize in making quick customer self-service copies and small bakeries are examples of manufacturing activities that are not a part of the area's base activities for large-to-medium size communities. On the other hand, in rural counties or small metropolitan areas, a large retailer, e.g., a Walmart, or a large retail cluster such as a regional mall can make up a significant part of its economic base. Indeed, the definition of what should be included in the base versus the non-base segment of the local economy depends upon size of the community and the size of the industry sector under study. Many industries produce for both the local and non-local markets, e.g,. hospitals, bakeries, and banking services, therefore it is the task of the researcher to estimate what share of the industry should be included in the base.

Input-Output models

Input-output models are the methodological backbones for most of the impact economic impact models used. RIMS-II, IMPLAN, CREIM, and the Utah Model, for example, are all based on an input-output model. Both the Georgia Technology Institute's LOCI-2 model and the Arthur Anderson Insight model incorporate an input-output component. The REMI model can also be grouped in the input-output modeling camp; however, because of its complexity it is more appropriate to put it into its own category.

The attractiveness of input-output models is their ability to estimate the inter-industry linkages between the affected sectors. For example, if a new plastics firm is attracted into the area, an input-output model can estimate:

- The direct impact on all of the area's industries that could become part of the new firm's supplier base.
- The impact on the area's retailers and consumer services by the new workers at the plant.
- The more indirect impacts, or the second, third and subsequent rounds of impact caused by the plant's suppliers increasing their purchases and by their workers and the area's impacted retailer workers spending their money.

The final regional impact of new business activity in a region is commonly measured in terms of the ratio of its total impact to its direct impact which is call the multiplier. For example, if it is estimated that a new manufacturing firm has an employment multiplier of 2, it means that for every new job at the firm, another job is created in the region.

Input-output models generate three general types of regional multipliers:

- **Output or value-added multipliers.** This measures the additional regional output in the local economy as the result of the output of the basic industry. Thus if the industry generates $10 million of output for the region and this results in $5 million in additional output by local companies/suppliers then the output multipliers would be 1.5.

- **Employment multiplier.** This is the ratio of the total number of new jobs created in the local economy due to the new industry divided by the amount of employment generated at the subject facility. For example, if a new industry employs 100 workers and the total number of jobs generated in the area due to this plant reaches 125 workers, the multiplier would be 1.25.

- **Earning multiplier.** This is the earnings or payroll paid to residents of a region due to the new plant divided by the earnings or payroll generated by the subject project. If a factory has a $1 million payroll and the total payrolls for the company and all its suppliers, as well as the portion of the payroll at other goods and services providers supported locally by the expenditures of the subject project total $2.5 million, the earnings multiplier is 2.5.

Quite often, one may see multipliers labeled as Type I or Type II or even Type III. Type I multipliers measure only the inter-industry impact on a local economy, excluding the impact of household purchases. In other words, a Type I multiplier will capture the impact of a new plant on its local supplier base but will exclude the impact on the area's retailers of increased household spending. For this reason, Type I multipliers offer a very conservative estimate of a new firm's impact on an area.

Type II multipliers capture the effect of household expenditures on local retailers; however, they tend to overestimate these impacts. Type II multipliers assume the same linear "production function" for households as for industries. Hence, for example, if your income doubles, so will your consumption of food, clothing and housing. It is likely that you will increase your consumption levels but not to the same level as your increase in income.

Type III multipliers are a hybrid between Type I and II and releases the strict linear production function from households.

The technical difficulties facing researchers in the construction of input-output models are large, however (Miller and Blair, 1985). First, it is extremely expensive to construct an input-output of a region from the ground up. Extensive business surveys would be required on an annual basis. Hence, most models are built using non-surveyed approaches that highly depend on the national input-output model constructed by the U.S. Department of Commerce. But this opens up additional problems:

- **Estimates on inter-industrial linkages can be out-of-date.** The most recent national input-output table is 1987. Since that time, changes in manufacturing processes, for example, the greater use of plastics and computer components, may have significantly altered the linkages between industries. Several technical and subjective approaches have attempted to update these inter-industrial linkages; however, theoretical difficulties plague almost all of them. See Miller and Blair (1985) and Allen and Gossling (1975).

Estimating the regional export base is very difficult. The national input-output model provides estimates on the required inputs needed by area industries but, of course, does not provide any information on where they are produced. Numerous books and academic articles have been written suggesting and criticizing competing techniques that can be used to estimate the percent of an area's demand for inputs that is supplied by local producers. Unfortunately, all have their deficiencies.

Three basic types of procedures are used to estimate the regional demand for an industry's output to determine if that industry is a regional export sector. The first, which is used in a modified form to generate the RIMS-II multipliers, calls for the use of **Location Quotients** (LQ). In constructing the LQs for an area, industry employment and/or earnings are typically used as proxies for regional output. In brief, LQs are the ratio of an industry's share of a region's output to its share of the nation's output:

$$\frac{\text{Percent Share of Regional output of industry A}}{\text{Percent Share of U.S. output of industry A.}}$$

If an industry's LQ is less than 1, for example 0.7, then it is estimated that 70 percent of the region's demand for the industry's output is supplied locally, while the remainder is imported into the region. If an industry's LQ is greater than 1, then it is a regional export industry and none of the industry's output is imported into the region.

The major problem with LQs are that they do not account for cross hauling of industrial output. Although a regional industry may have the capacity and output volume to satisfy all of the region's demand for its output, businesses and customers may choose to buy a portion of the industry's output from producers outside the region. For example, given the increase in micro-breweries across the nation, it is more and more likely that many regions could be self-sufficient in beer production; however, customer preference for national and international brands will always assure that imports will not be zero. **The key limitation of LQs, therefore, is that its usage will *overestimate* local provision of local demand which will in turn cause the model's multipliers to be too large.**

The next procedure that is often used is **Supply-Demand-Pool Technique (SDP).** A variation of this approach is used in the Utah model. Assuming that regional industries and customers demand for an industry's output are similar to the average for the nation, then using data from the national input-output tables, it is possible to estimate a region's demand for a specific industry's output. Subtracting this estimate from the actual level of the industry's regional output will leave, if positive, the amount that the industry exports. If the difference is negative, then the region imports the industry's output from producers outside the region (Miller and Blair, 1985).

