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STEMMING FROM OUTDOOR RECREATION EXPENDITURES
IN THE UPPER LAKE STATES

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Lawrence D. Pedersen

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USE OF IMPLAN TO ESTIMATE ECONOMIC IMPACTS STEMMING FROM OUTDOOR RECREATION EXPENDITURES IN THE UPPER LAKE STATES

by

Lawrence D. Pedersen

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ABSTRACT

USE OF IMPLAN TO ESTIMATE ECONOMIC IMPACTS STEMMING FROM OUTDOOR RECREATION EXPENDITURES IN THE UPPER LAKE STATES

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The USDA Forest Service's IMPLAN input-output (I-O) has been used to generate estimates of outdoor recreation economic impacts, but the reliability of such estimates is largely unknown. Problems with IMPLAN's regional purchase coefficient (RPC) trade estimates were identified. Alternative RPCs were constructed from a reconciled 1977 Multi-Regional Input-Output (MRIO) database. Comparisons with IMPLAN's current RPCs reveal the alternative RPCs to be more internally consistent and in line with regional economic theory. The 1985 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (FHW) data were used with alternative IMPLAN models to generate outdoor recreation impact estimates for the upper Lake States region. Variables examined include recreation activity participation levels and spending patterns, sampling errors associated with the FHW activity and spending data, I-O model sectorization schemes, sector spending allocations, and trade estimates. All variables affected the magnitudes of total economic impact estimates. The range of spending estimates constructed to account for FHW sampling error had a large influence on impact magnitudes, indicating that reports of deterministic impact estimates may be misleading. Evidence presented concerning IMPLAN's RPC estimates indicates that improvements in impact estimates could result from estimation of IMPLAN's RPCs from the reconciled MRIO database.

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CHAPTER I

INTRODUCTION

Background

State governments have become involved in sponsoring a variety of initiatives to foster economic development in recent years. Fosler (1988) documents this trend in The New Economic Role of American States. Nothdurft (1984) reviews recent state economic initiatives that focus on natural resources. Tourism and recreation have been major areas of emphasis for state economic development efforts.

Reliable estimates of the relative economic impacts from alternative development programs are useful in planning economic development. Knowledge of economic impacts can improve governmental programs aimed at promoting economic growth. An industry's relative economic impacts vis-a-vis other industries are an appropriate consideration in the case of "targeting" a particular industry for special governmental assistance. Other factors to consider include the industry's growth prospects, the comparative advantages for the industry that exist in the state versus elsewhere, and anticipated social benefits.

People recognize the need for better economic data and information on outdoor recreation. This is illustrated by the summary of outdoor recreation key issues and recommendations in Appendix I of Americans Outdoors: The Legacy, the Challenge, (President's Commission on Americans Outdoors, 1987). According to the study, states are reported to have expressed needs for "improved information collection and analysis to provide a better base for decisions" and "better

identification of values to help justify actions recommended" (p. 281-282). The report goes on to state: "Most state assessments reference the values of recreation and the outdoors. These concerns about values are often closely related to overall planning and research needs." Two of the three primary areas encompassed by the concerns expressed were "better recognition by and communication to the public about recreation values" and the "need for more research and documentation of quantitative benefits of recreation to the economy..." (p. 282).

Two recent examples of efforts explicitly aimed at improving the quality of outdoor recreation impact analysis are the Public Area Recreation Visitor Survey (PARVS) and the estimation of upper Lake States outdoor recreation economic impacts (Pedersen and Chappelle, 1987). The PARVS effort has involved Federal and State agencies in coordinating surveys of park recreationists in several regions of the United States. The primary objective of PARVS was to "generate spending data needed to determine the economic impacts (jobs, income, etc.) of public agency expenditures for recreation facilities and services" (Propst, 1988, p.4). The estimation of outdoor recreation economic impacts in the upper Lake States (Michigan, Minnesota, and Wisconsin) was part of an effort to measure the contribution of the forest resources to the region.

The funding for these and other similar recreation studies indicates there is a demand for reliable economic impact measurements of outdoor recreation. At the same time, however, reliable recreation economic impact measurement is constrained by many factors. These factors may be viewed as generally falling within three categories: the definition of outdoor recreation, the input data used with the impact

model, and the impact model itself. This thesis focuses on issues relating to outdoor recreation input data and impact models. Brief attention is also given to outdoor recreation definition issues.

The need for this study is further discussed in the following section. Other preliminary concepts and an introduction to the subject are then presented to establish the context of the dissertation research. The chapter concludes with a statement of study objectives.

Need

A plethora of data on outdoor recreation and related statistics on travel and tourism exists, but there has been little effort devoted to comparing and relating such data, especially within the context of recreation economic impact analysis. In the absence of consistency checks across studies and statistical information, regional outdoor recreation participation and spending profiles largely remain untested and unreliable. This, in turn, inhibits the development of credible outdoor recreation economic impact estimates.

There are several reasons why comparisons of recreation data and economic impacts are difficult to undertake, including a lack of consensus concerning outdoor recreation and tourism definitions, the multi-purpose nature of many outdoor recreation trips (recreationists often participate in a mix of activities), and different objectives in conducting outdoor recreation and tourism studies. As stated in the Methodological Notes accompanying the paper presented by Pedersen and Chappelle at the 1987 Lake States Governors' Conference on Forestry (p. 4):

> At the time of this study, no complete, consistent, and reliable outdoor recreation data base exists that can be used in an economic impact analysis of a sub-region of a multi-state

area (such as the more heavily forested areas of our three state region). The lack of standardization in data reflects different objectives under which the data were originally collected. For example, outdoor recreation-related data may be gathered to measure tourism, state park attendance, or the multiple demands on lakes or streams. Units of measurement range from simple head counts through trips, "occasions," recreational visitor and activity days, and hours spent in the activity. Studies also include and exclude different types of recreationists, again, depending on their objectives.

There are many other recreation analysis pitfalls. The sheer diversity of activities and recreationists makes impact estimation difficult. Double-counting is a risk when using multiple sources of data as in this study. Fishermen camp and campers fish; separating out what multiple data sources have included may be impossible. Typical spending categories mentioned in studies frequently do not fit the SIC codes used in impact analysis. Examples include: "transportation" and "vehicle-related," which could refer to a myriad of sectors besides gasoline, and "food," which may or may not include restaurants and beverages. Spending will also differ depending on the recreationist's origin and destination, lodging, activities engaged in, and the recreation season.

In addition to the differences between studies noted above, outdoor recreation economic impact studies often differ in their treatment of two categories of economic activity affected by recreation activity: recreation-related equipment purchases and fiscal impacts on various levels of government. Many studies focus only on trip expenditures and do not address either durable equipment spending or the public costs of providing the recreation experience. Comprehensive profiles of outdoor recreation economic impacts might also give consideration to expenditures in the region that occur in preparation for recreation outside the region. There are also more esoteric impact issues such as analyzing changes in personal consumption expenditures for food and other items that stem from successful hunting and fishing. However, budgetary, data, and time constraints often prohibit the development of comprehensive recreation impact analyses.

This thesis examines several specific means to refine recreation economic impact estimates generated by the USDA Forest Service's IMPLAN (IMpact analysis for PLANning) model (U.S. Department of Agriculture, 1983). Important issues faced in estimating recreation economic impacts will be illustrated through generating estimates of upper Lake States outdoor recreation economic impacts using Micro IMPLAN (Version 2.0) (Alward et al., 1989).

Use of Outdoor Recreation Data in Impact Analysis

Accurate recreation participation and spending profiles need to be constructed before reliable recreation economic impacts may be estimated. Spending profiles may then be converted into final demand vectors which, in turn, "drive" input-output (I-O) models. Thus, the levels of direct, indirect, and induced sales, value-added, income, or employment impacts generated by a recreation I-O analysis critically depend on participation and spending estimates.

In order to expand their usefulness and address the myriad of objectives facing state planners, spending profiles and associated final demand estimates would ideally be developed (and, subsequently, be capable of being delineated) according to a number of variables. These variables include recreation activities, types of accomodation used, recreationists' residency status, and, preferably, substate regions and season. Developing distinct spending profiles according to these variables would permit:

- the flexibility to examine issues for different objectives and multiple interests. Among other reasons, such flexibility is desirable with multiple definitions of tourism and recreation existing and private interests often centered around specific

activities (e.g., hunting or fishing);

- improved estimates as new primary and secondary data become available, be they estimates for lodging, recreation activity levels, or other recreation-related variables; and
- more crosschecking of estimates across studies in order to examine their consistency and reliability.

Regarding this last point, outdoor recreation data come from national, state, and local sources. There have been few efforts to contrast participation level and spending pattern estimates across and within different levels of the spatial hierarchy. Conclusions stemming from comparisons of estimates across recreation studies are inhibited by differences in time when studies were conducted, what they measured and the measurement units they used, and low precision caused by small sample sizes in some cases. However, such comparisons may at least give some qualitative impressions of consistency and provide a measure of the reliability of outdoor recreation economic impacts. The reliability of outdoor recreation economic impacts should be questioned if gross inconsistencies between outdoor recreation data are found and not resolved before generating the impact estimates.

In light of the importance of the final demand estimates for input-output analysis, the reliability of recreation participation levels and spending profiles are probably at least as important and in need of review as is the input-output model used to generate the economic impact estimates. However, problems with an I-O model may sometimes be identified and rectified, leading to generic changes in the I-O modeling system. Such changes could then help all future users of the I-O modeling system. In addition to possible generic I-O improvements,

refinements in the analysis at the stage of using the I-O model may also sometimes be more easily and quickly achieved. Attention to the I-O model in such cases may be justified on the basis of efficiency. This study will describe where generic improvements may be made in the IMPLAN modeling system and associated IMPLAN user materials, especially as they apply to outdoor recreation economic impact estimation.

Issues and variables encountered throughout the impact estimation process are described, along with their influences on the ultimate impact estimates. This examination provides some indications of where the greatest amount of future research time and effort should be spent. In order to improve the reliability of recreation impact measurements, it may be wise to extrapolate values from other studies for certain variables which have consistent values across studies and to devote more time to those variables with wide ranging values. A savings of time resulting from extrapolating values from other studies could also be spent in developing more comprehensive assessments of impacts through pursuing the often-neglected aspects of outdoor recreation impact analysis mentioned earlier (durable equipment purchases and public fiscal impacts). Despite interest in outdoor recreation impacts, funding for impact studies is limited. Efficient allocation of research resources requires a marginal return approach. This approach would devote the greatest amount of attention to refining measurement of those variables which most affect the precision and reliability of impact estimates.

Input-Output Model Influences on Outdoor Recreation Impact Estimates

Recreation data and I-O models are two major sources of influences on the magnitude of outdoor recreation impact estimates. The quality

and consistency of recreation participation and spending data are, at best, untested. In contrast, there have been recent input-output (I-O) improvements in terms of structural I-O techniques used, model accessibility, and user aids for measuring outdoor recreation I-O impacts. This is specifically true with regards to the USDA Forest Service's IMPLAN model. IMPLAN version 2.0 is available in a personal computer (pc) version which allows for faster turnaround and greater user input in model development. It has adopted a new trade estimation technique in place of one which is known to overestimate regional impacts. It also has separate retail and wholesale trade sectors which permit greater precision in measuring impacts from recreation-related expenditures. Additionally, IMPLAN training materials and computer spreadsheet aids have been developed for recreation impact analysis.

The range in size of multipliers provide a further indication that research on recreation participation and spending data may provide greater refinements in generating reliable recreation economic impact estimates. Sectoral multipliers generated by IMPLAN for any given region and type of economic variable tend not to vary from each other by more than a factor of one. If estimated properly, they seldom are outside of a range of one to three. For any given region, most multipliers of the same type (e.g., sales, income, jobs, Type I, or Type III) are within 50%, plus or minus, of the average multiplier for that type.

In contrast to most multipliers, recreation participation and spending estimates are "all over the map." In other words, on a percentage basis, differences betwen multipliers appear to be less than differences between recreation participation and spending estimates.

Therefore, successful efforts at improving the accuracy of participation and spending data are likely to improve the reliability of estimates of total outdoor recreation economic impacts more than refinements in sectoral allocations of spending (the distribution of recreation expenditures across input-output accounts) or improvements in multiplier accuracy. This assumes the objective is to develop reliable recreation economic impact estimates. However, objectives may sometimes be tainted by political motivations to inflate the importance of a particular industry. Also, the objective may be to measure multipliers or assess the distribution of spending across economic sectors, or both, rather than estimate total economic impacts. This second point is further addressed below under the heading, "The Concept of Accuracy as It Applies to I-O Analysis."

Ideally, consistency checks and sensitivity analyses are conducted throughout an entire impact estimation process. Several dimensions at the stage of utilizing IMPLAN may have a significant bearing on final impact results. Addressing some of these issues may be warranted on the basis that they may be more cost effective than improving the quality of recreation participation and spending data. Five specific issues relating to use of the input-output model could be investigated in the process of conducting sensitivity analysis of economic impacts:

1) the sectorization scheme: minimizing aggregation error and testing for sector spending allocation error (this is essentially an extension of checking the consistency of spending profiles across outdoor recreation studies);

2) alternative deflators: Appendix D of the IMPLAN Version 1.1 Analysis Guide bridges BLS deflators for 110+ sectors to IMPLAN's (version 1.1) 464. (Updated BLS deflators have also been bridged to version 2.0's 528 sectors and are available to IMPLAN model users.) There are alternative deflators, ranging from gross national or local consumer price indices's (CPIs)

through very narrowly defined, industry-specific producer price indices (PPI). (Regardless of whether deflators form some part of a sensitivity analysis, they should be used to convert data for any year other than 1982 to IMPLAN version 2.0's 1982 base year. Accuracy of the deflators is related to the issue of sectorization and aggregation error.);

3) allocation of spending to I-O sectors: "bridging" spending from survey responses to I-O sectors is compounded by ambiquities in survey responses and survey spending categories, and by aggregation or classification differences between survey spending categories and I-O model sectors. The process of converting purchaser prices to producer prices ("margining") must be conducted for most recreation expenditure surveys to correctly use them with I-O tables which are based on producer prices. Appendix E of the IMPLAN Version 1.1 Analysis Guide provides margins for most of the 100+ personal consumption (PCE) categories associated with the 1977 U.S. input-output accounts. Detailed Bureau of Economic Analysis (BEA) worksheets are available which further differentiate these PCE categories into over 1700 PCE items. Use of the margins from the IMPLAN manual may involve aggregation or spending allocation error, while the detailed BEA worksheets tend to be cumbersome and time consuming;

4) employment estimates: County Business Patterns (CBP) is a major data source used to formulate IMPLAN's employment estimates. The CBP does not incorporate estimates of self-employed persons and is based on March surveys. Another complication for deriving reasonably accurate estimates of recreation employment is the seasonality and transitory nature of recreation employees. As noted by Propst et al. in Assessing the Secondary Economic Impacts of Recreation and Tourism: Work Team Recommendations (in Propst, compiler, 1985, p. 59), the induced portion of the impact may be overstated if the summer recreation employees do not match average employee spending patterns;

5) consistency checks with other secondary economic statistics: the literature on validation of I-O models and estimates has tended to emphasize comparisons with primary models, but there have been several suggestions and some studies made (e.g., Siverts, 1988) which have focused on looking at additional secondary economic data.