The same cross-hauling concerns arise with the SDP technique as with the LQ. In the Utah model, adjustments were made by substituting higher regional export estimates derived from other models for the estimates generated by the SDP technique (Koya, 1994a).

The final, non-survey regionalization techniques for input-output models are **regional purchase coefficients (RPC)** (Stevens, et.al, 1983). This approach is used in the REMI and IMPLAN models. RPCs are defined as the proportion of regional demand that is self-supplied by the region's industries. Using detailed data from the 1977 *Census of Transportation,* Treyz et.al. generated supply-to-demand ratios for 466 industrial sectors (Treyz et.al, 1992). The REMI model builds on this approach by having the RPC in its model be dependent upon industry profitability and the region's industrial mix (Treyz, 1993). In other words, unlike most other models, the determination of regional exports and imports is made endogenous to the model.

IMPLAN's regional purchasing coefficients are partially estimated from the 1977 multi-regional Input-Output Accounts (MRIO) developed by the U.S. Department of Health and Human Service. A clear problem with this approach is the age of the data used to estimate the RPCs.

- **Input-output models assume a completely linear production function that bars incorporating some of the very aspects of regional economies that makes them unique, such as agglomerative or cluster economies.** Input-output models are based on the assumption that all firms in an industry use the same production function requiring the same fixed mix of inputs regardless of changes in relative prices. No economies of scale are allowed nor are any cost savings associated with having industrial clusters.

- **Input-output models do not account for changes in wages and salaries or the cost of goods or services as a result of the new economic activity.** A region's output to worker ratio is assumed to be the same as the nation's regardless of the relative wage of area workers or their relative skill levels.

- **Input-output models assume that workers and commodities are in perfectly elastic supply.** Most input-output models assume full-employment and a highly elastic labor market. They make no distinction between the economic impact of hiring the unemployed, the underemployed, individuals who move into the area, or residents who were not previously attached to the area's work force.

- **Input-output models work instantaneously, so that all changes in the area economy happen during the same time period as the initial event.** In reality, communities adjust more slowly. Existing excess capacity, inefficiencies in area labor markets, and simply the necessary time required for business to respond to the increase in business activity will cause the impact to occur over a period of several years.

The list of problems confronting the use of input-output models in regional economic is so long that it may seem truly surprising that they are used at all, let alone almost universally. Harry Richardson, a well-respected regional economist, is rather curt with the input-output models:

> Their inability to handle substitution effects satisfactorily makes them poor vehicles for the analysis of the effects of interregional competitive forces such as the impact of technological changes or lower factor prices in one region on output prices and income in other regions....Input models are ill-equipped to cope with the dynamics of structural change, such as the entry of new industries or the obsolescence of old ones. Most serious of all, the costs of developing input-output transactions tables may be prohibitive since sub-national input-output accounts data are not collected as a matter of costs. The choice is between expensive industrial survey methods or the unreliable procedure of relying on national input coefficients. (Richardson, 1979 pg. 182.)

Still, input-output models continue to be used because, despite all of their problems, they provide the best means to estimate the economic impact of changes in the local economy. Moreover, many inroads have been made to rectify many of their problems.

The following smaller sections offer brief descriptions of the economic impact models that are currently being used. Several of these models are limited to local area analysis, which others are statewide models.

Development Impact Assessment Handbook

The Urban Land Institute

Price: $94.95 (includes model)

This handbook provides an introduction in how to prepare an economic impact analysis on the local area. It comes with a development impact assessment model on disk. The handbook offers directions to conduct seven different analyses:

- Physical and site analysis
- Market analysis
- Social impact analysis
- Environmental Impact Analysis
- Economic impact analysis
- Fiscal Impact Analysis
- Traffic Impact Analysis

One of the strengths of the handbook is that it provides a good introduction to economic impact modeling for local areas by offering a step-by-step procedure in conducting a simple impact analysis. It provides a description of the basic questions that need to be answered in preparing an economic impact analysis.

The book offers a set of ratios, such as

- the number of construction employee hours per $1,000 value of contract construction
- consumption to income ratios
- workers per 1,000 square feet of retail or other activities.
- wages and salaries as a fraction of output.

Using these ratios, which are based on national averages, the practitioner is directed to setup fairly short algorithms that result in estimates of the economic impact of the development.

The model boasts that it will take the user only 8 to 12 hours to gather the necessary data to perform this analysis and for "eager" users, as little as 10 minutes (Burchell, 1994b). Unfortunately, the weaknesses of the handbook's approach is that it can offer no more than a cursory analysis of the potential impact of new development.

- **The model's multipliers are limited to only major industrial groupings (manufacturing, retail, office) and are not region-specific.** In other words, the model ignores the importance of the region's economic structure in preparing the economic impact of the project.

- **The model does not allow for the regionalization of the input-output coefficients. One multiplier fits all communities, which is clearly not the case.** Moreover, the model's multipliers for industrial development are in error. The total employment impact of industrial development is less than the model's calculated direct employment impact. Using both the manufacturing and general industrial input categories for different sizes of industrial activities, the model continued to estimate higher direct (on site) employment estimates (base of workers per square feet ratios) than its total employment impact which adds off-site jobs to the on-site jobs.

- **The model does not allow any phase-in transition period that models long-term population response to economic development.**

In short, the Urban Land Institute's *Development Impact Assessment Handbook* provides a good introduction to economic impact analysis. Moreover, the simple model included in the volume provides the novice analyst an interesting model to experiment with. However, the simplicity of the model, the restrictiveness of its assumptions and uncovered errors in its structures do not allow it to be an adequate tool to conduct economic impact analyses.

Chicago Region Econometric Input-Output Model (CREIM)

Federal Reserve Bank of Chicago

CREIM is an econometric input-output and forecasting model built for the six-county Chicago region. The model contains 123 behavioral equations, 28 accounting identities, 68 exogenous variables that together generate forecasts for 151 endogenous variables (Israilevich, 1997). It identifies 36 industries (two-digit SIC disaggregation for most of the manufacturing sectors) and generates output, employment and earnings forecasts for each. In addition, the model provides estimates on the area's gross regional product, unemployment rate, and per capita income and net migration, and change in the consumer prices. It should be noted that civilian labor force estimates are not readily available in most other regional impact models.

The major strength of the CREIM input-output component is that it is constructed from establishment-level data from the U.S. Bureau of the Census and currently incorporates 1987 data. Hence, it avoids many of the problems facing researchers when attempting to regionalize national input-output tables. In particular, the CREIM does not rely on national input-output coefficients which require the acceptance of the assumptions that the region shares the same the level of technology as the nation as a whole for all of its industries. Israilevich suggests that preliminary analysis indicates that the difference between regional and national technologies may be significant (Israilevich, 1997). More importantly, Israilevich also found that the source of input-output data in regional models can cause significant differences in forecast and impact analysis results (Israilevich, 1995).

The major drawback to the CREIM model is that it is hard to duplicate because it relies on establishment-level data that are highly guarded by the U.S. Bureau of the Census due to clear disclosure problems.

IMPLAN System
MIG Incorporated

Cost: The IMPLAN model software costs $375.00
State data to use with the model varies from $475 to $1,900.

IMPLAN (IMpact Analysis for PLANning) was developed by the USDA Forest Service to assist the Forest Service in land and resource management activities. In 1993, Minnesota IMPLAN Group Inc. (MIG) opened to provide database and analytical tools including the IMPLAN model. MIG is capable of providing estimates of final demand, final payments, output and employment for 528 sectors in every county in the U.S.(Lindall and Olson, no date).

IMPLAN is a standard input-output model and is based on the National Bureau of Economic Analysis 1987 Benchmark Input-Output Model. First, it is a static model that is not readily available for forecasting purposes and is based on the typical assumptions that have been discussed previously. Its regional purchasing coefficients are partially estimated from the 1977 Multi-regional Input-Output Accounts (MRIO) developed by the U.S. Department of Health and Human Service. Supply-demand ratios were also calculated to serve as upper bounds for all RPCs to avoid the possible overestimation of the region's ability to be self-sufficient, which would in turn result in too high of multiplier effects.

IMPLAN generates two types of multipliers for employment, output, personal income and other measures: a traditional Type I multiplier which measures the change in the region's economy due to inter-industry linkages alone and a Type III multiplier. IMPLAN's Type III includes the induced household expenditures effect but differs from the standard Type II multiplier in that the consumption function is nonlinear with the area's marginal propensity to consume declining with income. This is a prudent modification since a strictly linear consumption function would over-estimate consumption patterns as income increases. This multiplier is patterned after the multiplier developed by Miernyk (1967).

The RPCs for the 24 manufacturing sectors were econometrically estimated, while the services sectors (non-shippable commodities) are the observed MRIO values for the state. County specific RPCs are estimated from the state MRIO equations (Lindall and Olson, no date).

Unfortunately, recent research indicates that the model's Type III multipliers are flawed. According to Charney and Leones (1997) "the IMPLAN Type III multipliers consistently overstate induced impacts in relatively low-wage sectors and understates induced impacts in relatively high-wage sectors relative to conventional Type II multipliers." However, the model's Window-based software provides the option of using a Type II multiplier.

IMPLAN provides a relatively low-cost input-output modeling system that has been heavily used by researchers nationwide. Except for the current problem found by Charney and Leones, the model has been well-regarded in the profession. In addition, IMPLAN can be built on the county-level, allowing the user to create his/her own region to study. It is limited, however. It is not a forecasting model, nor can it be adjusted to reflect the impact of changes in relative costs or new production efficiencies in the local area.

Utah State and Local Government Economic andFiscal Impact Model UMRIO-92

Governor's Office of Planning and Budget

The UMRIO-92 is a fully integrated input-output economic impact and fiscal impact model operated by the State of Utah. The model provides the ability to conduct economic impacts on nine economic subregions in the state. The principal source of data is the state's ES-202 data compiled by the Utah Job Service. In addition, the model incorporates the U.S. Bureau of Economic Analysis Regional Economic Information System (REIS) data. The REIS data is by two-digit SIC while the state's ES-202 data is broken down into 800 four-digit SIC codes. The two data series are combined by constructing two-digit SIC ES-202 wage and salary earnings according to the proportional distribution of ES-202 wage and salary estimates among the detail industries (Koga, 1994a). (The BEA data, which always has at least a two-year lag, is updated using the state's ES-202 data by assuming the ratio of REIS earnings to ES-202 wage and salary holds steady.

To estimate regional value-added or Gross State Product, the Utah model uses the national value added/earnings ratios from the most recent national input-output model. However, since the newest national input-output model dates back to 1987, its technical coefficients are nearly ten years old and as Israilevish notes, the differences between Utah's technical coefficients and the U.S. can be significant (Israilevich, 1995) .

The model is regionalized by using location quotients and a modified supply-demand pool technique. Since an underestimation of an area's exports will result in an overestimation of the area's multipliers, the model's "tentative" exports estimates are based on the lower estimates calculated by area location quotients or supply-demand-pool (Koya, 1994a, 1994b). Again, location quotient is the ratio of an industry's share of total regional output to its share of total U.S. output. If the resulting location quotient is greater than 1, it suggests that the industry is more concentrated in the region than nationwide and thus is part of its export base. The supply-demand pool technique estimates the region's individual industry's export share by subtracting the region's demand for the industry output (assuming that the region's industries use the same technology as the nation) from the region's estimated output. These "tentative" estimates were reviewed and revised by a "group of informed Utah economists."(Koya, 1994b).

In summary, the Utah economic model is based on professionally accepted methodologies. Being an input-output model, it is subject to the limitations discussed above; nevertheless, its well-documented construction can serve as an excellent blueprint for other states interested in building their own input-output models.