A concern related to this fifth issue is the reliability of IMPLAN's trade estimates. Version 1.1 of IMPLAN used a technique called supply-demand pooling to generate trade estimates between a region's industries and the outside world. This approach to trade estimation originated with Isard (1953). Supply-demand pooling is based on a net

trade concept. The difference between regional demand and regional supply (output) is assumed to be imported if there is greater demand than supply; if supply exceeds demand, the excess is assumed to be exported. In other words, local supplies are assumed to be exhausted before imports are turned to or, conversely, local demand is filled before exports occur.

The net trade concept ignores crosshauling which is frequently observed in the real world. Imports tend to occur for most goods and services even if local supply is adequate to meet local demand and, similarly, exports tend to occur even if local supply can not meet local demand. This is a general phenomenon across all regions and sectors, although it holds true more for small regions than large, complex (diversified) regions and more so for manufactured goods than services. Also, the degree of crosshauling observed will be affected by the degree of sectorization detail.

The consequence for adopting the supply-demand pooling approach is that economic impacts may easily be overestimated. As stated in "Regional Non-Survey Input-Output Analysis with IMPLAN" (Alward, et al., 1985, page 8), "In general, IMPLAN multipliers tend to be larger... probably due in large part to the maximum trade assumption." This makes intuitive sense. If every time something is purchased locally it generates round after round of purchases of products that are assumed to be produced locally rather than imported, then the estimated impact will be greater. Less "leakage" as it is called, creates larger impacts. This is reflected in inflated multipliers.

Version 2.0 of IMPLAN uses an alternative approach that indirectly accounts for crosshauling and is based on gross trade flows estimated

through the use of regional purchase coefficients (RPCs). The approach has been developed largely through the work of Stevens and his colleagues (Stevens, et al., 1983) and is also used by Regional Economic Models, Inc. (REMI). Basically, the amount of local output purchased to meet local demand is determined econometrically. Independent variables used to estimate the RPCs include such factors as the physical size of the region, transportation and other factor costs such as wages, and the relative share of total regional employment an industry comprises versus the industry's share of total employment on the national level. After estimating the proportion of demand supplied locally, the remainder of demand is assumed to be met through imports, and the difference between total output and the amount of output consumed locally is assumed to be exported.

The estimation of trade between regions has been found to be a critical factor in determining the size of impacts. Richardson (1972, p. 175) has stated, "It is widely known that the effects of changes in trade coefficients, especially in an expanding region, can have a bigger impact on the structure of the regional economy than changes in technological coefficients due to technological change or product mix." While acknowleding some dissent, Stevens et al. (1986, p. 2) contend there appears to be "general agreement" that the accuracy of regional purchase coefficients is "most crucial to the accuracy of any regional I-O model."

In his 1985 review article on input-output and economic base multipliers, Richardson calls the Stevens et al. RPC approach a "welcome change from endlessly repetitive and mechanical location quotient methods..." of trade estimation, but cautions the approach may face

difficulties due to reductions in the Census Bureau's Transportation Survey data collection and dissemination. The RPC approach has relied quite heavily upon an aging 1977 Commodity Transport Survey database. The 1982 Commodity Transport Survey was not released by the Census Bureau because of substantial discrepancies found in subsampling after the Survey was completed.

Theoretically, the RPC approach may generate more realistic trade estimates and subsequent economic impact estimates than the supply-demand pooling technique. This is because it does not automatically assume maximum local trade. However, there is little empirical evidence that the RPC technique is consistently more accurate. Most literature on the performance of alternative nonsurvey trade estimation techniques predates the full development of the econometric RPC approach. Two papers coauthored by Stevens, the originator of the technique, (1983 and 1986) comprise the major evidence on the performance of the RPC technique versus other techniques.

Stevens et al. (1983) reported mixed results when comparing RPC-based I-O models to survey-based models for the states of Washington and West Virginia. The causes of the mixed results were partly attributed to the lack of documentation for the West Virginia survey-based model. The authors also noted that the regression-derived RPCs were, at that time, underestimating true RPCs because they were based on the 1972 Census of Transportation which did not report shipments under 25 miles. Most unreported shipments under 25 miles would be intrastate shipments. As a result of not incorporating shipments under 25 miles, intrastate shipments as a percent of total shipments were underestimated. This would tend to make RPCs based on the 1972 Census underestimates of

actual (real world) regional purchase coefficient values. This problem was eliminated for later versions of RPCs based on the 1977 Census of Transportation which reports shipments under 25 miles.

Another reference to an empirical comparison of trade estimation techniques including the RPC approach is in an unpublished paper by the Regional Science Research Institute (RSRI) (Stevens, et al., 1986). The authors argue that survey-based tables or multipliers may be flawed due to missing data, small sample sizes, and their higher level of aggregation relative to secondary I-O models. Thus, they contend it is dubious to assess the accuracy of nonsurvey I-O models based solely on comparisons with survey-based tables or multipliers. In contrast, the authors adopt a different approach that compares the RPC technique against the supply-demand pooling technique and two other nonsurvey trade estimating techniques (location quotients based on employment and output) in estimating what are termed "known" or "observed" RPCs. These "known" RPCs are "constructed by the Regional Science Research Institute" from a multitude of secondary data sources, instead of being derived from primary surveys. As would be expected on a theoretical basis, the RPC technique outperforms the other techniques.

The statistical comparisons indicate the RPC technique is most accurate for those cases where the actual RPC is small (less than 0.3). Perhaps more interestingly, because of the inconsistency with some other authors' nonsurvey comparisons, the performance of the other three techniques are virtually identical. For example, the RSRI RPC's root mean square error (RMSE) from the "known" RPCs is reported to be 0.223 overall versus between 0.60 and 0.601 for the other three techniques. For small "known" RPCs, the RSRI RPC's RMSE is 0.122 while the other

three techniques are between 0.694 and 0.706. For large "known" RPCs, the RSRI RPC's RMSE is 0.319 while the other three techniques are between 0.423 and 0.432. These results imply both that the RSRI RPC trade estimation technique is superior to the other three techniques and that there is virtually no performance difference between the three alternative techniques. It should be noted that the RMSE, will accentuate large differences more than some alternative statistical measurements such as the mean absolute difference. Thus, the RMSE makes the performance difference between the RSRI RPCs and the other nonsurvey trade estimation techniques appear larger than alternative measurements. However, reported results from Theil's inequality index and regression results also lend evidence to the better performance of the RSRI RPCs and similarity of performance between the other estimation techniques.

In any case, the empirical evidence on the superior performance of the RPC approach to estimating trade is meager, probably due largely to its recent vintage. There have been a number of articles (e.g., Garhart (1985), Ralston et al. (1985), and Garhart and Giarrattani (1987)) that address the error generation created by using a single vector of RPCs to estimate trade (such as is done by REMI, RSRI, and, now IMPLAN) rather than a matrix of RPCs. The articles describe simulation experiments with survey-based models to demonstrate that use of a matrix of RPCs could improve the accuracy of RPC-based trade estimates. This issue is briefly addressed in chapter 2. It has relevance for the comparison of different trade estimation techniques. However, the simulation results reported thus far are not very dramatic. For example, Garhart and Giarratani (1987) report multiplier differences of less than fifteen percent. Such differences are not very significant when contrasted against differences

several magnitudes greater which were found stemming from other variables in this study. Furthermore, the issue is largely beyond the scope of this research study, which is to examine trade estimate used by IMPLAN (i.e., applied across rows).

It is known for other reasons that many of the RPC values currently being generated by version 2.0 of IMPLAN are highly questionable. These RPCs may contribute to significant distortions in economic impact estimates, especially for particular industries, including many sectors affected by recreation. This conclusion was originally reached in the process of preparing economic impact estimates for a 1987 Lake States Governors' Conference on Forestry (Pedersen and Chappelle, 1988). It was based initially on comparisons of RPC estimates generated by IMPLAN to IMPLAN's estimates of output and demand for the same sectors, and on comparisons with RPCs derived from REMI models leased by state governments in the Lake States region.

Table 1 presents some of the questionable IMPLAN RPC values observed for the State of Michigan. These RPC values were generated by IMPLAN and would influence impact estimates unless the model user changed them. IMPLAN estimates of the ratio of local production to local demand appear in the SDP column. The SDP value indicates the maximum potential value the RPC can attain, given IMPLAN's estimates of regional demand and output. The actual RPC may be well below the SDP ratio due to imports and exports. IMPLAN and SDP trade estimates are for 1982. 1985 REMI RPCs for the state of Michigan are also shown.

Table 1 includes only a portion of the Michigan sectors with dubious RPC values. A pattern can be discerned of negligible value RPCs appearing in clusters of sectors. The negligible RPC values for the pulp

Table 1. Michigan RPC and SDP Trade Estimates

IMPLAN #	IMPLAN Sector Name	Intraregional Michigan Trade Estimates IMPLAN	SDP	REMI
188	Paper Mills,exc Bldng Paper	0.00	1.00	0.37
189	Paperboard Mills	0.00	1.00	0.30
190	Envelopes	0.00	0.50	0.04
191	Sanitary Paper Products	0.00	0.42	0.11
192	Building Paper & Bldg Board	0.01	1.00	0.01
193	Paper Coating and Glazing	0.00	1.00	0.26
194	Bags,except Textile Bags	0.00	0.83	0.13
195	Die-cut Paper and Paperboard	0.00	0.97	0.47
196	Pressed & Molded Pulp Goods	0.00	0.58	0.00
197	Stationery,Tablets & Related	0.00	0.57	0.08
198	Cnvrted Paper & Paperbrd,nec	0.00	0.33	0.06
243	Fabricated Rubber Prdcts,nec	0.01	0.22	0.23
244	Misc Plastics Prdcts	0.01	0.85	0.46
245	Rubber & Plastics Hose & Belting	0.01	0.25	0.07
353	Pumps & Compressors	0.00	0.81	0.44
354	Ball & Roller Bearings	0.00	0.35	0.18
355	Blowers & Fans	0.00	0.71	0.32
356	Industrial Patterns	0.00	1.00	0.52
357	Power Transmission Equip	0.00	0.61	0.37
358	Industrial Furnaces & Ovens	0.00	0.95	0.36
359	General Industrial Machinery,nec	0.00	0.44	0.49
360	Carburetors,Pistons,Rings,Valves	0.00	0.86	0.62
361	Machinery,exc Electrical,nec	0.00	0.81	0.80
461	Other Wholesale Trade	0.01	0.88	0.91
478	Misc Repair Shops	0.00	0.75	0.78
479	Svcs to Buildings	0.00	0.64	0.48
480	Personal Supply Svcs	0.00	0.79	0.96
481	Computer & Data Processing Svcs	0.00	0.71	0.97
482	Management & Consulting Svcs	0.00	1.00	0.89
483	Detective & Protective Svcs	0.00	0.83	0.58
484	Equip Rental & Leasing	0.00	0.74	0.95
485	Photofinishing,Commercial Photography	0.00	1.00	0.95
486	Other Business Svcs	0.00	1.00	0.96
487	Advertising	0.00	0.76	0.96
488	Legal Svcs	0.00	0.91	0.96
489	Engineering,Architectural Svcs	0.00	1.00	0.98
490	Accounting,Auditing,& Bookkeeping,nec	0.00	0.80	0.96
492	Auto Rental & Leasing	0.26	0.89	0.88
493	Auto Repair & Svcs	0.26	0.89	0.95
494	Auto Parking & Car Wash	0.26	0.94	0.86

and paper sectors (including sectors 188 through 198 shown in Table 1) were of greatest concern for the 1987 Lake States forestry economic impact study. These industries account for the majority of forest product industry sales in the Lake States region. Their combined sales were in excess of ten billion dollars in 1982. Their negligible IMPLAN RPC values imply that virtually no Michigan demand for pulp and paper products is met by regional production, which is contrary to firsthand knowledge of the industry. Negligible RPCs for the service sectors listed (beginning with sector 461 through the end of the Table 1 list) are perhaps even more at odds with what is known about these sectors. Service industries tend to supply local markets and, overall, are likely to have higher RPCs than manufacturing industries. The magnitude of their RPCs should be expected to be closer to 1.0 (as the SDP and REMI values are for the sectors listed) rather than 0 (as IMPLAN's unchanged RPCs are for the sectors listed).

An extensive examination of IMPLAN-generated RPC values was a major focus of this research in light of these and other observations which raised concerns about IMPLAN's RPC trade estimates. The objectives related to this phase of the research are to identify and measure the extent of problems with IMPLAN's RPCs and to propose means of ameliorating these for IMPLAN users. Review and use of alternative RPCs is timely in terms of widespread use of the pc IMPLAN release. Although it has implications for all IMPLAN applications, the RPC analysis relates directly to the reliability of outdoor recreation economic impacts. It will be shown that many of IMPLAN's RPCs affecting recreation impacts are at odds with regional economic theory.

The Concept of Accuracy as It Applies to I-O Analysis

The degree of accuracy required for input-output estimates will depend, in part, on the purposes of the I-O analysis. Input-output analysis is used by public agencies for at least two distinct purposes. The first of these is to convey a measure of the total or absolute impacts associated with some type of economic activity. The true purpose of such a use of I-O analysis may be to justify the importance or budget of the agency associated with the activity. In such cases, the purpose is to use I-O as a descriptive public relations tool to convey an impression of the importance of a particular economic sector or activity. However, measuring total impacts associated with some types of activity may be appropriate and even required in cases involving major public expenditures of funds or uses of public lands. In these and other cases, the I-O analysis may serve to better illuminate which sectors are affected by particular public or private actions.

The second purpose is to use input-output as an analysis tool for economic development or industrial targeting. Here, the emphasis is likely to be more on establishing the relative merits of different sectors or public assistance strategies. Computing total impacts may not be as important as relative impacts; a comparison of select multipliers or industrial and institutional linkages may be what is needed by decisionmakers. Accuracy in input-output trade estimates and other I-O parameters is critical for reliable evaluations of differences between individual sectors.

It is common to see authors borrow multipliers from other studies or to simply select a number (often 2.0) and multiply it by their estimates of direct sales (or income or jobs) to arrive at estimates of

"total" impacts. Generally, the authors are not claiming to be accurate in such cases and may even admit that their estimation procedures leave much to be desired. However, whether due to funding constraints or other priorities, unique multipliers for the time, space, and activities under consideration could not be calculated. Also, the authors may have believed it inappropriate not to mention that impacts extend beyond the direct impacts measured.

Exaggeration of impact size is a danger when multipliers are borrowed, and such exaggeration could, in turn, contribute to widespread discounting of impact estimates and input-output analyses more generally. However, much recreation planning and many recreation analyses are not critically dependent upon the level of accuracy in the measurement of impacts. Borrowed multipliers may be used simply to indicate that secondary effects from recreation activity occur, rather than to illustrate the exact magnitude of expected impacts associated with the recreation activity being studied. In contrast, accurate impact measures are much more critical in industrial targeting and economic development studies which must assess the relative contributions or potential contributions of economic sectors.