Regional Economic Models Inc. (REMI) Economic Impact Model

Cost: One area, 53 industry sectors:

Purchase	**$46,000**
12 mo. lease	**$24,000**
3 mo. lease	**$18,250**
Individual Study	**$ 5,600**

The REMI Economic and Demographic Forecasting and Simulation (EDFS-53) model is one of the most well-regarded and highly-used economic impact model in the country. It is also one of the most expensive. The model's structure is complex but well-documented in academic journals. To a large extent the REMI model is a modified input-output model. However, its uniqueness and strength is the sophistication of its modifications.

The user is not required to supply any data to "regionalize" the model. REMI is partially based on county-level data from *County Business Patterns* and the *Bureau of Economic Analysis (BEA)*. It can forecast and simulate changes in demand and supply conditions for 53 industrial sectors, across 94 occupations, up to 2035. However, if the user has information on the regional structure of the local economy it can be entered into the model.

Contained within its hundreds of equations are a relative-cost model, a labor demand and supply model, and a forecasting model. In brief, the REMI model can be broken down into five highly integrated components (Treyz, 1997):

- **Output component** - This component incorporates an input-output model into a standard national income product account framework. The output of a regional industry is the addition of regional demand from area consumers, local government, business investments and national and international demand for its exported goods and services.

- **Labor and capital demand component-** The area's relative wage and capital costs to the nation are estimated and used to estimate the demand for labor and capital in the area through the use of a Cobb-Douglas production function. The higher the area's relative wage, the more capital intensive will be its industries.

- **Population and Labor Supply** - Population change is estimated by a cohort-survival demographic model. The model has four components of net migrants of which economic migrants are the most important. Factors that affect economic migrants include economic and amenity factors. Economic factors include a probability function for an unemployed resident getting a job and changes in the region's real after-tax wages.

- **Wage, price and profit components** - Production costs are estimated using a relative production cost equation where the area's wage and capital costs are compared to national averages. Wage rates are a function of the demand for labor across 94 different occupations. Relatively high wage areas (by industry) will lose business activities and achieve a below average rate of growth.

- **Market Share component** - The market share component estimates both the regional purchase coefficients (RPC) for the region's industries and the region's export share (ES) of national and international sales. Both an industry's RPC and ES are based, in large part, on the relative competitiveness of the industry to its national counterparts. One of the more unique features of the model is that its regional purchase coefficients (RPC) are endogenously determined, being a function of the area's profits and industrial mix. Similarly the area's share of national and international output is a function of the area's firms' profits and industrial mix.

One of the model's strengths is its flexibility: the user has over 2,500 policy variables that can be used to change population, production costs, employment, taxes, training, productivity, demand

and a host of other factors. The model also offers over 200 translator variables that allow the user to model changes in five different types of tourist activities and over 200 detailed industry demand shocks (Treyz 1997). It is also a forecasting model which allows the user to contrast alternative economic development scenarios.

From a more academic or technical view, the model is unique for its attempt to address many regional factors that other models ignore. For example, a standard input-output is based on the assumption that an area's labor supply is completely elastic. If output is doubled, labor demand doubles without any impact on wages or any other costs. In the REMI model, an increase in employment in industry "A" will cause a wage increase in the occupations that industry "A" hire. The higher wage rate dampens profits for the industry "A" and other industries that have similar occupational demands (Treyz, 1993).

Finally, the model is easy to install and operate. REMI provides training assistance for model users. In fact, one of the unique features of REMI is that the model users have a major say in the research agenda for the REMI staff. Its annual users' meeting offers a forum for REMI staff and clients to share ideas on problems and new additions/modifications to the model.

REGIONAL INDUSTRIAL MULTIPLIER SYSTEM (RIMS II)

U.S. Department of Commerce

Cost: $600 per region (one or more counties).

RIMS-II provides employment, output and income multipliers for either 38 major industry groups or 471 industry groups for single counties, clusters of counties, economic regions and individual states, and groups of states.

The RIMS II uses location quotients (LQ) to regionalize its model. In particular, it uses an earnings-based LQ for agriculture, mining and manufacturing industries, while for the all of the remaining industries it uses the personal income LQ. RIMS II is aware of the problems in using LQ, including the lack of regionalized data. Although the national input-output table provides technical coefficients for nearly 500 national industries, data limitation constrict the construction of regional LQ to the two-digit industry level. Taking, for example, the highly aggregated industrial machinery sector that includes computers and lawn mowers, one can see how using only one LQ would most certainly cause errors in estimating a region's internal supply for that industry. However, the wage and salary component of BEA county-earning data has been expanded to the 4-digit SIC level, although such highly detailed data is not available to the general public. It is being used in RIMS-II and can be aggregated to less detailed industry level if appropriate.

The use of straightforward earnings LQs is questionable, however, because they provide an inadequate estimate of the area's level of regional demand. Earnings are only one component of an area's total income, which also includes transfer payments, dividends, interest, and rents, less social insurance contributions. By incorporating personal income into the denominators of the standard LQ calculations, the LQ accounts for the region's differences in non-earning buying power. Hence, the regional purchase coefficients will be reduced where regional nonearned income is higher than average. According to RIMS

> "A mixed-LQ approach that combines the use of earnings-based and personal income-based LQ's should be useful in estimating regional purchase coefficients. Thus, for industries that sell most of their output to intermediate demand, an earnings LQ may be more appropriate; in this case the level of regional total earnings would be a proxy for the level of total intermediate output. However, for industries that sell most of their output to final demand, a personal income LQ may be more appropriate; in this case the level of regional personal income would be a proxy for the level of final demand." (Cartwright, 1981)

Comparison Analysis

Several studies have been completed comparing the multiplier estimates generated by the leading economic models including IMPLAN, REMI and RIMS-II. In brief, most have found that they generate similar multipliers, when used correctly and adjusted for structural differences.

One of the problems barring an accurate comparison of the three models from being taken is that they use different multipliers due to their different methodologies. RIMS II provides the standard Type I and Type II input-output multipliers. Type I incorporates only inter-industry effects of a change in output, leaving the resulting household expenditures out of the analysis. Its Type II multiplier incorporates household consumption, but under the rather strict assumption of a linear consumption to income ratio. In other words, if an household's income doubles, so will its consumption of all goods and services.

IMPLAN also offers a Type I and a labeled "Type III" which changes the consumption function to a nonlinear relationship where the marginal propensity to consume is not constant. Instead, it decreases with incomes. Unfortunately, IMPLAN's Type III has been found to be unresponsive to the wage structure of the generated jobs and overstates induced impacts in relatively low-wage sectors and understates induced impacts in relatively high-wage sectors (Charney and Leones, 1997)

REMI multipliers are more complex than both RIM-II and IMPLAN, in that endogenous investment, government, labor intensity, export and import responses are also estimated in the model.

In their analysis of the three models, Richman and Schwer found that in general IMPLAN multipliers are the largest and the REMI multipliers are the smallest. In fact, IMPLAN's employment multipliers were the largest in all sectors except the real estate sector, where RIMS II proved to be the largest. The relative magnitudes of the output multipliers mirror those of the employment multipliers. Again, IMPLAN reports the largest multipliers in all sectors except in one case (miscellaneous manufacturing) where REMI reports the largest multiplier. The REMI and RIMS II multipliers are statistically indistinguishable. However, Rickman and Schwer found that after they benchmarked the IMPLAN and REMI models to control for differences in the definitions of their multipliers, those two and the RIMS II multipliers were statistically indistinguishable from each other. (Rickman and Schwer 1995)

Similar findings were uncovered in the exchange between Crihfield and Grimes et.al. on the comparison of the IMPLAN and REMI models. Grimes et al. found that when the models were given similar inputs they yielded very similar results (Grimes,1992)

Brucker et al. (1990) compared the results of the IMPLAN, RIMS II, and three other older models to those of the survey-based 1978 Texas model for two key industries in Texas, petroleum refining and computer equipment. The results of their study were mixed at best. RIMS II and IMPLAN were within 7 percent of the Texas model's results for output changes in both the petroleum refining and computer equipment industries. However, both were well off the mark in their estimates of income and employment. For example, IMPLAN's estimate of the resulting employment change was 9.2 percent too low for the Texas petroleum industry but a large 49.4 percent too high for the state's computer equipment industry. RIMS II's estimates for the employment in the state's oil refining industry was 39.6 percent too low and its estimates for the computer industry was 16.1 percent too low.

In conclusion Brucker states:

> A major criterion in any objective assessment of the five models would be their ability to predict accurately. However, even if the assumption that the closeness to the Texas model is an adequate proxy for accuracy is accepted, the question of which model is the most accurate remains moot. None of the models are consistently close to the Texas estimates. Nor do any of the models consistently

> provide estimates of employment impacts or disaggregated impacts in an acceptable range of closeness to the Texas model. (Brucker, p 134)

Brucker also concludes that perhaps a good criterion to use when selecting a model is how flexible and "friendly" it is to accepting regional information that is available to the user.

Bourque (1990) found that while there were substantial differences in multiplier estimates between the multipliers generated by RIMS-II and the Washington State survey-based model, they were statistically correlated. Bourque found that about one-third of the output, earnings and job multipliers compared had a deviation of more than 20 percent. Still, on average, the RIMS-II multipliers were close to the Washington model. Averaged over the 26 sectors used in the comparison. RIM-II's average output multiplier was 1.88 compared to the Washington model's 1.71; its earnings multiplier 0.52 compared to 0.53; and its employment multiplier 28.8 to 27.2.

In short, researchers have found that when compared properly RIMS-II, IMPLAN and REMI generate similar results. However, at the same time, Bourque's words of caution still ring true.

> Regional economists have succeeded in popularizing the regional multiplier concept. Synthetic regional multipliers, produced by computer wizardry, have become a commercial success in an uncritical market. Ready-made multipliers are now available to even the novice without warning labels that these figures are subject to large errors in individual instances.(Bourque, p.97)

SECTION III
Fiscal Models

Introduction

Fiscal models are designed to estimate the net public cost of residential and nonresidential land development. In the past, residential development has received the greatest focus in fiscal impact analysis because of the clear relationship it has with school expenditures, public safety and traffic congestion. Commercial or industrial expenditures have received less scrutiny, in part, because their direct demand for public services are less. Many businesses pay for their own security services, for example. However, this is changing and now researchers are probing the more difficult problems of measuring the fiscal impact of nonresidential development.

Bartik argues (1996) that on the cost side there are three key factors that a fiscal impact model should estimate:

1. the direct public service demands generated by new or expanding businesses;

2. the population growth attracted by job growth, as well as the tax revenue and public service costs generated by this population change.

3. whether the additional business activity and population will require expansion of the existing infrastructure and what that infrastructure expansion will cost.

Burchell, et al. (1986), concur and warn that attempts to track further secondary impacts can be problematic and may lead to double counting. For example, attempts to measure the impact of a new development on the values of neighboring properties are problematic. For example, a new shopping center may increase property values of surrounding parcels but at the same time decrease property values in surrounding older retail areas. Burchell, et al., also disregard attempts to measure impact of secondary development such as the fiscal impact of increased retail development due to the increase in population caused by the original industrial development under study.

Since fiscal impact analysis of new development should incorporate the development's economic impact and demographic impacts, coupling a fiscal impact model to a good economic model is important. In fact, the better fiscal impact models are built on strong economic impact models. The Maryland Resource Allocation Model is driven by an IMPLAN input-output model; New York's Empire State Development Cost-Benefit Evaluation Model incorporates the REMI model; Arthur Andersen's Insight Model offers RIM-II multipliers; and the Utah fiscal impact model contains a state-constructed input-output model. Weaker models use simple overall employment and income multiplier that the users is required to estimated. This is a task most local practitioners are unable to perform properly due to the lack of data and/or resources.

Cost estimates

There are two basic approaches to estimate the fiscal cost of land development: average cost and marginal costs. The average cost approach, being by far the easiest method to calculate, is heavily used in fiscal estimate modeling. However, it is vulnerable to large errors in that it does not take into account existing excess or inadequate capacity. While in the long run, cost estimates generated by the two methods may be similar, the cost projectories can be strikingly different.