Improved accuracy of input-output estimates also may be addressed in the context of reporting results. Reporting of a range of estimates (even though the range does not constitute a true statistical confidence interval) relates more information and may more accurately convey the level of knowledge regarding likely economic impacts than a single number. Thus, despite what might appear to be a loss of precision, the reporting of impacts in ranges -- based on familiarity with the

variability in data and model parameters -- may be less misleading than a single number which falsely connotes a high level of precision.

There has been only limited theoretical and applied work on stochastic and probabilistic I-O models. Jackson (1986), for example, has described the basis of what amounts to a probabilistic specification of technical and trade coefficients which would generate interval multipliers or impact estimates. Aggregations of industries are treated like samples of firms within an industry. Unlike the usual I-O aggregation, the information on the disaggregated industries' technical coefficients and trade are aggregated together into probability functions, weighted on the basis of output. The author notes that, in distinction from a model that is generated at least in part from random influences, his model takes into account "expected systematic variation" observed at the disaggregated data level. The accuracy of the disaggregated data is a critical constraint on the accuracy of such a probabilistic model. Also, estimation of final demands used to drive the model remain critical to the model's results.

Computing hardware continues to advance with each passing year. Further development and applications of stochastic or probabilistic I-O models can be expected to accompany increased computing capabilities. Admittedly, decisionmakers may well prefer singular (point) values, which do not reflect any uncertainty, to interval or range estimates with probabilities attached to them which are more difficult to interpret. However, it remains the analyst's task to avoid oversimplifying or deceptive estimates which do not relate the level of uncertainty encountered.

Application of Valuation and Impact Concepts to Recreation Impact Analysis

a. Terminology

The use of certain terms pertaining to impact analysis is not always consistent in the recreation literature. The dominant, conventional usage is to refer to impacts as "secondary" or "indirect" impacts. On the other hand, the experience felt by recreationists, or their utility from the experience, is generally denoted as the "direct" or "primary" effect. This orientation may stem from the perspective of benefit-cost analysis, which conventionally does not allow for a counting of indirect benefits (defined as market transactions associated with the recreation experience), to be counted as benefits. Thus, Walsh (1986) states,

> "Economists distinguish between the primary benefits and secondary impacts of recreation economic decisions...The net benefits of individual consumers represent the social benefits of public recreation programs. The consumer surplus of individual users may not be spent in the region of the recreation site or spent at all, but this does not make it any less real to individual consumers. ...the secondary effects of the actual expenditures by individual consumers and managers of private and public recreation resources...are the regional economic impacts on business output or sales, employment, net income, tax revenues, government spending, and environmental quality. The essential idea is that primary costs to individual consumers and managers become secondary gains, in part, to the regional economy supplying recreation goods and services. Studies of regional economic impact do not measure the value of the project to the primary users of the recreation site but rather the value of the project to those who are involved in supplying the primary users with goods and services."

> ..."The Water Resources Council guidelines recommend the regional economic impacts should be treated as income transfers in a separate account to distinguish them from benefits which contribute to general welfare or national economic development. Conceptually, employment anywhere in the nation of otherwise unemployed or underemployed resources that results from a project represents a valid benefit. However, they are not counted because of problems of identification and measurement

> and because unemployment is regarded as temporary. The guidelines allow one major exception to the rule. If the regional economy of a proposed project has substantial and persistant unemployment of labor, then the benefits of the project may include the income (salaries and wages) of otherwise unemployed labor working onsite in the construction or installation of a project or a nonstructural improvement.
>
> ..."Most secondary gains to a particular region will be offset by actual or potential losses elsewhere. This means that outdoor recreation programs redistribute income to the regional economy of parks and other recreation sites from other regions and the nation. Whether such redistribution is desirable is a political decision beyond the scope of economics. The essential point is that these changes in the distribution of income represent transfers of income and not social benefits, i.e., not real welfare gains to the nation. What is a gain to the local region may be a loss to another region, and the national economic welfare may not change. Economists refer to such transfers of income as pecuniary impacts to distinguish them from technological impacts where real national secondary benefits occur in regions with long run unemployment, immobility of resources, and economies of large scale."
>
> (pg. 373-376)

This last paragraph contains several misleading statements. It would have been more accurate to note secondary gains to a region <u>may</u> be <u>at least partially</u> offset by actual losses in other (subnational) regions, rather than qualifying the first sentence by acknowledging that the losses "will be offset by actual or <u>potential</u> losses elsewhere." Are the gains and losses perfectly equivalent, such that the gains merely "represent transfers of income" and nothing else? At issue is whether the gains are identically matched by losses elsewhere (within the nation, or system of regions being considered), or only partially so. If regional gains exceed losses elsewhere, the net gain could rightfully be included in an impact analysis of the benefits for the system of regions. This point is not addressed directly, although later in the same paragraph the author does state that gains "<u>may</u> be a loss to another region" (rather than will be), and "national economic welfare

may not change" (rather than will not). Generally, it is not known whether regional secondary gains are offset or not by losses elsewhere.

Economics has a role in aiding the understanding of the nature of income redistribution so as to allow for more informed political decisions on the desirability of such redistribution. It is within the scope of economics to objectively measure the redistribution and predict its impacts.

Most (but not all) economists make a distinction between pecuniary and technological impacts, but the distinction is not well conveyed in the last sentence of the last quoted paragraph. Pecuniary effects are monetary (income or wealth) distributional effects stemming from market transactions and changes in prices. Dismissing pecuniary effects as merely distributional impacts rests on the assumption that there are exactly equal gains and losses. This, in turn, is dependent on perfect competition assumptions, or at least full employment of resources in the markets under consideration and any related (complementary or substitute) markets. In contrast, technological effects imply "real" effects on preferences or technological opportunities, presumably affecting aggregate welfare. Resource allocation may be affected in either case.

Technological impacts may occur from many sorts of economic activity, including travel and tourism. An important issue is what is the spatial unit of analysis? New economic activity may create beneficial technological impacts in a depressed area by positively affecting the region's long run unemployment, immobile resources, or untapped potential for economies of scale. In contrast, the same activity may well have only distributional consequences in regions with

full employment, perfectly mobile resources and no remaining economies of scale to tap. As described, new wealth is created in the depressed area whereas there is only income being transferred in the latter regions (assuming regions with such conditions exist). "Real" national secondary benefits may be said to occur in the first circumstance, as opposed to merely "pecuniary" benefits in the latter. It is clear that outdoor recreation can generate "real national secondary benefits" by this perspective, but it depends on the region in which the recreation occurs.

Problems remain with this perspective, however. Neoclassical economics, with its emphasis on the forces of equilibrium and efficiency, tends to ignore situations exhibiting long run ("structural") unemployment and factor immobility. Belief in the workings of Adam Smith's invisible hand could lead one to argue that public or private recreation expenditures in areas of long run, high unemployment may be less economically beneficial than expenditures in areas of low unemployment particularly in terms of price distortions, but also in terms of productivity. Expenditures in low unemployment areas might provide further competitive incentives for resources to be allocated to where they provide their highest return and lead to (or force) technological innovation. In contrast, expenditures in high unemployment areas may not generate the same intensity of incentives and may distort price signals, leading to a loss in efficiency.

The above argument is oversimplified as it does not address a number of social welfare concerns, such as those pertaining to Second Best, inflation, and welfare payments issues. The point is that determining what to consider in regional impact analysis is not as

straightforward as described by Walsh. The basis for counting impacts in areas of high unemployment rests not only on the idea that the nation gains from using resources that would have been wasted otherwise, but also on the concept that better economies of scale may be achieved in such areas, leading to gains in efficiency. (The corollary for low unemployment areas is that there are no further possible resources to be exploited -- this ignores the possibility of importation and the concept of comparative advantage -- nor are there any further economies to be achieved). If there is any basis to the saying that necessity is the mother of invention, then conditions of high resource utilization are likely to lead to technological progress. In contrast, idle resources and slack demand do not generate incentives for innovation.

It is not the purpose here to draw final conclusions about these points of view, but only to contend that the rationale behind accepting or rejecting the legitimacy of impact estimates is not perfectly objective. Guidelines on when to count impacts versus not allowing them are arbitrary and more political than economic.

b. Residents Versus Nonresidents

A related recreation impact issue consists of which recreationists to count. Recreation expenditures within a region by the region's residents are sometimes dismissed because they are assumed to contribute nothing to the regional economy. According to this view, such expenditures are simply a transfer of income from one part of the region to another part. The gain to one area is viewed as perfectly offset by a loss to another area resulting in no net impact. This view ignores distributional consequences relating to the marginal differences in

impacts between different types of activities occuring within the same region. While certainly less significant than entirely new economic activities introduced to a region, changes in economic activity within a region are not the same as economic leakages out of a region. Thus, for example, while more recreation in Michigan by Michigan residents may amount to a loss in other parts of the Michigan economy, the new recreation impacts are not likely to exactly equal reduced impacts elsewhere from the change in spending habits. It is unrealistic to believe they exactly cancel each other out. To contend the impacts are identical is paramount to believing there is no difference in sectoral multipliers. This would, in turn, eliminate much of the justification for differentiating between economic sectors and industrial targeting programs.

Additionally, some recreation expenditures within the region by the region's residents may be a form of import substitution if they take the place of recreation expenditures outside the region. However, accurately differentiating such expenditures would be difficult for it would involve measuring incomes, costs, and preferences over time.

It would be difficult to measure marginal differences in impacts from residents of a region engaging in more regional recreation and less of other activities. A primary problem with such measurement would be to identify the economic sectors of the economy which "lose" from more regional recreation expenditures. Several alternative situations exist. Again using Michigan as an example, any additional Michigan recreation-related expenditure that occurs exclusively in place of out-of-state recreation spending is pure economic gain to the state. From the perspective of the state, it would be legitimate to count any impacts

from such import substitution and resulting "leakage" reduction. However, it is very possible and perhaps likely that some portion of any observed increase in Michigan recreation-related spending takes the place of other spending in Michigan, or comes out of savings. Tradeoffs occur in such cases. A complete description would account for impacts associated with losses in areas and sectors from which the funds are transferred from, and contrast these to gains in areas and sectors benefiting from greater recreation activity.

One possibility for assessing "true" gains from such transfers of spending within a region would be to offset any increase in new recreation spending by an equal amount in other sectors in proportion to typical personal consumption expenditure (pce) patterns. (Savings and taxes could be figured into these too.) This could provide a comparison of economic impacts associated with recreation relative to average or typical consumer expenditure economic impacts. However, this blunt approach measures average differences rather than true marginal changes in consumption expenditures that would likely occur as a result of increased recreation expenditures. Trend studies of personal consumption expenditures and leisure activity, delineated by income classes, might shed better light on the tradeoffs that are made. These might be used to develop weights of sectors likely to experience reductions from additional recreation activity.

c. Comprehensive Impact Analyses

Conducting more comprehensive impact analyses is related to the issue of examining net impacts. Computation of actual local economic impacts stemming from recreation activity should include an analysis of costs, besides recreationists' expenditures. This would foster a better

understanding of impacts and who is affected by them. It might also improve impact projections which would be useful for planning purposes. However, as Keiner (1985) notes, this point is often ignored in many impact studies which address only expenditures of recreationists. There appears to be a lack of appreciation that costs need to be included in order to present a balanced impact assessment. Other reasons that costs are often ignored include funding constraints, study priorities, and factors relating to the nature of the costs.

Millerd and Fischer (1979, p. 248) review secondary benefits and costs that should be taken into consideration when calculating local economic impacts. Their list provides an indication of the complexity a thorough recreation economic impact assessment would entail. The following description of secondary benefits and costs is an elaboration of Millerd and Fischer's list.

Secondary Benefits

1) public expenditures for initial construction, preparation, and operation of recreation facilities; and other public expenditures induced by these (schools, roads, etc.);

2) recreationists' trip-related expenditures (e.g. lodging, meals, travel, etc.);

3) increased private investment due to recreation facilities (stores, motels, roads, cottages, etc. - including construction and operation of these, and their induced impacts). (Note that tourist spending may make the difference between the success or failure of many marginal businesses, especially in more rural areas);

4) external effects from roads/ transportation facilities (better provision of goods and services - for example, the increase in size of a community permitting a large discount store to open, etc.);

5) major equipment purchases: boats, recreational vehicles, etc.

Costs

1) lost income opportunities (for example, to extraction industries -- agriculture, timber, and mining);

2) increased local government expenditures -- medical, fire protection and police services for tourists (however, these may be offset by stimulated nonresident recreation home development and the property taxes these provide);

3) "various external costs" - local residents may substitute other forms of recreation, causing loss of local income opportunities;

4) price effects on goods and services locally (higher mark-ups on goods during tourist seasons tend to apply to local residents as well) - also possible substitution of imported goods in place of locally produced goods (locally produced crafts replaced by imported crafts).

5) environmental costs from recreational use of local environmental resources. These range from litter through soil erosion and noise pollution. Some of these costs may be obvious and have explicit market transactions associated with them; others may not be very discernible nor have any readily apparent monetary values.

The level of analysis detail described above and by Millerd and Fischer is seldom approached in outdoor recreation or other resource economic impact studies. It would require multiple data sources and tools of analysis; an input-output table alone would not be sufficient. The list (and similar ones like it) may serve as an ideal to strive for and provides public agencies with reminders of impact considerations.

Heroic assumptions are often necessary to complete such comprehensive profiles of recreation economic impacts. The value of some recreation variables may never be unambiguously determined if they relate to goods which have joint production costs, are nonexclusionary, or otherwise are produced, traded or consumed in conditions which violate the perfect competition model. Conditions necessary to achieve perfect competition have been enumerated in many different ways. Broader descriptions sometimes refer to well-defined, enforceable property rights, the absence of market barriers, and the absence of Second Best

conditions. At a minimum, most lists include perfect information; many rational buyers and sellers operating as price takers; perfectly mobile factors of production and homogenous, perfectly divisible goods.

In the case of joint production costs, the same factors are used for producing multiple goods. This makes it impossible to objectively allocate the costs for producing the goods. The problem is compounded by the goods often being produced at the same time and by indivisible factors (such as often associated with fixed costs). Nonexclusionary goods or services are those from which, due to prohibitive costs or simply the practical impossiblity, persons cannot be excluded. In such cases, persons who benefit cannot be made to pay for their use of a good or service. Outdoor recreation often involves such goods and services. Examples include scenic vistas, appreciation of the presence of wildlife, and multiple uses of waterways such as for fishing, boating, and swimming.

Durable recreation equipment and public costs of providing for recreation experiences are examples of difficult-to-measure variables that affect outdoor recreation impact estimates. As an analog to joint production costs, the economic impact measurement problem with durable recreation equipment might be viewed as joint consumption (purchase) benefits. Such equipment is often used in multiple regions and sometimes even for nonrecreational purposes. Some analysts have elected to include a percentage of the equipment's costs in their impact studies, based on the percentage of recreation trips made to a region or amount of time the equipment is used in a region. However, such approaches are usually quite arbitrary and may be improper depending on a study's objectives.