In areas experiencing rapid growth, the marginal public costs of new development will most likely be greater than the average costs. New development could strain already overused public resources such as streets, wastewater capacity, and public schools, forcing major capital infrastructure expenditures. The costs of retrofitting public infrastructure, such as doubling the capacity of an existing highway or an existing wastewater plant, will usually be more than the original construction costs (Bartik,1996).

On the other hand, for an area that is experiencing slow growth or had a past period of economic decline, the marginal cost of new development could reach down as low as zero as plenty of public service capacity stands idle.

In short, for older central cities which have suffered economic and demographic stagnation or decline, marginal cost pricing is preferred and will yield cost estimates below those generated using an average cost approach. For rapidly growing areas, such as urban edge cities, which are experiencing rapid growth, marginal cost pricing is also preferred and will yield cost estimates well above those derived using average costs. Not surprisingly, it is in the moderately growing areas where the marginal cost of new development can be closely approximated by existing average costs.

While the marginal cost pricing is preferred by most practitioners and researchers, it raises major problems that can result in cumbersome operating procedures. Therefore, average cost methods are used. As quoted in the Utah model:

> In the sense that a particular government service is available to the entire population, the total cost of the services divided by the population, or the per capita cost, measures the increase in cost of providing the service as the population increases. In the sense that no two individuals use a given service with the same intensity, the per capita cost of the service does not precisely measure the increased cost of the service. Since measuring the cost imposed by each additional person in the population because of a given economic development is very difficult, the benefit of knowing the precise cost for each person is not worth the effort. The per capita of the service, then, while not precisely accurate, is close enough to yield a reasonable estimate of the additional government expenditure

required by economic development (Koga,1996).

The **per capita or household cost estimation** is probably the most often used method used in calculating the average cost of a project. In this approach the existing average costs of serving the area residents are simply applied to the change in population that is generated by the new development, as well. The per capita cost estimation method rests on two key assumptions (Burchell, 1986)

1. Today's per capita operating costs are good estimates of future per capita operating costs.

2. Today's public service levels are good estimates of future public service levels.

In addition to per household or per capita cost methods, there are two other approaches that have been developed that use the average cost method. The **Service Standard Model** is based on estimates of the "standard" public resources needed to service the new level of development. Service standard, for example, could call for 1 public safety officer of an increase for 5,000 in population and 1 recreation worker for every 10,000 increase in population. These standards are typically developed from national sources, such as the U.S. Census of Government. The service standard model is easy to understand and use; however, it does not allow for differences in local and national service standards (Burchell, 1986).

Another commonly used average cost method that can be used to estimate the costs of nonresidential development is the **Proportional Valuation Technique**. In short this method is based on two simple ratios:

1. An estimate of the community's total expenditures on nonresidential development based on the existing community's percentage of nonresidential property values to the total property.

2. The project's percentage of the community's nonresidential property valuation.

Through these two ratios, an estimate of the public costs are estimated. If the new development accounts for a 0.5 percent increase in the community's nonresidential property value, then it would generated an estimated 0.5 percent increase in public costs. Of course these estimates are for annual operating costs. One-time development costs are added in separately.

The **Proportional Valuation Technique** faces several serious limitations. First, the cost of service varies dramatically with the type of industry or business. The wastewater treatment costs associated with a food processing plant is far different from an instrument assembly operation. The location of the plant in a well-designed business park or as a stand alone will affect street and road repair. Finally, a major regional shopping center will have a greater impact on the area's streets and roads than an equal amount of retail space scattered throughout the area.

The constraints holding back the usage of marginal cost estimates are that they take more resources, time and money to prepare. The most often used marginal cost approach is the **Case Study** where the analyst interviews public officials and gathers statistics to derive the estimated marginal cost per department. In carrying out a marginal costs estimate, the new development is charged the whole cost of the needed expansion of the area's infrastructure improvement. Burchell, et al. claims that "there is no better method to employ for detailed results and intimate knowledge about the fiscal impact site"(Burchell, 1986). However, they also warn that the case study method is the most expensive to prepare.

One warning should be made about the **Case Study** approach. In some instances, the analyst may not find hard numbers on the potential cost of the development. In these cases, the researcher is forced to depend upon the subjective opinion of department heads who may provide average-cost generated estimates.

There are two additional marginal cost approaches available. The **Comparable City Approach,** as reviewed in Burchell (1986), is based on the analyst assembling the expenditure multipliers from statistics of cities of various sizes and experiencing different rates of growth. The multiplier "represents a proportional relationship of the average expenditures of cities of various size and growth rates to the average expenditures of cities of the most common population size and growth rate." (Burchell, 1986). If due to a large development the community's population moves up into the next size category, then its average per capita expenditure is multiplied by the larger-size category's expenditure multiplier. The net change in expenditures due to the development is the difference between the city's average per capita costs multiplied by the large-size category's expenditure multiplier and that for the former (smaller) size group. If public expenditures do not vary with the size of the city, then this method would convert to the simple per capita method since the multiplier of the various sized cities would be one.

The **Employment Anticipation Method** is a method used to estimate impact of nonresidential development. As presented in Burchell (1986), it is based on the historical relationship between commercial and industrial employment and per capita municipal costs, which varies by city size.

Revenue Estimation

Revenues estimation is more straightforward and subject to fewer problems. Property, sales and income (payroll) rates are known. Given the 1)number of new jobs created and their expected wage rates (both should be available from the developer),2)expected utility usage, 3) area employment, income and demographic multipliers, then it is a pretty easy exercise to estimate potential revenues. For miscellaneous revenues such as parking fines or park fees, a per capita method is most often used.

Final words of caution:

Caution should be taken regardless of the approach adopted, however, to avoid the following errors that could create significant errors in of the estimation of costs and benefits.

1. **Displacement effect.** In tallying the net public revenues generated by a new retail development, the analyst must factor in the negative impact this project will have on older retail areas in the area. The loss of jobs and property value at the impacted older retail areas should be deducted from the employment and property value gains expected at the new retail facility. Moreover, it is likely that the cost of serving the older retail areas would not decline greatly. Public safety costs would still be required, for example. Moreover, studies have shown that in commercial and office projects, many of the firms that locate in new offices relocate from existing facilities that can remain vacant for a long period of time. If these relocations are in the same jurisdiction it is possible that they could have only minor net impact on public revenues and costs.

2. **Who takes the new jobs matters.** Analysts face difficulties in estimating the cost impact of new development because it depends upon who gets the new jobs. If the new jobs are taken by in-migrants, then the project will have much greater cost impacts on schools, population-based services, than if the new job-takers were existing residents who were unemployed or not previously in the workforce. In fact, it can be argued that since many city's costs are related to poverty, if the new development provides jobs to the area's low-income unemployed or underemployed, it can result in lowering some costs. Moreover, since these individuals and families already live in the community, their employment will not strain existing capacity levels. Finally, on the revenue side, payroll taxes, sales taxes and residential property taxes would rise.

   Unfortunately, research shows that without an effective job program that would provide training, job development assistance and employment maintenance assistance, most new jobs in areas are filled in the long-run by in-migrants.

The following section reviews each of the models under study.

The New Practitioner's Guide to Fiscal Impact Analysis

Center for Urban Policy Research
Rutgers University

Price: $10.00 (out of print)

This short book offers an update of a much larger volume published in 1978 and provides an excellent first step in the development of fiscal impact models on the local level. Although the data in even the newer volume are out-of-date, the clear presentation and discussion offered by the authors provide the analyst with a solid step-by-step procedure in building a fiscal impact model.

The authors present a clear discussion of the six different approaches of calculating the fiscal cost of development that were reviewed in the previous section. For each, the authors provide well-presented, step-by-step examples on how each of the approaches are applied. In addition, they list the strengths and weaknesses of each approach

Unfortunately, the handbook usage beyond being a good educational tool is limited. Many of the key ratios or multipliers for the various techniques cannot be easily updated by practitioners. Still, in spite of its age, it provide a much stronger presentation than its newer rivals, including the Urban Land Institute's *Development Impact Assessment Handbook.*

Development Impact Assessment Handbook, 1994.

Urban Land Institute

Price: $94.95 (includes model)

This handbook reserves one chapter on fiscal impact analysis which provides a fair overview of the topic. However, the *The New Practitioner's Guide to Fiscal Impact Analysis* provides a much stronger presentation.

The Development Impact Assessment Model that accompanies the handbook provides a simple fiscal impact model that uses the per capita approach of cost estimation. The authors point out the same flaws of this often-used methodogy that are discussed above. Moreover, the authors warn that:

> The model does not substitute for a comprehensive, report-length fiscal impact sutdy that embodies case study detail, considers the nuances of each revenue source, and so on. The preview model does, however, provide a reasonable reliable depiction of the order-of-magnitude fiscal impact of growth.(Burchell et al. 1994 p.139).

While the authors believe that the model is good enough for a "quick" analysis that can generate a rough estimate of a project's fiscal impact, I offer the more conservative assessment that the model's best use is as a teaching aid.

The handbook does provide an useful checklist of common mistakes analysts commit when presenting the results of a fiscal impact model. These include:

1. **Not providing adequate documentation.** Without the background data readily available

in an appendix, for example, decision makers reading the report may become frustrated in being unable to understand how the results were derived.

2. **Offering an Unbalanced Presentation.** The cost side of the development cannot be ignored.

3. **Being Unable to Defend Large Numbers.** If the results of the fiscal impact model generate numbers that are "too good to be true" they probably are not.

In addition to these helpful suggestion, the handbook recommends a very reasonable approach in presenting the result of the analysis. In summary, the authors warn

> The art of effectively presenting the results of a fiscal impact report cannot be overstressed. A fiscal impact report cannot be presented in the abstract by merely stating the net result without an explanation of the intermediate calculations, and base assumptions. Such an approach compromises credibility. On the other hand too much emphasis on numeric and methodological detail will lose the audience. An effective presentation achieves a balance of appropriate technical detail and narrative that can be clearly followed by the audience (p.141).

Economic Impact Analysis II (INSIGHT MODEL)

Arthur Andersen

and the

American Economic Development Council

Price: (still waiting)

The Arthur Andersen Economic Impact Analysis II model (also known as the INSIGHT MODEL) provides a highly detailed and fairly flexible fiscal impact model for local government. The model's purchase price includes an intensive two-day course which covers the major controversies and problems in building an economic and fiscal impact model. The course is based on a handbook that offers a good discussion on the strengths and weaknesses of input-output modeling and average and marginal cost pricing. In addition, the course offers ideas and suggestions on how to present the model's findings to policy makers, a welcomed addition for most researchers.

The model relies on an average cost pricing approach. In particular, the model divides up the resulting costs of economic development into those costs associated with residential development (per capita estimates) and nonresidential costs (per employee). In other words, the user must allocate public expenditures into commercial-related or residential-related across the major governmental departments. The authors suggest that the user meet with department heads to estimate the per capita and per employee costs for expenditure categories.

In estimating the total costs and benefits associated with the project, RIMS-II employment multipliers are used to estimate the indirect benefits to the community of the development in terms of new total earnings and employment. Unfortunately, the model provides the user with only statewide RIMS-II multipliers, so that the indirect impact may be overestimated. In addition, the model does not attempt to measure the costs or benefits associated with these indirect workers moving into the community.

The manual estimates that it will take the user approximately 30 to 40 hours, a week's time, to collect the necessary data for constructing the model. In addition, an annual update of the model will take an estimated 20 hours.

Unfortunately, the model leaves the user with many difficult questions to answer, without the benefit of a suggested default value. While most users appreciate the opportunity to fine-tune, and adjust purchased models to the unique structure of their community, it is very possible that they will not have the data on the following necessary input values for the model:

- Percent of construction materials purchased locally.
- Percent of the full-time equivalent construction workers who reside within the boundaries of the subject county.
- Percent of total furniture and fixtures purchased within the subject county.
- Percent of all other newly purchased equipment purchased within the county.
- The number of full-time equivalent employees who will be hired from the county's current employment base.
- The number of new employees at the facility who will not be residents of the county.
- Percentage of employees at the facility who reside in the subject county.
- Percent of materials bought within the county for operating the facility.
- Percent of retail sales spent within the county.