A few examples will illustrate the influence of a study's objectives on the appropriateness of different techniques for measuring the value of, or impacts from, recreation equipment expenditures. If the analyst is projecting changes in recreation impacts, marginal impacts may well involve a different pattern of durable equipment expenditures than the existing average pattern. Change in recreation activity patterns involve not only a change in the types of equipment used, but also a change in use intensity of recreation equipment. The intensity-of-use issue relates to whether new equipment, used equipment, leased equipment, borrowed, or existing (already owned) equipment will be used. Projected changes in equipment purchases should take these alternatives into account, if durable equipment purchases are an important part of the analysis.

The size of the tourism-recreation industry in a particular region may be defined to include all local durable recreation equipment sales, whether the equipment is used in the region or not. Alternatively, if the objective is to measure the influence of a state's tourism promotion campaign, it may be important to attempt to isolate the proportion of recreation equipment sales to nonresidents only. Again, the appropriate point of view can only be defined in light of a study's objectives.

In addition to the difficulty between allocating public costs of providing for recreation experiences between residents and nonresidents and recreation and nonrecreation purposes, public costs are multifarious. The more obvious costs to include in impact studies are those related to constructing and maintaining recreation facilities. Roads, sewers, fire and police protection in surrounding areas also are necessary for the provision of recreational experiences. Less obvious

are other public functions performed at the state and local levels which affect the recreation experience. For example, these include, but are not limited to, many aspects of planning and management that occurs within state bureaucracies that address natural resource, commerce, transportation, energy, and environmental concerns. Portions of office budgets for these state bureaucracies, including administrative and support staff salaries, reflect costs created by a desire to generate and monitor recreation activity.

Public costs for recreation are not substantially different from public costs for other activities. For example, there are substantial infrastructure costs associated with maintaining agricultural activity in rural areas, not to mention agriculture extension and other agriculture-related government personnel costs. In a similar sense, the activities and associated costs of a state's commerce department may be partly responsible for the expansion of economic activity in a particular industrial sector. Whether public costs for recreation are substantially greater, more diverse, or qualitatively different from public costs associated with other forms of economic activity is not as important as attempting to identify them and linking them to measured benefits.

Federal recreation expenditures are generally perceived as an inflow of funds and a pure gain at the regional level. Taxes (or federal budget deficit) required for the funds are ignored (due again, in part, to the joint production-allocation of costs problem). State expenditures may often similarly be viewed as an inflow of funds for substate regions.

Study Premises and Assumptions Regarding the Influences of Variables on Impact Estimates

This research examines the variability of economic impact estimates associated with outdoor recreation expenditures. Different data and methods are two primary causes of variability in outdoor recreation economic impact estimates. Data used differ in terms of: 1) the degree to which they can be unambiguously defined or quantified, and their accessibility and ease of manipulation, and 2) perhaps more importantly, their influence on results, in this case, the magnitude of the impact estimates. The same type of data may well vary over space, activity, or time. Different methods and models may also be employed to derive impact estimates. The choices made as to which data, methods, or models are used in impact studies are also influenced by the study's objectives, funding, and expertise of the researchers.

There are economic impact variables whose values could be accurately determined if enough effort is devoted to the task. Variables which fall into this category include industry output, the number of affected employees and their wages, industry-specific deflators, producer margins, and trade. Even with these variables, however, aggregation errors and other types of measurement error not subject to statistical analysis (unlike sampling error which can be estimated by statistical analysis) may occur.

The premises guiding this research are that: 1) sources of high variability in outdoor recreation impact estimates exist and can be identified, 2) it is possible to assess the consistency of this variability and the ease in using ranges of these variables in a sensitivity analysis of impact results, and 3) impact estimates may be

refined by efficiently utilizing information displayed by patterns of differences in impact estimates.

More specifically, in the case of outdoor recreation economic impacts, it is assumed that:

1) a source of variability in existing estimates of economic impacts stems from differences in definitions (and, hence, sectoral aggregations) used to classify and measure outdoor recreation. This variability stems not only from what activities to count as outdoor recreation, but also from what spending is considered (e.g. residents or nonresidents only, trip expenditures only or durable equipment purchases too, and costs of providing for the recreation experience).

2) Alternative producer margins and deflators used to convert recreation participation and spending information into input data for an input-output model will generate results which will vary by less than a factor of one from each other. This occurs because alternative producer margins and deflator values fall within a narrow range. Producer shares are generally in the range of 50 to 100% of purchaser prices. Deflators similarly will be expected to fall within 50% of each other, unless the deflation takes place over several decades or is for a period of high inflation like the 1970s. (For this study, the deflators used only cover the period 1982-1985). However, checking and improving the precision of margins and deflators used may be accomplished with relative ease. Substituting more precise margins and deflators to achieve even slight impact precision improvements may prove to be an efficient use of time in impact analysis.

3) The magnitude of RPCs and the nature of the sectorization scheme will generally tend to have larger influences on impact estimates than

deflators or margins. However, the influence of RPC trade estimates and errors due to very aggregated sectorization schemes are less tractable in terms of their effect on impact estimates. The extent to which they differ from the "ideal" ("true" values in the case of RPCs and fully disaggregated schemes in the case of sectorization) will influence their relative magnitude of influence on impact estimates. RPCs, in particular, can be expected to have inconsistent, but potentially large influences (greater than a factor of one) on impact estimates. This supposition is made on the basis of the author's research for the 1987 Lake States Governors' Conference on Forestry (Pedersen and Chappelle, 1988). Also, RPCs are used to convert matrices of intermediate demands (in addition to final demands). This is in contrast to deflators and margins being used to convert a vector of final demands only (representing spending distributed across I-O sectors); they are exogenous in a demand-driven model. Therefore, RPCs influence calculations of indirect and induced impact components, whereas deflators and margins do not. In other words, errors in RPC estimation may be viewed as subject to being compounded by the multiplier effect.

Study Objectives

Refining allocations of recreation spending to input-output sectors and examination of IMPLAN's trade estimates are primary objectives of this dissertation research. Special attention will be devoted to the issue of RPC trade estimates, as they affect all IMPLAN models used to generate economic impacts, whether the impacts relate to outdoor recreation or any other economic activity. Also, because of its applicability as a case study, a detailed description will be presented

of the steps followed in preparing 1985 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation data for use with IMPLAN.

Evidence that the trade estimates in the IMPLAN modeling system can be significantly improved and the development of an detailed bridge for allocating recreation spending to IMPLAN sectors are two major products of this research. The study also has implications for several other issues, including: how variability in participation and spending profiles across recreation studies affects resulting impact measurements; how sensitive economic impact estimates are to certain types of errors; where the greatest gaps in data occur; and where improvements in data collection could be made.

The study utilized only secondary sources of data to develop alternative trade estimates and outdoor recreation economic impacts. The only trivial exception to this is subjective opinions obtained from Michigan State University Parks and Recreation Resources Department faculty on minor questions regarding the likely nature of certain types of recreation spending.

Other secondary objectives and steps followed in the process of achieving the study's objectives are as follows:

1) Document problems with RPCs generated by version 2.0 of IMPLAN. Construct alternative RPCs from a "corrected" 1977 Multi-Regional Input-Output (MRIO) accounts database and contrast these with IMPLAN. This comparison will have the purpose of demonstrating that IMPLAN's trade and impact estimates can be improved if this alternative database is used to re-estimate RPCs for the modeling system.

2) Compile 1985 upper Lake State data on fishing, hunting, and wildlife-associated recreation activity and spending. Most recreation

participation data used for the 1987 Governors' Conference on Forestry (Pedersen and Chappelle, 1987) came from Michigan, Minnesota, and Wisconsin State Comprehensive Outdoor Recreation Plans (SCORP) reports. These data were combined with spending profiles from Minnesota to calculate total regional recreation spending. These spending data are contrasted to similar spending estimates generated from the U.S. Department of the Interior, Fish and Wildlife Service's 1985 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.

3) Compile alternative spending profiles. Recreation spending categories are bridged to IMPLAN sectors. This process consists of disaggregating much of the data and converting them to producer prices to conform with the I-O accounting format. They are then deflated to 1982 values and serve as vectors of recreation final demands for use with alternative Lake State IMPLAN models. A range of spending profiles are constructed, reflecting published statistical information and consideration of different types of expenditures. Low and high estimates of spending are developed for trip expenditures only, all spending including durable equipment, all spending except durable equipment, all recreationists, and nonresidents only. These estimates take into account sampling errors only. Additional nonsampling errors which could compound problems associated with sampling errors are usually not directly measureable. They are not addressed in this study.

4) Construct alternative IMPLAN models. The Lake State models will reflect different sectorization schemes and trade estimation assumptions. Alternative sectorization schemes allow one to measure the influence of aggregation error on estimated impacts. Models for the Lake State region (Michigan, Minnesota, and Wisconsin) are the primary focus

of the analysis. Models of the three individual Lake States and several counties in Michigan (Kalamazoo, Kent, and Ottawa) serve to test the general applicability of observations regarding IMPLAN's RPCs.

5) Estimate recreation economic impacts, using the final demands derived in step 3 with type I and type III multipliers derived from the Lake State IMPLAN models. Compile total output, personal income and employment economic impacts.

6) Contrast estimates of total economic impacts. Variables examined include activity participation, spending patterns, and I-O model sectorization schemes, producer margins, and trade estimates. The objective is to measure the reliability of existing recreation and I-O model data, construct a range of estimates in which actual (real world) values likely exist, and derive a corresponding range of economic impacts. (True statistical confidence intervals for the recreation economic impacts cannot be constructed as they represent a synthesis of multiple sources of data without known probability functions).

7) Report results, consisting of:

a) comparisons between alternative sets of activity estimates, spending profiles, margins, sectorization schemes, and RPCs,

b) summary descriptions of resulting changes in multiplier-based impacts from the use of different values for these variables;

b) estimates of economic activity associated with particular definitions of outdoor recreation in the Upper Lake States. Attention to alternative outdoor recreation definitions must be given, as this study relies on two alternative secondary data sources with different delineations of recreation regions and activities.

CHAPTER II

INPUT-OUTPUT ANALYSIS & IMPLAN

Introduction

This chapter presents background material on input-output analysis and the USDA Forest Service's input-output model, IMPLAN. For a good reference text on I-O, see Miller and Blair, Input-Output Analysis: Foundations and Extensions (Prentice-Hall, Inc., 1985). Major publications on IMPLAN include the IMPLAN User's Guide and Analysis Guide (U.S. Department of Agriculture, 1983 and 1985, respectively), More current IMPLAN materials may be available from the IMPLAN Development and Applications Group, Agricultural and Applied Economics Department, University of Minnesota, St. Paul, Minnesota.

Input-Output Analysis

Input-output analysis (I-O) was developed by Wassily Leontief in the United States during the 1930s. I-O can be used to measure effects felt throughout an economy when output of one or more sectors (industries) are increased or decreased. More precisely, this impact analysis tool allows for computation of direct, indirect, and induced effects associated with changes in final demand on an industry-by-industry basis. Final demands refer to consumption sectors of the economy and include government and household institutions and investment, inventory, and export accounts. They involve transactions after which there is no further processing within the region.

I-O tables are mathematical representations of economies. Through a system of linear equations, they serve as both accounting frameworks and impact analysis tools. Sales (receipts) of industries are recorded

across rows while purchases (expenditures) are recorded down columns. Sales are divided into intermediate and final demands, while purchases are divided into intermediate and final payment categories.

Although different symbols are sometimes used, these relationships are often depicted by the following notations: i-ith row sector, j-jth column sector, n-number of sectors in model; X_i-total output (sales) of sector i, X_j-total outlays (purchases) of sector j; x_{ij} is the output of sector i purchased by sector j; Y_i-final demands of sector i, consisting of C_i (personal consumption), I_i (here, investment, including inventories), G_i (government purchases), and E_i (exports). Final payment sectors may be depicted by: V_j-total primary inputs (value added and imports) of sector j, consisting of L (personal income or payments to labor), P (property income), T (indirect business taxes), D (depreciation), and M (imports).

Rows of intermediate and final sales (receipts) may be expressed as follows:

$$\sum_{i=1}^{n} (x_{i1} + x_{i2} + \ldots + x_{in} + C_i + I_i + G_i + E_i = \sum_{i=1}^{n} X_i$$

where $$X_i = \sum_{i=1}^{n} \sum_{j=1}^{n} x_{ij} + \sum_{i=1}^{n} Y_i, \text{ and}$$

$$Y_i = \sum_{i=1}^{n} (C_i + I_i + G_i + E_i)$$

Columns of intermediate and final payments (expenditures) may be expressed as follows:

$$\sum_{j=1}^{n} (x_{1j} + x_{2j} + \ldots + x_{nj} + L_i + I_i + G_i + E_i) = \sum_{j=1}^{n} X_j$$

where $$X_j = \sum_{j=1}^{n} \sum_{i=1}^{n} x_{ij} + \sum_{j=1}^{n} V_j, \text{ and}$$

$$V_j = \sum_{j=1}^{n} (L_j + P_j + T_j + D_j + M_j)$$

A helpful accounting feature of an input-output table is that it is balanced; total gross outputs equal total gross outlays. Thus,

$$\sum_{i=1}^{n} X_i = \sum_{j=1}^{n} X_j .$$

The pattern of sector outlays depicted in the columns can be used to derive a set of fixed, linear production functions after all transactions are accounted for and recorded between sectors. The portion of sector j's purchases attributable to sector i is called a technical coefficient and is noted as:

$$a_{ij} = \frac{X_{ij}}{X_j} .$$

The basis for input-output analysis can now be formulated, using the relationships and definitions presented. First, it should be noted that the level of intermediate purchases may be derived by taking the matrix of a_{ij}'s and multiplying them by the vector of total gross outputs, X_i. Dropping the subscripts on vectors to allow for more convenient notation and beginning with the initial condition that total gross outputs are equal to intermediate and final demands, the following manipulations allow total gross output to be derived from knowledge of final demands and technical coefficients:

$$\begin{aligned} X &= AX + Y \\ X - AX &= AX - AX + Y \\ X(I - A) &= Y \\ X &= Y\,(I - A)^{-1} \end{aligned}$$

where I is an identity matrix with ones along its diagonal and zeros elsewhere.

The $(I-A)^{-1}$ matrix is called the Leontief inverse, after the pioneering economist who was in large part responsible for developing input-output analysis. Multiplying the Leontief inverse by a vector of final demands will produce estimates of output levels required throughout all sectors of an economy to exactly meet the final demands.

Subsequently, the output estimates can be used to generate projections of income, employment, value added or other economic variables by using historical information on sectoral ratios of these variables to output.

Nonsurvey I-O: Adaptation of National Coefficients for Regional Models

Several techniques have been developed through the years to avoid the expense associated with constructing a complete survey-based I-O analysis. Most techniques adjust national level I-O coefficients to the region being analyzed. Employment data are often used to make extrapolations from the national to the regional level, despite problems associated with the practice, because of the ready availability and frequent reporting of employment data. Problems with such extrapolations include:

1) regional and temporal productivity differences exist;

2) employment data used are often based on employment for one date (in March for County Business Patterns), thus masking seasonal differences and not necessarily representative of an annual average;

3) different mixes of full and part-time employment are reported for different sectors and exist in different regions, thus making extrapolations to sales (like the issue of productivity) questionable;

4) self-employed persons and certain other categories of workers (owners and administrative personnel) are not reported, underreported, or not reported as working within a particular sector in the same manner as other employees; and,

5) disclosure and aggregation issues, affecting comparisons of any data across regions and the nation, affect employment as well.

Regional scientists are divided in opinion over the efficacy of nonsurvey techniques. The Brucker et al. article (1987) reviews five "ready-made" I-O model systems. The article, and subsequent comments on it, attests to the growing use of nonsurvey I-O models, despite

reservations about their use. Three nonsurvey techniques are briefly described below. See Miller and Blair (1985) or Richardson (1978 and 1985) for a more complete review of the numerous approaches available and perspectives on their performance.

a. Location Quotients

The location quotient (LQ) is generally specified as follows:

$$\frac{e_i^r / e^r}{e_i^n / e^n}$$

where e_i^r = regional employment in sector i

e^r = total regional employment

e_i^n = national employment in sector i

e^n = total national employment

Alternatively, the mathematical equivalent of this is sometimes specified as:

$$\frac{e_i^r / e_i^n}{e^r / e^n}$$

The location quotient for any particular industry indicates the relative share of local employment the industry accounts for vis-a-vis the national industry share of employment. If the industry accounts for a larger share of employment on the regional level than it does on the national level, the LQ_i will be greater than one. Conversely, if the industry comprises a smaller proportionate share of local employment than the national industry share, the LQ_i will be less than one.

Many variants on the use of location quotients to transform national coefficients into regional coeffients have been devised. For the Simple Location Quotient technique, if the $LQ_i \geq 1$, then the a_{ij}'s for the ith industry are used. If the $LQ_i < 1$, then the a_{ij}'s for the

ith industry are adjusted downward by the value of location quotient. The basic idea behind this approach is that imports will have to occur if the industry is not as present on the local level as it is nationally. On the other hand, excess output is assumed to be exported (rather than consumed in intermediate production) if the industry comprises a larger share of local employment than nationally. This follows from interpreting the a_{ij}'s as technical coefficients and the assumption that regional production processes are the same as national production processes.

b. Supply-Demand Pooling

The supply-demand pooling (SDP) (or commodity balance) technique flows from the simple assumption that, given transportation costs, demand will first be met by local production. Simultaneously, sales of regional output will first go to meet local demand. Thus, imports will only occur after local production is exhausted and exports will only occur after local demand is met. The SDP technique is also sometimes termed a net trade approach. Both imports and exports will not be allowed to occur for the same industry, with the balance between local demand and production determining which will take place.

c. Regional Purchase Coefficients

The original regional purchase coefficient (RPC) approach combined Census Transportation data with other secondary data econometrically to derive regional trade estimates. (The 1983 article by Stevens, Treyz, Ehrlich, and Bower, is one of the earliest descriptions of this nonsurvey technique; their approach will be referred to as the STEB approach.) A number of alternative specifications have been used by the

originators of the RPC approach to trade estimation. The changing of the specification for the RPC estimating equation and the resulting changes in estimated RPCs has caused some degree of consternation for REMI model users. On the one hand, it certainly is worthwhile to improve the specifications used, so as to enhance the reliability of the REMI models. On the other hand, it can be embarrassing to not be able to generate consistent forecasts and impact estimates. An emphasis on determining RPCs on the basis of the relationship of regional to national values has remained throughout changes in the RPC specifications. The reduced log-linear form of the RPC equation indicates this emphasis:

$RPC_i^r = b_0 \,/\, (F_j^{r,i}/F_j^{n,i})^{b_j}$;

where $F_j^{r \text{ or } n,i}$ = variable j, for commodity i in r or n

r = region under consideration

n = U.S.

b_0 = a constant

b_j = elasticity of response of RPC_i^r to a change in the ratio of variable j

The first step in the STEB RPC technique involves deriving RPCs for manufacturing industries from the following equation:

$$RPC_i = (X_i^r/D_i^r)\, P_i$$

where X_i^r = the amount of commodity i produced within the region (based on Census of Manufacturers data),

D_i^r = the amount of commodity i demanded within the region (based on BEA I-O data and other demand calculations),

P_i = the amount of commodity i produced within the region that is also shipped locally (based on the Census of Transportation Commodity Survey).

(Note that P_i can be expressed as $X_i^{r,r}/X_i^r$, where $X_i^{r,r}$ represents regional output shipped locally (intraregionally). Substituting this formulation of P_i into the RPC equation, the X_i^r's cancel, leaving $X_i^{r,r}/D_i^r$, the ratio of intraregional shipments to total demand, or RPC.) The derived RPCs are then used as dependent variables in a regression equation from which all other RPCs are derived. Richardson (1985, p.623) notes that the following equation has been used, based on fitting an initial sample set of RPCs:

$$RPC_i = K(w_i^r/w_i^n)^{b1} (e_i^r/e_i^n)^{b2} (W_i^n/V_i^n)^{b3} (LQ_i)^{b4} (A^r/A^n)^{b5} + e$$

where w = wages, e = employment, W = tonnage of shipments, V = value of shipments, A = land area, i is a subscript for industry, e is an error term, and r and n are superscripts for region and nation.

Fitting the equation for 2-digit SIC manufacturing sectors (and adding seven other dummy variables for particular 2-digit SIC sectors), Stevens et al. (1983, p. 279) report significant t-values for all the independent variables in the equation and an R^2 of .679.

IMPLAN

IMPLAN is maintained by the Forest Service at the U.S. Department of Agriculture's Fort Collins Computer Center. The National Environmental Protection Act of 1970 provided the impetus for impact studies. The Rangeland Renewable Resources Planning Act of 1974 and National Forest Managment Act of 1976 provided further incentive for the development of IMPLAN. IMPLAN is an input-output (I-O) model with associated data bases. Input-output analysis can be used to measure effects felt throughout an economy when output of one or more sectors (industries) are increased or decreased. More precisely, this impact analysis tool allows for computation of direct, indirect, and induced

effects associated with changes in final demand on an industry-by-industry basis. Final demands refer to consumption sectors of the economy and include government and household institutions and investment, inventory, and export accounts. They involve transactions after which there is no further processing within the region.

IMPLAN's data base contains a detailed national interindustry table and estimates of final demand, final payments, gross output and employment for each county in the U.S. A data reduction technique (the RAS method, which is an iterative, balancing process) is used to develop state and county estimates of value added and final demand. These data files can be combined with U.S. interindustry data to to form regional input-output models consisting of aggregations of counties and/or states. Appendix A presents a complete listing of IMPLAN's 528 sectors and their corresponding Standard Industrial Classsification (SIC) codes.

The data in version 2.0 of IMPLAN represents 1982 economic relationships. The national interindustry table used in IMPLAN is based on 1977 U.S. input-output tables (U.S. Department of Commerce, 1984) updated to 1982 through the RAS method and related techniques. Use of more current national tables would be desirable to reflect changes that have occurred in the national economy since 1977; however, the 1977 tables are the most current detailed national I-O tables available (through April, 1990).

Miller and Blair (1985, p. 266-316) review evidence regarding the stability of technical coefficients. They interpret the evidence as indicating that, while coefficients change over time, "for aggregate kinds of measures ... the error introduced by using an 'old' table may not be large." (p. 273). Most of the studies cited by Miller and Blair

compared I-O tables that are between four to ten years apart. Nonsurvey models (such as IMPLAN) using the 1977 U.S. I-O tables are facing a gap in excess of twelve years. This larger, more recent time period probably includes greater economic changes than in the smaller period covered by the I-O tables in the comparison studies. Particular sectors have experienced very dramatic changes since 1977 (e.g., computers, service sectors generally, and foreign trade). In this light, Miller and Blair note that larger errors were often found when particular sectors were considered rather than aggregate measures. (p. 273). Thus, a need for a more current set of national tables exists for nonsurvey models such as IMPLAN, depending to some extent on which sectors are involved in its applications. However, IMPLAN and other nonsurvey modelers have little control over when new national I-O tables will be published.

Use of IMPLAN involves running several of the model's modules, including Region, Accounts, Symmetric, Lister, Smash, and Invert. These are described in the IMPLAN User's Guide and Analysis Guide (U.S. Department of Agriculture, 1983 and 1985, respectively). The titles of these modules are not all readily apparent (nor are they important) when operating the pc version of IMPLAN. The different steps allow the user to delineate a region, estimate regional economic activity through combining regional and national data with the use of data reduction techniques, aggregate and name sectors, and derive estimates of multipliers and impacts for the sectors specified.

Numerous descriptions of IMPLAN applications have been published. Two publications of interest here are "Using Socioeconomic Data in the Management of Fishing and Hunting on Public Lands" (Alward et al, 1985)

and "Opportunities for Analyzing the Economic Impacts of Recreation and Tourism Expenditures Using IMPLAN (Alward and Lofting, 1985).

IMPLAN Version 2.0 adaptation of RPC approach

Earlier versions of IMPLAN used the supply-demand pooling approach for trade estimation. Version 2.0 incorporates a modified RPC approach. The IMPLAN adaptation of the RPC approach is described in an unpublished document by Alward and Despotakis (IMPLAN Version 2.0: Data Reduction Methods for Constructing Regional Economic Accounts, no date). Derivation of IMPLAN's RPCs will be described first, followed by a discussion of how the IMPLAN approach differs from the Stevens RPC technique and initial evidence of problems with the IMPLAN RPC values.

a. Derivation of IMPLAN's RPCs

For IMPLAN, the fitted model is given as:

$$\ln(M_i^{nr}/ X_i^{rr}) = b_0 + b_1\ln(w_i^r) + b_2\ln(e_i^r/ e_i^n) + b_3\ln(LQ_i) + b_4\ln(A^r/ A^n) + e$$

where M_i^{nr} = imports into region r from domestic (U.S.) sources,

X_i^{rr} = output produced and consumed in region r

b_0 = a constant (although different intercept terms are used for different sectors, to parallel Stevens, et al.)

w_i^r = wage in region r for industry i

e_i^r/ e_i^n = ratio of region to national employment by industry

LQ_i = the location quotient for industry i

A^r/ A^n = ratio of region r land area to total U.S. land area

e = an error term

A weight-to-value independent variable is not used as unique RPC equations are constructed for each separate commodity sector. Note too, that the lefthand, dependent term is neither the RPC nor the SDR, but rather a region's ratio of domestic imports to output shipped locally.

Also, 1982 data is used for the independent variables, while 1977 MRIO data is used for compiling terms for the lefthand side of the equation.

The RPCs for region r and industry i are then calculated as:

$$RPC_i^r = \frac{1}{1 + M_i^{wr} / X_i^{rr} + M_i^{nr} / X_i^{rr}}$$

where M_i^{wr} = foreign (non-U.S.) imports to the region, and

M_i^{wr} / X_i^{rr} is assumed to be a constant

b. IMPLAN Differences from the Stevens RPC Approach

Two basic differences between the Stevens RPC estimation approach and the approach adopted for the IMPLAN modeling system are the different databases the approaches used to develop RPC values for their initial dependent variables, and the actual dependent variables being estimated. Other differences exist between the two approaches, such as the use of different independent variables, however, most other differences tend to relate to these two differences discussed below. Also, some other differences noted in the Alward and Despotakis paper have been eliminated through evolution in the STEB RPC estimation technique (e.g. foreign trade is accounted for in Treyz and Stevens, 1985).

1. Dependent Variable being estimated

The IMPLAN regression equation actually estimates the natural log of the ratio of domestic trade to intraregional trade, which is a component of a subsequent RPC calculation. The STEB regression equation estimates the natural log of the RPC directly.

2. MRIO vs. Transportation Census

Both databases are of 1977 vintage. The 1977 MRIO data constitute a complete set of U.S. multiregional accounts for the fifty states and the District of Columbia. It is based largely on secondary data, including the Transportation Census, but also numerous other sources that range from readily available to quite obscure. Other than the conversion of this data base from a port-of-entry to a contribution trade orientation, RPC estimates can be derived directly from it for use in a regression equation. (Foreign imports and exports are attributed to the state in which they first are unloaded or loaded in the port-of-entry approach. The contribution approach allocates total national exports and imports according to a state's proportionate share of demand for imports and output for exports.)

STEB needed to use a number of data sources to compile initial RPC sample values. However, most of these data sources are well known governmental data sources that have track records and are published with descriptions of their statistical accuracy. The MRIO database, on the other hand, has not been extensively reviewed. It is known that budgetary constraints prevented some proposed data collection and reconciliation steps from being conducted, and that, as a result, it contains numerous gaps and inconsistencies (Multi-Regional Policy Impact Simulation Project, 1988). Therefore, the Stevens, et al. database is suspected to be more reliable than the original 1977 MRIO database.

There are a number of minor errors in the Alward and Despotakis draft report on IMPLAN's RPCs. These errors may be important because the report is the only documentation on the derivation of IMPLAN's RPCs and much of the report is devoted to critiquing the STEB RPC estimation

technique. For example, it is stated that equation 98 provides a ratio which could be used for comparison purposes with the STEB goodness-of-fit measure; however, the proposed ratio's numerator and denominator are exactly identical, making the ratio equal to one. The statement is made on the following page that, without an additional constraint, "...the estimated RPC may indicate gross imports (underlining added) exceeding the production of a commodity in an application for a particular region." Gross imports may well exceed regional commodity production; an accounting problem arises when gross exports exceed regional commodity production.

Errors also exist in the report's "Appendix A: The Estimation of Regional Gross Trade Flows -- A Literature Survey." One of the more important of these errors is the contention that the STEB approach overestimates RPCs due to the manner in which local demand (D_i) is estimated. It is correctly noted that 1972 BEA U.S. National I-O technical coefficients, incorporating imports, are used by STEB to estimate demand, thus overestimating domestic requirements. This is in line with the conclusion to chapter two in the main text which states, "...the main weakness of the STEB approach is the inconsistency between the definition of RPC and the treatment of foreign trade." However, if D_i is inflated due to the inclusion of imports in the a_{ij}s, then the RPCs are underestimated as D_i appears in the denominator of the RPC equation ($RPC_i = (X_i/D_i)P_i$), and a larger denominator will reduce the RPC value.

The conclusion to the STEB article states that the bias of the RPCs is towards underestimation: "In closing, it should be reiterated that most manufacturing RPCs for most states are somewhat underestimated by

the RPC estimating equation. As previously noted, the 1972 Census of Transportation failed to report shipments moving less than 25 miles. A preponderence of such shipments would be to destinations within the state of origin, so the percent of output shipped within each state is underestimated by an amount that will vary among commodities and states." (p. 284). The authors then note the 1977 Census will include "short shipments" and that future RPC equations will be based on the 1977 data.

Ralston et al. (1986) offer another view on the RPC bias issue. They contend that the use of one RPC for an industry (per row in an I-O table), as is done in the STEB and IMPLAN models, leads to inaccuracies, including possible overestimates of multipliers. However, their evidence is a Delaware I-O model estimated by the supply-demand pooling method.