Default values or, at least, a suggest "back of the envelope" estimating procedure would be helpful to most users.

The model's generated reports are well presented. They provide the user, for instance, with a report on the assumptions used in the development of the fiscal impact analysis and a summary of project returns including an estimate on the payback period for the initial public cost of the project, return on investment, net present value, and a modified internal rate of return.

LOCI-2 Fiscal Impact Model

Georgia Technology Institute's

Cost: $350.00 Single CPU model
$ 50.00 Program files and technical documentation

The Georgia Technology Institute's LOCI-2 Fiscal Impact Model provides an inexpensive computer framework for conducting fiscal impact estimates on the local level. The model, like the Insight Model discussed earlier, requires the user to develop an impressive database, including information that would be very difficult to compile in nearly all cases. Unlike the Insight Model and most models, LOCI-2 ventures well beyond providing estimates for only the direct fiscal impacts of a new plant, it also attempts to measure the **full** fiscal indirect impact of a new plant including, for instance, the added property tax revenue generated by individuals moving into the area due to the indirect impact of a new plant opening. Unfortunately, this feature proves to be more of a liability than an asset.

The model offers three levels of analysis. If the model is being used to measure the impact of a new manufacturing facility then

- **Level 1 - provides an estimate of the fiscal impact of construction phase and the on-going operation of the plant.** At this level of analysis, fiscal revenues include only 1) the sale taxes generated by the facility's purchases of goods and from its workers' purchases and 2) the facility's property taxes. Costs include only initial public development costs and the public service costs generated by the plant's daily operations.

- **Level 2 - includes the fiscal impact generated in Level 1, and adds estimates on the fiscal impact of the plant's employees.** Revenue estimates are expanded to include increases in residential property taxes, user fees paid by new residents and public revenues on other indirect economic activities. At this level of analysis, the public costs of providing services to the facility's employees are estimated. Added costs, included at this level, are the costs of providing services to the facility's employees, such as public safety, recreation and utilities. These costs are based on an average per household calculation.

- **Level 3 - provides, in addition to the impact estimated in Level 1 and Level 2, the fiscal impact due to the full multiplier effect of the facility's purchasing goods and services from local suppliers and its employees' purchases of goods and personal servcies from local retailers.** Revenues at this level of analysis include local sales taxes and residential property taxes generated by new residents, who do not work at the facility but moved into the area due to its increased growth. Property tax revenues generated by new commercial and retail construction caused by the plant's opening are also included. Cost estimates include the added cost of providing public services demanded by the resulting round of increased commercial, retail and resident development caused by the facility's opening.

A fourth level of the model provides the ability to estimate the fiscal impact of visitors and tourism on the community.

The model uses a cost per household approach in estimating the public costs of meeting the needs of the facility's new workers and, if the Level III analysis is used, the cost of meeting the needs of the new residents moving into the area due to the indirect increase in business activity. An average household-to-employee ratio is calculated to estimate the facility's residential fiscal impact. The direct cost of public services to the plant are based on jurisdiction's existing business- to-total cost ratios. It should be noted that the model allows for the inclusion of any added marginal cost for utility services, if the construction and/or operation of the new facility requires the city's utilities to expand their capacities.

If users want to use the model to its full extent, Level III, they have to enter estimates on several very difficult-to-obtain variables. To estimate the indirect economic impact of a new plant, users have two options.

- Supply the model with both an average employment multiplier and an income multiplier for the area.

- Enter local data into a small input-output model component that is contained in the model. Even the most knowledgeable user will be challenged in estimating the data needed to use this component, however. The user must.

    - provide estimates of the value added per dollar of revenue and revenues per establishment for the area's manufacturing, retail, services and wholesale sectors.

    - estimate the amount of purchases that the new plant will make to local suppliers, in addition,to estimating the suppliers' value added to suppliers' industry's overall revenues.

Given the large probability of error that can result in estimating the indirect impact of a new plant, we cannot recommend use the model's Level III analysis. The data requirements are simply to demanding.

It is unfortunate that the model does not contain a good economic impact model such as RIM-II or IMPLAN. It is also unfortunate that the purchase of the model does not include a training session. The absence of these two features, while keeping the cost of the model low, limits its usefulness and accuracy.

Maryland Resource Allocation Model

Maryland Department of Economic Development

The purpose of the Maryland Resource Allocation Model (RAM) is "to provide an objective frame work within which the state can allocate its scarce economic development funds among competing projects (Hoskins and Ganguly, 1996)." The Model includes both an economic impact and a fiscal impact component. The model includes five modules: an economic impact, tax impact, public expenditure impact, economic development adjustment and opportunity cost analysis.

The Department of Business and Economic Development is also constructing county-specific Resource Allocation Models (RAM-LG) which also incorporate a cost-benefit analysis similar to the state model discussed below (Burkholder and Ganguly, 1997)

In preparing the analysis, it is assumed the state subsidy is mandatory for the business expansion to occur, but the company typically must meet one of the following criteria: company operations would be highly competitive, the company needs to become more competitive but is denied access to private financing or that the company has been offered an economic development subsidy by a competing state (Hobkin and Ganguly, 1996).

The model offers several very unique estimates in addition to estimating the fiscal and economic impact of the project. First, it estimates the probability of the company actually moving. Second, it calculates the break-even margin from which the maximum allowable state incentive is based. The maximum subsidy is equal to the net present value of both the state receipts from taxes (income, sales and real property taxes) generated by the project minus both the additional state costs associated with the increase in the demand for state services due to the project and the opportunity cost of the state subsidy. Third, it estimates the displacement effect that the firm's expansion or closure would have on other state firms in the same industry. If, for example, a large portion of the firm's customer base is located in the state, then, its potential departure will have less of an impact to the state, as it is likely that its in-state competitors will expand operations to pick up the company's former customers.

One of the limitations of the model is that it only includes grant and loans in its economic development option. The model cannot be used to estimate business technical assistance or job training programs, for example.