More generally, Stevens (through RSRI) and REMI have adopted several changes in their approach which eliminate many of the concerns (including those about foreign trade) expressed in the Alward and Despotakis report about the STEB technique (see Treyz and Stevens, 1985). Finally, Alward and Despotakis report that it was assumed non-port states (those without foreign borders) have no foreign import values in the MRIO database. This probably contributed to errors in calculations of IMPLAN RPCs. A review of the "corrected" MRIO data -- and tables prepared from them -- indicates many nonport states have foreign import values.)

c. Evidence of Problems with IMPLAN RPCs

IMPLAN models generated by this author for the states of Michigan, Minnesota, and Wisconsin, a three-state model of these states, and

several Michigan county models, all contained dubious zero-valued RPCs as well as many near-zero RPCs, reducing the size of estimated impacts. The percentage of sectors affected was between ten to thirty. There appeared to be some consistency as to which commodity sectors were affected across the various IMPLAN models. Initial questioning of certain RPC values was on the basis of IMPLAN reporting a zero or near-zero RPC, despite output for the sector being sizeable relative to demand for the sector (as indicated in a large SDP value), and on the basis of comparisons with REMI RPCs.

Nonsurvey Input-Output Analysis Model Validation

Nonsurvey I-O model validation involves three issues: what is to be measured in the validation process, what it is to be measured against, and what measurement tools to use. How to interpret the measurement results could be considered a fourth issue. There is an extensive literature on the subject of nonsurvey I-O accuracy. Over two dozen regional science articles focused on this topic have been published in the last fifteen years. Articles which provide an overview of the work in this area or comment on alternative measurement tools include: Sawyer and Miller (1983); Jensen and McGaurr (1977); Morrison and Smith (1974); Butterfield and Mules (1980); Harrigan, McGilvray, and McNicoll (1981); Round (1983); and Richardson (1985). Comments accompanying the Brucker et al. 1987 article on "ready-made" I-O models also reflect opinions on the topic of nonsurvey I-O accuracy.

A primary choice of what is to be measured has been between cells of technical coefficients versus multipliers (generally output multipliers are used). This choice is related to Jensen's (1980)

distinction between "partitive" and "holistic" accuracy, whereby the former refers to cell-by-cell accuracy and the latter the general accuracy of the table as a whole. Partitive accuracy is much more exacting, while achieving holistic accuracy would more modestly demand that an I-O model merely "represent the size and structure of the economy in general terms" (Jensen, 1980, p. 143). (Jensen goes so far as to note that "Partitive accuracy in regional input-output tables, with existing data sources and research resources, is not an achievable goal." (Ibid., p. 143)).

More recent attention to assessing the accuracy of trade variables, such as the size of imports and exports, or regional purchase coefficients, could presumably be characterized as falling between the extremes of partitive and holistic analysis. Such analysis of only one aspect (trade) of the I-O table is generally conducted on an sector-by-sector basis, rather than cell-by-cell. This is in line with the fact that most nonsurvey methods have applied regional adjustments to national technical coefficients on a row-by-row basis. However, the need for partitive accuracy in trade estimates has been raised by Garhart (1985), Garhart and Giarattani (1987), and Ralston, Hastings, and Brucker (1986). These authors have contended that regional purchase coefficients should be determined on a cell-by-cell basis rather than applied across entire rows.

Theoretically and intuitively their argument has appeal. It is highly unlikely regional demand for a particular commodity will be exactly equal across all sectors in a region, but that is the implication of "rows-only" RPCs applied by IMPLAN and the STEB approach. One reason mitigating against exactly equal RPCs for a particular sector

is linked to aggregation error. Any sector in an I-O table is actually comprised of different, but related entities. Various sectors' purchases from a particular sector are often actually purchases of different products and vary to the degree they are likely to be imported. One place to look for RPC differences is between intermediate demand and final demand sectors, just as there are often differences between goods produced for industrial use versus those for consumption in the home. For example, households purchase pick-up trucks while industrial sectors purchase a variety of other trucks, yet the I-O model may have one aggregated truck sector. Also, the capacity and, therefore, propensity to import differs by buyer (as well as by size of region and other factors). Therefore, I-O sectors will naturally differ to the extent by which their demands are met by local supplies (as reflected in RPCs) for any particular sector.

Garhart (1985) and others have reported simulation and survey results which they interpret as lending support to their position that RPCs should be determined on a cell-by-cell basis. However, their results, to this author, do not appear overly compelling. Significant differences in RPCs across rows have been described, but the effect of these differences on multipliers does not appear to be very dramatic. For example, Garhart and Giarratani (1987) conducted simulations of errors introduced into a survey-based state of Washington I-O model. They report mean absolute percentage errors under fifteen percent in multipliers from using rows-only RPCs instead of cell-by-cell RPCs. I believe accuracy within fifteen percent for measuring total impacts or individual sectoral impacts would generally be adequate for most I-O applications.

IMPLAN software allows the user to change cell-by-cell RPC values. However, the issue of row variation of RPC values is not addressed in this study, as the basis for making cell-by-cell distinctions on a completely secondary basis is lacking and beyond the scope of this research. Further research in this area might involve adjusting the rows-only RPCs to cell-specific values by ad hoc assessments of industry characteristics or possibly using some nature of weights based on secondary data (such as the U.S. Transportation Census).

With regards to what is to be measured in model validation efforts, it also should be noted that attention has seldom focused on evaluating the appropriateness or range of final demands that are used to "drive" the I-O model. There have been many articles written on differences between survey and nonsurvey models but few on the variability of input data which serve as final demands for the models. It is a tenet of this study that model validation for practical I-O applications involves examination of the input data at well as review of the I-O model's accuracy.

Whether the choice has been to measure nonsurvey I-O model technical coefficients, multipliers, or trade variables, the standard against which to measure these has been, with few exceptions, estimates from survey-based models. (The few exceptions involve simulation experiments that have measured the results of introducing varying percentages of change to trade or technical coefficients.) Concerns raised about such comparisons include that survey models are frequently rather aggregated, are out-of-date (approaching several decades in age), and contain data gaps or other sampling errors and problems. Despite

these concerns, most efforts at evaluating nonsurvey methods only compare nonsurvey model values against survey model values.

The approach used here to evaluate IMPLAN's RPCs will assess the reasonableness of RPC values in light of alternative secondary data sources (Census data, for example) and their real world implications. "Reasonableness" will be imputed through both mechanistic means and by economic concepts. (The choice of the term "concepts" here is not arbitrary; most judgment on the RPCs will stem from common sense or have a basis in regional economic principles, but it may be argued that the latter are not well-developed enough to warrant "theory" status.) There are no perfect means to assure RPCs developed from secondary sources will conform precisely with true RPCs; in fact, "true" RPCs cannot ever be known with absolute certainty. However, there are several subjective means available to evaluate the overall reasonableness of RPC estimates. One such means is to compare them within and across regions in conjunction with knowledge of the structure of different types of markets and how regional economies operate. As part of this process, it is helpful to contrast one set of RPCs with RPCs developed through alternative methods or from different data sources. This illuminates the implications of the RPC values and enables judgements as to which RPCs are more tenable both for specific sectors and as a set.

A wide variety of measurement tools have been used to measure the accuracy of nonsurvey methods. A partial list of the more popular of these include the Theil inequality (or information) index, regression analysis, the chi square statistic, and correlation coefficients. Additionally, a number of simple comparison measures have been reported which relate absolute or relative differences between nonsurvey and

survey tables or multipliers. These are variations on simple percentage differences, including such measures as the mean absolute percentage error (sometimes referred to as the average absolute percentage error or "MAPE"), the standardized mean absolute difference (or "SMAD"), and the root mean square error ("RMSE").

Opinions conflict as to which of these comparison measures are most appropriate, or if any of them are viable. For example, Miernyk (1976, p. 49), referring to a set of nonsurvey multipliers versus a set of survey-based multipliers, states "there is no way to statistically test the significance of the differences between the two sets of multipliers." A frequently cited problem in this regard is violations of assumptions necessary for the statistical measures (such as known population distribution frequencies and independent observations). For example, Boster and Martin (1972, p. 40) report results using the Wilcoxon signed-rank test, contending, "In analyses of this type, nonparametric techniques (as in the Schaffer and Chu study) have a clear advantage over parametric techniques." However, Round (1983, p. 202) states, "Unfortunately, the Wilcoxon test is also inappropriate, again because the basic assumptions of the test are violated" (independence between the variates being measured). Similarly, Theil's inequality index is apparently chosen as superior to others by Stevens and Trainer (1980), Park et al. (1981), and Stevens et al. (1986), but rejected by Garhart (1985) because of its questionable interpretation.

Another problem with some statistical tools for measuring nonsurvey I-O accuracy is with zero cell values in I-O tables. There usually are a large number of cell values of zero, particularly in I-O survey tables. These create problems for measures that place such zero

values in a denominator (e.g., the chi square statistic and the standardized mean absolute difference) or that give equal weight to them as to other nonzero cells with the result that measurement of differences are arguably reduced (e.g., regression analysis).

There are at least three reasons to use multiple statistical tools in this type of analysis. The first is, as several authors have noted (Harrigan, McGilvray, and McNicoll, 1980 and 1981; Butterfield and Mules, 1980; and Round, 1983), that there is no one "best" measure for contrasting the differences between two vectors or matrices. A related second reason is that different statistical tools will place an emphasis on different factors (for example, variance versus skewness), thus reporting multiple comparison measures will help avoid bias in the analysis. A third reason is to enhance comparisons with previous results reported in the regional science literature. Formerly a major reason not to use multiple comparison measures is the time involved in developing such measures; however, time is less of a factor with widespread use of computer spreadsheets and inexpensive statistical software. For these reasons, despite the slight redundancy due to similarity in the results from several statistical measures, a number of comparison tools will also be used for this study, specifically for measuring the differences between RPC estimates and the corresponding effects of these differences on multiplier estimates.

Emphasis will be placed on measuring the relative influence of alternative RPCs on total outdoor recreation impact estimates. Measures of the differences in RPCs and multipliers for all economic sectors may not be the same as measures of differences between sectors affected by particular economic activity, such as outdoor recreation. In this

regard, it is important to measure how a model performs in terms of policy or study objectives. The particular objective here is accurate measurement of outdoor recreation economic impacts.

a. Procedures for Evaluating IMPLAN's RPC Values

This thesis devotes a disproportionate amount of space to consideration of IMPLAN's RPCs due to the topical nature of the RPC issue and the opinion expressed frequently in regional science literature (including by Richardson (1985), Stevens and Trainer (1980), and Park et al. (1981)) that trade estimates are critical to the accuracy of I-O models. RPCs can be evaluated on the basis of comparisons with other sets of RPCs and in terms of the RPCs' influence on impact estimates. They can also be evaluated on the basis of related primary or secondary data that provides implications as to what the magnitude of the RPCs should be. These alternative means of evaluation provide different kinds of information regarding RPC reliability, accuracy, and significance. In light of these considerations and the multiple objectives of this thesis, there were four major steps in the analysis of IMPLAN'S RPCs:

1) conduct comparisons across sets of RPCs from different sources (IMPLAN, REMI, MRIO);

2) check consistency of RPCs with well-established sources of data (specifically, 1982 Census and County Business Patterns data) and any available industry-specific studies;

3) measure consistency of RPCs from one source (IMPLAN)
   a) internal consistency across sectors within one region
   b) internal sectoral consistency across regions (states and substate regions); and

4) measure the impact of alternative sets of RPCs on resulting multipliers and estimated outdoor recreation economic impacts.

There are numerous statistical tools which could be used in these four steps, as indicated in the above descriptions of measures used for evaluating nonsurvey methods. For the most part, the analysis will employ relatively simple comparison measures (mean absolute percentage error, the goodness-of-fit measure - R^2, or other standard measures of absolute and relative differences). Exceptions are that the Theil inequality index also is used to measure differences in RPCs and chi square also is used to measure differences in resulting multipliers. These exceptions are made to permit more extensive comparisons to past nonsurvey measurements. Detailed procedures for these steps are described further in the Methods chapter and results are presented in subsequent chapters.

Measurement of Outdoor Recreation Economic Impacts

Economic impacts have been estimated for particular recreation activities, sites, park systems, and states. There have been numerous journal articles on outdoor recreation economic impacts, mostly appearing in the travel and tourism or recreation literature, and at least half a dozen Ph.D dissertations on some aspect of the subject. The approach here is relatively unique, in that it measures how outdoor recreation in the forested areas of a multistate region impacts the entire multistate region.

Studies of outdoor recreation economic impacts using economic base theory or input-output analysis were first conducted in the 1950s. Two of the earliest publications addressing recreation economic impacts remain important texts today: Clawson and Knetsch's Economics of Outdoor Recreation and Tourism and Recreation, by Arthur D. Little, Incorporated. These publications compare the sectoral distribution of

site-specific outdoor recreation spending for nineteen and sixteen different studies, respectively, in addition to reviewing many other dimensions of recreation and associated economic impacts.

At about the same time the Clawson and Knetsch and Little books were being written for a national audience, three books were published which address outdoor recreation economics issues affecting the Lake States. These include The Development of Outdoor Recreation in the Upper Midwest, (Lodge, 1964), Resources and Recreation in the Northern Great Lakes Region (Minnesota Department of Agriculture, no date), and The Economics of Outdoor Recreation in the Upper Midwest (Sielaff, 1963).

Several recent examples of state efforts to develop comprehensive profiles of travel and recreation are available. The Council of State Planning Agencies' report, "The Contribution of Outdoor Recreation to State Economic Development" (Keiner, 1985) reviews a number of these. Holecek (1985) has proposed ongoing monitoring of tourist spending by county in Michigan and for the state as a whole based on extrapolations from lodging sales and use tax data. This approach forms the basis of O'Halloran's 1988 Ph.D. dissertation. Another recent study by Massoud Ahmadi, described in the report, "The Economic Impact of Tourism in Maryland: A Multiregional Analysis," (no date) used the same input-output model (IMPLAN, version 2.0) proposed for use here. Ahmadi's report describes the development of tourist profiles for eight subregions of Maryland as a result of participation in nine recreation activities and use of seven types of accommodations. The IMPLAN-based model developed was a 48-sector, interregional model, linking the eight subregions and a model for the overall state of Maryland.

In recent years, Michigan, Minnesota, and Wisconsin have had increased interest in the economic growth potential of recreation activities within their borders. New studies are being generated and there is more state-sponsored data collection. Two recent reports from Michigan are representative of this trend: Building Michigan's Recreation Future: the 1985-90 Michigan Recreation Plan. Appendix B. Recreation in Michigan: Users, Activity, Programs, and Opportunities (no date) and Travel and Tourism in Michigan: A Statistical Profile (Spotts, editor, 1986). The Recreation Plan was prepared by Michigan's Department of Natural Resources as part of Michigan's 1985 State Comprehensive Outdoor Recreation Plan (SCORP). Travel and Tourism was funded by Michigan's Department of Commerce. Wisconsin and Minnesota also have recent SCORP reports indicating type, frequency, location (state subregions), and other aspects of recreation use. Michigan, Minnesota, and Wisconsin SCORP reports contain recreation data for the early 1980s. The primary advantages to using the SCORPs is that there is some degree of conformity in definitions across the three states' reports and they contain recently compiled information by state agencies.

This author has been involved in two previous research efforts related to estimating outdoor recreation impacts that used IMPLAN in conjunction with recreation data. The first was undertaken as a project for an MSU course, Resource Development 960, Simulation Models in Natural Resource Management. This effort involved using a computer spreadsheet to combine estimates of specific recreational activity spending patterns with sector specific deflators and multipliers for the State of Michigan. The sectoral spending patterns were based on a study

conducted by the Regional Science Research Institute (RSRI) for use with the U.S.D.A. Forest Service's IMPLAN model (version 1.1). (See "Tourism Expenditure Translators for Use in Measuring the Regional Economic Impacts of Recreation on Forest Service Lands" by Benjamin H. Stevens, 1984.) The deflators and multipliers were generated using version 1.1 of the IMPLAN model. The computer spreadsheet allowed the user to estimate recreation economic impacts based on selecting different levels and types of fifteen different outdoor recreation activities. Adjustment in any of the program parameters (deflators, multipliers, and sectoral spending allocation) could also be performed by the model user. A major drawback to the spreadsheet model developed is that recreation participation data for the State of Michigan and most other states are not currently collected in as much detail as the categories developed by RSRI and incorporated in the spreadsheet. This limits the usefulness of the spreadsheet model as a practical tool for planners and decisionmakers.

A second major effort by the author consisted of estimating "wildland" recreation impacts in the upper Lake States for the 1987 Lake States Governors' Conference on Forestry (Pedersen and Chappelle, 1988). Following a literature search for recreation participation and spending data, total recreation spending was computed based largely on participation levels published in SCORP reports and reported spending patterns observed in Minnesota. These were used in conjunction with an IMPLAN (version 2.0) 48-sector model to generate economic impacts.

This analysis of outdoor recreation economic impacts provided a profile of outdoor recreation in the more heavily forested areas of the Lake States. (The estimation process and results are described in

Pedersen, et al, 1989.) However, as with most other recreation studies, there are several limitations to the analysis. Public costs associated with providing the recreation experience were not assessed, as these were not analyzed for the other two forest resource uses (forest products and wood energy) either. Little was done in the course of the analysis to check the consistency of estimates across data sources and overall sensitivity of results. Another concern with the resulting economic impact estimates is the arbitrary nature of the "wildland recreation" definition (both spatially and activity-wise).

A third concern regarding the economic impact estimates stems from the IMPLAN model's initial RPC values. During construction of this model, RPC values were changed for approximately 10% of the original 528 disaggregated sectors. Initially, these fifty-plus sectors, and others as well, had RPC values equal to zero. Changes in RPC estimates were made on the basis of REMI RPC estimates (Treyz, 1986), and subjective assessments regarding the likelihood a sector had an RPC significantly different from zero. Thus, for example, many service sectors with zero RPCs were changed to conform with REMI estimates, while some mining sectors with zero RPCs were left unchanged. As noted in chapter 1, the most troubling zero RPC values were for twelve pulp and paper sectors, which account for the largest share of forest products economic activity in the Lake States.

Economic impacts would have been underestimated if the RPCs for the 50-plus sectors were not changed. It is not known how frequently IMPLAN generates unwarranted zero RPC values, or other RPC values that are significantly at odds with actual real-world RPC values. However, similar sectoral patterns of clearly erroneous RPC estimates were

observed for three individual state models generated at the same time the three-state regional model was constructed. Also, "Table 2. Observed RPCs for States," of Appendix G -- Regional Purchase Coefficients, in the Micro IMPLAN Software Manual (Alward, 1989) reports values for service and government sectors at the state level used in the pc IMPLAN model. A number of the reported RPC values have questionable zero values. If a pattern can be established, then the source of the estimation errors may be more easily identified and ameliorated. At a minimum, IMPLAN users may more readily avoid generating lower impact estimates than are warranted by knowing which particular sectors deserve attention.

Secondary Sources of Recreation Data for Use in Impact Analyses

The National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (Fish and Wildlife Service, U.S. Department of the Interior) is a major source of recreation participation and expenditure data. The 1985 National Survey data will be used in this study and contrasted to SCORP data. Recreation data used in developing National Forest plans for the three states (U. S. Department of Agriculture, Forest Service, unpublished Recreation Information Management System (RIMS) data, no date) was rejected as being too unreliable for the 1987 Governors' Conference on Forestry. The quality of these data appears to differ from one National Forest to another and over time. Another source of information is Public Area Recreation Visitor Surveys (PARVS) data. However, the only nonproprietary published PARVS report as of summer, 1989 is a report of limited relevance to this dissertation, prepared for the TVA (Cordell, et al. 1987). Two other national sources of data are

Charles R. Goeldner's Travel Trends in the United States and Canada (Goeldner, Charles R. and Karen P. Duea, 1984) and Statistics on Outdoor Recreation (Clawson, Marion and Carlton S. Van Doren, editors, 1984). The 1984 edition of Travel Trends is the seventh in a series of informative reports on state travel statistics.

Some additional information is available from states and universities in the form of county level or specific recreation activity studies. Many of the latter are summarized for the state of Michigan in "Travel and Tourism" (Spotts, 1986). MSU's Park and Recreation Resources Department has been involved in a number of specific recreation activity studies, such as research into boating and marinas (Stynes, 1983). Examples of multifaceted, detailed county level reports include "The Economic Impacts of Recreation-Tourism: St. Croix County, Wisconsin" (Rose and Cooper, 1986) and Preliminary Results of Summer, Fall, and Winter (Recreation) Surveys: Tri-County Tourism Research Project (Spotts and Mahoney, 1985).

CHAPTER III

METHODS

Introduction

This chapter describes the variables examined and the methods used to analyze research results presented in chapter 5. Chapter four will present a detailed description of the steps followed to prepare the data and models used in the analysis.

Examination of IMPLAN's Regional Purchase Coefficients

The extent of problems with IMPLAN's RPCs were documented first. Alternative RPCs were subsequently constructed and compared to IMPLAN RPCs. Problems with IMPLAN's RPCs are documented through illustrating their inconsistency and dubious values within regions, across regions, and through comparisons with data both internal and external to IMPLAN. Much of the RPC evaluation relies upon subjective impressions of likely industry and regional trade characteristics. These are guided by regional economic concepts. Also personal communications with individuals familiar with the database used to generate IMPLAN's RPCs have confirmed the database was flawed and likely to generate inappropriate trade values.

Initial Identification of IMPLAN RPC Problems

The consistency of dubious RPC values for particular sectors was examined through the construction of IMPLAN models for three counties in Michigan (Kalamazoo, Kent, and Ottawa), the states of Michigan, Minnesota, and Wisconsin, and a Lake State region model consisting of these three states. Confirmation of a pattern of zero or near-zero RPCs,

despite sizeable sector output relative to demand, was made on the basis of visual inspection of RPC estimates for these IMPLAN models.

REMI RPC values were available for comparison purposes for the Kalamazoo County and Michigan models. A correlation analysis was conducted between REMI's and IMPLAN's Michigan RPCs. This analysis indicates the extent of correlation between the two sets of RPCs for various groupings of industries, both with and without suspect zero value IMPLAN RPCs. The groupings include major (SIC 1-digit) industries and all industries for which RPCs were available. The goodness-of-fit measure (R^2) was used to establish overall patterns in the comparability and consistency between the REMI and IMPLAN RPCs. Although evaluation of the goodness-of-fit measure is subjective, this author would interpret R^2 values above 0.5 as indicating relatively good correlations between the sets of RPCs and R^2 values below 0.25 as indicating little correlation. As it turned out, no R^2 values exceeded 0.25, as indicated by Table 5, page 118, and the discussion of the correlation analysis in chapter five.

Development and Comparison of Alternative RPCs

Miernyk (1976) and others have argued against overreliance on mechanical nonsurvey I-O techniques. In their development of the RPC technique, Treyz and Stevens considered other approaches but adopted a "subjective" approach for estimating RPCs for non-manufacturing industries (Treyz and Stevens, 1985). 1977 Census of Transportation data, upon which their RPC estimation technique for manufactured goods relies, were only reported for manufactured goods.

More recently, Jensen (1988) and others have focused attention on "holistic" descriptions of economies using input-output tables. These

authors have contended that certain economic structures are predictable across regions, based on comparisons of different regions' I-O tables. Of particular relevance for the analysis of RPCs here is their finding that tertiary activities tend to be found across all regional economies and appear to be fundamentally universal in economic structures. If this is the case, then service sectors and their RPCs should be fairly uniform.

Four approaches were considered which could generate more informed (yet still subjective) judgments regarding the parameters of RPCs. These four approaches would utilize sources of data other than REMI or IMPLAN. For example, it was thought that state tax data might possibly differentiate between in-state and out-of-state sales, such that estimates of exports (both domestic and foreign) on an industry basis could be derived. However, initial investigations indicated this "backdoor" approach to calculating RPCs probably would not be productive, at least in the case of Michigan. Sales and use taxes are not always attributed to the industry selling the product, but rather are sometimes reported by and attributed to the industry buying the product. According to Treasury Department officials, there are no tax records that reflect the level of sales or exports in any kind of systematic fashion across industries. Thus, sales or export extrapolations from Michigan Treasury Department tax records would be highly unreliable.

Another approach examined whether the problem could be with output estimates rather than strictly the RPC estimation. This approach contrasts IMPLAN and REMI estimates of output by sector with published 1982 Census and County Business Pattern (CBP) data. 1982 Census data was

not available in time for use in the 1987 Governors' Conference on Forestry study. Had the 1982 Census data been available, it would have permitted identification of the source and resolution of some REMI and IMPLAN RPC discrepancies.

Use of Census and CBP data may establish on an industry-by-industry basis whether the source of RPC inconsistencies between IMPLAN and REMI stems from RPC estimation alone or arises largely from constraints imposed by REMI or IMPLAN estimates of supply. Differences in RPC values may be due to dramatic differences between REMI and IMPLAN output or demand estimates. This can be seen by recognizing total regional output for a sector, X_i^r, is the ceiling value for intraregional trade, $X_i^{r,r}$. (Sales of local production to local demand cannot exceed local production sales.) In turn, by definition, the supply-demand ratio (SDR) functions as a ceiling value for the RPC. In this light, it would not be surprising if REMI and IMPLAN RPC estimates differ significantly if their estimates of output are dramatically different.

Preliminary analyses indicated output estimates did play a role in the discrepancies between the two sets of RPCs for certain sectors. However, interpreting which output estimate was more accurate remained a problem due to aggregation and disclosure issues. This can be illustrated through a specific example, REMI and IMPLAN RPCs for water supply (SIC 494) and sanitary services (SIC 495).

The 1983 REMI Michigan RPC for a "Water Supply and Sewer Systems" sector was 0.03. This RPC value is constrained by a REMI estimate of the supply to demand ratio (SDR) for this sector being equal to .03. With demand being estimated at $75 million, this implies supply must be equal to approximately $2.25 million (=.03 x $75 million). IMPLAN estimates

for what appears to be the same Michigan sector (#459, Water Supply and Sewerage Systems") are $442.245 million for demand, $365.32 for output, and an RPC of .6157, implying $272.29 million of demand is met by local production. Obviously, one or both of the output estimates ($2.25 million and $365.32 million) are grossly inaccurate (as may be the demand and RPC estimates).

Census data for 1982 does not exist for the Transportation, Communication, and Utilities sectors (industries which fall within the SIC 40-499 codes, which includes water supply and sewer systems); however, 1982 County Business Patterns for the State of Michigan reports employment estimates for these sectors. The CBP estimates between 0 and 19 employees were employed in the water supply sector (SIC 494) and 1,835 persons were employed in the sanitary services sector (SIC 495), based on March 12, 1982 employment records. This does not include administrative and auxiliary personnel of which the CBP reports there were 1521 for all of SIC 40 through 499. Based on the water supply and sanitary service sectors accounting for less than 2% of the other employees (about 1850 of the 131,064 total), it is reasonable to assume between 15 and 150 (roughly 1% to 10%) of these administrative and auxiliary personnel could be associated with the water supply and sanitary services sectors. Therefore, combined employment in the water supply and sanitary services sectors can be approximated to be between 1850 and 2000.

Annual payroll for the 1835 sanitary services employees is reported to be $36.194 million, or very close to $20,000 per employee. Including administrative and auxiliary personnel, and water supply employees would increase this figure slightly, to result in a rounded annual payroll

between $36.5 to $40 million. This payroll range would cast serious doubts upon the REMI production figure of $2.25 million; it is much more in line with IMPLAN's $40 million total income estimate for the water supply and sewer systems sector. However, the 1835 employees and $36.194 million includes all of sanitary services, SIC 495; the CBP data does not breakout sewerage systems, SIC 4952 which is the only portion of sanitary services REMI and IMPLAN include in their water supply and sewer systems sector. It is not readily apparent what portion of the SIC 495 employment or payroll should be attributed to SIC 4952.

REMI and IMPLAN aggregate the remaining portion of sanitary services (that which is not in 4952) with other sectors, including steam supply, (SIC 496), irrigation systems (SIC 497). This becomes the "sanitary services, steam supply, and irrigation systems sector." The additional sectors have four to forty-four employees. REMI's RPC for this sector is .97; IMPLAN's .6157 RPC remains the same as for the water supply and sewer sector.

In this case, the dramatic differences between REMI's RPCs casts doubt upon one or both of them. Consideration of the type of product (water supply and sewer service) associated with the sector also influences the evaluation. The IMPLAN .62 RPC is viewed as much more reasonable than the REMI .03 RPC for the water supply and sewer systems sector, as this author knows of no out-of-state projects responsible for meeting the vast majority of Michigan water and sewer services demand.

If RPC values are imposed by erroneous output estimates operating as constraints on the RPC values, this may constitute a more serious problem for the I-O model than when the RPC value is merely a product of the RPC estimation equation and output estimates appear sound. Other

facets of the model may be affected in those cases where it is found that output is the source of the RPC discrepancy. Multiplier, employment, and income estimates, and related ratios of output per worker, may be more seriously affected. (This has been illustrated with regards to IMPLAN sectors 461 (other wholesale trade) and 462 (recreational related retail trade). IMPLAN users and staff have noted these sectors acquired much lower output and value added estimates in all regional data files during the course of the development of the pc version from the mainframe version. The low values generate very high erroneous multipliers. This analysis avoided the problems by substituting original mainframe values for sectors 461 and 462 in all state data files.)

Census and CBP data were used to develop "best guess" RPC estimates for both Michigan and the Lake States. The data were largely used to provide direction in choosing between alternative, widely divergent RPC estimates. Census and CBP data were taken into consideration more in the formulation of alternative Michigan RPCs than Lake State RPCs due to time constraints and the difficulty of working with three states' data.

A third approach to generate more informed judgment on RPC values was to conduct a search for prior studies on industry trade flows and secondary trade data for specific industries. It was believed reliable information gained for even a few sectors could serve to establish a performance pattern between alternative sets of RPCs. Unfortunately, no industry-specific data was found that could provide reliable trade information.

Examples of important Michigan industries which have been the subject of extensive research include agriculture, forest products, and

automobiles. Michigan agricultural trade estimates were obtained from the Michigan Department of Agriculture and Michigan State University's Agricultural Economics Department. However, these proved to be based on simplifying trade assumptions rather than primary data. The same proved true of forest product industry data.

The Michigan Commerce Department routinely revises REMI RPC estimates for automobile related sectors, based on their data collection and knowledge of the auto industry in Michigan. However, to this author, their revised RPCs appear to be as questionable as the unrevised estimates. Table 2 contrasts unrevised Michigan motor vehicles and equipment sector 1985 REMI RPCs with 1983 REMI RPCs which have been revised by the Michigan Commerce Department:

Table 2. 1983 and 1985 REMI Michigan Motor Vehicles and Equipment RPCs

SIC	Sector	1983	1985
3711	Passenger Motor Vehicles	.93	.44
3713	Truck and Bus Bodies	.41	.48
3714	Motor Vehicle Parts & Accessories	.90	.52
3715	Truck Trailers	.23	.71

The revised 1983 RPC for passenger motor vehicles implies 93% of Michigan demand for passenger motor vehicles was met by Michigan production. This would probably be an overstatement even thirty years ago, let alone today with a larger foreign share of auto sales and auto plants distributed around the U.S. The same skepticism applies to the motor vehicle parts & accessories RPC. (It is noteworthy that the REMI unrevised 1985 RPCs are higher than the 1983 RPCs virtually across all sectors, with the exception of these two motor vehicle RPC values.) The lower truck trailer sector RPC is probably an improvement over the 1985

RPC of .71; one would expect it might be in line with truck and bus bodies (below .5). As there are fewer truck production plants, the RPC for both of these truck sectors may be more easily analyzed by a state commerce department than the other two sectors.

The fourth approach was to closely examine the 1977 MRIO data used as the basis for constructing IMPLAN's RPCs. Alward et al. (1989) report observed MRIO RPCs for service sectors that have been adopted in IMPLAN as state RPCs. These are reported for all fifty states and Washington, D.C. Means and standard deviations were calculated for each sector and each state. These were calculated both with and without zero-RPC values to examine whether problems were associated only with the zero-RPC values, or if problems existed with the remaining RPCs after the zero-RPCs were removed.

"Corrected" MRIO data was obtained for the purposes of examining the IMPLAN RPC estimates. The "corrected" MRIO data was prepared by the Multi-Regional Policy Impact Simulation (MRPIS) project of the Social Welfare Research Institute at Boston College (1988). Due to budget constraints, several gaps and inconsistencies are known to exist with the original 1977 MRIO data prepared by Jack Fawcett Associates for the Office of the Assistant Secretary for Planning and Evaluation, U.S. Department of Health and Human Services (1983). The "corrected" MRIO data represent an effort by personnel at Boston College's Social Welfare Research Institute to eliminate MRIO data inconsistencies and balance the accounts. Adjustments to the MRIO data were made in consultation with the Jack Fawcett Associates staff who collected the original data.

The MRIO data is compressed in seven computer files. It may be decompressed into seven ASCII files, between 2.3 and 3.3 megabytes each,

which contain 1977 use, trade, and make matrices for 50 states and the District of Columbia. The matrices have detail for 124 sectors which have a perfect correspondence, although at a more aggregated level, with IMPLAN sectors. The documentation accompanying the computer files is brief, but adequate. Crosschecks of accounting identities performed with the data have verified its consistency.

The corrected MRIO data presented this study with several possibilities. An obvious task would be to retrace the estimation of the IMPLAN RPCs. Three difficulties prevent this, however. The first problem is that the input data used in the IMPLAN RPC regression equations for the MRIO commodity sectors (84 of the 124) are not available. Coefficients (which apply across all 51 regions) are published for these sectors as are the actual "observed" service sector RPCs, but the input values of the independent and dependent variables are not. Therefore, it would not be known where mistakes occurred in the original RPC estimation process even if the regression equations were re-estimated.

The second issue is that, regardless of the availability of the IMPLAN data, it would require a massive compilation and crosschecking of data to repeat the RPC estimation process. Essentially, it would involve manipulating approximately 10 or more units of data for 124 sectors in 51 regions (the fifty states and Washington, D. C.) (see the discussion of the IMPLAN RPC estimation process in chapter 2).

The third problem is that the RAS procedure has been applied to both IMPLAN and corrected MRIO data, such that it would be difficult if not impossible to retrace exact values. It should be noted, however, that although the RAS procedure may change values, it should not be the

source of grossly conflicting RPC values between IMPLAN and those derived from the corrected MRIO data. For example, the RAS procedure cannot be held as the basis for the difference between RPCs for those service sectors where the corrected MRIO RPC is calculated as close to 1.0 and IMPLAN has a zero value. The RAS procedure may be viewed as a smoothing technique which does not drastically change overall patterns. For example, only minimum necessary modifications are made as the RAS procedure adjusts the A matrix to be in accordance with sectoral sales and purchase sums. (See chapter eight of Miller and Blair (1985) for detail on the RAS procedure). Thus, despite the RAS procedure being used for both sets of RPCs, one would expect there still should be a nonrandom similarity between IMPLAN's RPCs and RPCs calculated on the basis of the corrected MRIO data.

Only limited uses of the corrected MRIO data were undertaken, due to time constraints. RPCs were calculated from the corrected MRIO data for all service sectors for the fifty states and the District of Columbia. The service sector means and standard deviations were compared with the existing IMPLAN service sector RPC estimates. Average state service sector RPC values were used to rank order the states and evaluate the reasonableness of the RPC values.

The multiregional nature of the MRIO data was also utilized to compile new MRIO commodity and service sector RPCs for the three individual Lake States and the Lake States region based on summing Michigan, Minnesota, and Wisconsin intraregional trade and demand data. These were then contrasted visually with IMPLAN RPC estimates to determine if IMPLAN's questionable zero RPCs were present in the corrected MRIO data set. Next, disaggregated IMPLAN and REMI data for

the state of Michigan were aggregated to conform with the MRIO 124 sector scheme and contrasted. The aggregated data included output, demand, imports, exports, and RPCs. Absolute RPC differences and revised MRIO percentage differences from IMPLAN RPCs provide the basis of the contrasts.

Calculation of RPCs from the corrected MRIO data required adopting the contribution assumption towards foreign imports and exports made by Alward and Despotakis in their original IMPLAN RPC formulation. According to the contribution assumption, for each MRIO sector, a share of total U.S. foreign imports and exports are assigned to a region (the three individual states or the Lake States) corresponding to the region's proportional share of national demand (for allocation of imports) and production (for allocation of exports). (In its unaltered state, MRIO foreign imports and exports are attributed to the "port-of-entry" state from which goods or services are shipped from the U.S. or through which goods first enter the U.S.)

One of the issues that can be addressed in this process is whether it is legitimate to assume there are no foreign imports in the MRIO accounts for states which do not have foreign borders. This was assumed in the estimation of IMPLAN's RPCs. Foreign imports were supposedly attributed to states on the basis of their port-of-entry in the MRIO accounts; however, this does not appear to be the case across the board. As noted in the Alward and Despotakis draft paper on the IMPLAN RPC estimation process, after equation 90 (the text does not have numbered pages): "Special consideration was given to states with no foreign borders. For such states the diagonal elements of the MRIOA trade-flow matrices already correspond to $X^{LL}_i : T^{LL}_i = X^{LL}_i$. Furthermore, interstate

flows between pairs of such states did not involve any imports to or exports from the US. Such flows therefore did not change as a result of the rebalancing process." The text following equation 72 makes a similar reference to the assumption that states without foreign borders have no foreign trade in the MRIO data base. However, a review of the corrected MRIO data by this author reveals many states without foreign borders have foreign imports credited to many sectors. The existence of foreign imports influences the size of RPCs. Therefore, the calculation of IMPLAN's RPCs may have been partially distorted by not taking into account foreign trade credited to states without foreign borders.)

Lake State Outdoor Recreation Economic Impacts

The major components of a recreation economic impact estimation process include the identification of:

1) activities (date, type, locality, and quantity) and recreationists (e.g. nonresidents versus residents) to be counted,
2) recreation activity spending, bridged to the appropriate impact model sectors;
3) the appropriate sector-specific deflators and input-output model or multipliers to combine with the spending, in order to generate economic impacts.

The identification of activities and recreationists to be counted should reflect the impact measurement objectives of the study and is done relatively independent of an I-O model, although the quantities estimated of these obviously influence the input data for the I-O model. Data on recreation spending by sector form a bridge between recreation activity surveys and I-O models. However, spending categories included

in surveys are often developed independently of the I-O model and rather aggregated spending categories are frequently used in the interests of survey brevity and achieving higher response rates. This tends to result in mismatches between recreation survey data and the Standard Industrial Classification (SIC)-based sectorization schemes of most I-O models. Thus, for example, surveys may not delineate between food purchased at restaurants and bars versus food purchased at grocery stores. The result of using conflicting classification schemes is that compromises are made to match the survey data to I-O sectors. The consequences of such compromises are largely unexamined and are generally not discussed in the reporting of recreation impacts.

A number of other I-O variables also influence the ultimate impact estimates besides the sectorization scheme and its match with the survey spending categories. These include the deflators used to adjust the input data to the year of the I-O model and the trade estimation, or more broadly, the nonsurvey and reconciliation techniques the model employs. A related concern is how well the model corresponds with other secondary sources of data planners are likely to use.

Variables Examined

Outdoor recreation economic impacts are sensitive to the influence of a large number of variables. Many considerations could be used for selecting which ones are the most important to test in a sensitivity analysis. The basis for selecting variables for this study were:

1) The variables had to be of potential importance in terms of ultimate impact results and of importance with regards to outdoor recreation impact analyses, and

2) The variables had to be either of general topical interest (RPCs) or could be relatively easily incorporated into the study (alternative sectorization schemes).

Two objectives of this analysis are to examine the range of values or alternatives within five sets of variables and to measure the relative influences of the variables on impact estimates. The five sets of variables examined are: recreation activity and spending levels, sectorization schemes, bridging of spending to IMPLAN sectors, and I-O model trade estimates. Much of the discussion and results relating to sectorization schemes, bridging of spending, and I-O model trade estimates apply to I-O analysis generally, although they receive particular attention here in the context of recreation impact analysis.

Consideration was also given to examining the use of alternative deflators. However, the impact of alternative deflators is dependent on the number of years covered; for this analysis it is only three years, from 1985 to 1982. Hence, deflators were not extensively considered and will only be briefly addressed.

The remainder of this chapter describes the approach taken for assessing the five sets of variables and their influence on Lake State outdoor recreation economic impact results. A variety of measurements and test statistics will be used in the analysis. Multiple means of measurement are necessitated by the difference in nature of the sets of variables and because both the range of data for the different variables is being examined as well as their influence on impact estimates. Also, there is a degree of arbitrariness as to which comparison measure to use, as some stress the importance of extreme values, while others stress the degree of variance in the data or other factors. The

statistical measures used in this study are standard measures discussed in most statistics and econometrics textbooks (e.g., Pindyck and Rubinfeld, 2nd edition, 1981).

Generally, relative differences between estimates will be expressed as percentages and unchanged IMPLAN parameters will be the basis for the measurement. A number of summary comparison statistics will be employed for relating differences between RPCs and multipliers. In addition to means and standard deviations, other statistics referred to will include the mean absolute difference, the standardized mean absolute difference, the root mean square error, the correlation coefficient (r), the chi square statistic and Theil's inequality index. Formulas for these summary statistics are as follows:

Mean Absolute Difference (MAD):

where i = 1,2...n and x = variable of interest (RPC, multiplier, etc.)

Standardized Mean Absolute Difference (SMAD): $\frac{1}{n}\sum_{i}^{n} |x_i^* - x_i|$

Root Mean Square Error (RMSE): $\frac{1}{n}\sum_{i}^{n} \left|\frac{x_i^* - x_i}{x_i}\right|$ $\qquad$ $\sqrt{\frac{1}{n}\Sigma (x_i^* - x_i)^2}$

Correlation Coefficient (r): $\frac{COV\ (x_i^*)\ (x_i)}{\sigma^{x^*}\ \sigma^{x}}$

Chi Square (χ): $\frac{\Sigma (x_i^* - x_i)^2}{x_i}$

Theil's Inequality Index (or information coefficient): $\frac{\sqrt{\frac{1}{n}\Sigma (x_i^* - x_i)^2}}{\sqrt{\frac{1}{n}\Sigma (x_i^*)^2} + \sqrt{\frac{1}{n}\Sigma (x_i)^2}}$

The Theil index may be further subdivided into the following "proportions of inequality," which relate the source of differences between two sets of variables:

bias, or U : $\frac{(\bar{x}^* - \bar{x})^2}{\frac{1}{n}\Sigma (x_i^* - x_i)^2}$

variance, or U : $$\frac{(\sigma^{x^*} - \sigma^{x})^2}{\frac{1}{n}\Sigma\,(x_i^* - x_i)^2}$$

covariance proportions, or U : $$\frac{2(1-\rho)\,\sigma^{x^*}\sigma^{*}}{\frac{1}{n}\Sigma\,(x_i^* - x_i)^2}$$

The bias proportion is indicative of the amount of systematic error, as it measures how much mean values of the variables differ from each other. The variance proportion reflects the degree the two variates' variances are similar. The covariance proportion measures any remaining error. These proportions should sum to 1, where the ideal values would be $U_M = 0$, $U_S = 0$, and $U_C = 1$.

The basis for including these is that they are relatively straightforward, well known statistical measures, they address both relative and absolute differences, they avoid bias stemming from reliance on any single comparison measure, and they have been used in regional science literature to contrast nonsurvey trade estimation techniques. The use of these statistical measures does not assume that the variables measured have particular frequency distributions nor that the sets of variables measured are strictly independent.

Activity and Spending Data

The influence of alternative outdoor recreation definitions will be examined in terms of their influence on the size of estimated economic impacts. Outdoor recreation studies employ different definitions and measure different sets of activities, making comparisons difficult and reported impacts somewhat arbitrary. The outdoor recreation analysis for the 1987 Governors' Conference on Forestry was no different in this regard, reflecting fairly unique objectives. It estimated impacts throughout the Lake States from outdoor recreation activity in a

subregion (the more heavily forested area) of the three states. It relied on recreation participation data from state government SCORP reports which use slightly dissimilar recreation classifications. Team sports and attendance at manmade attractions were not included as outdoor recreation activities. It did not include durable equipment expenditures.

The primary analysis relating to recreation activity and spending data here was to measure impacts associated with alternative (restrictive versus inclusive) definitions of spending corresponding to fishing, hunting, and wildlife-associated recreation in the forested areas of the Lake States. The resulting differences in estimated impacts will be contrasted to the earlier Governors' Conference on Forestry estimates.

The level of correspondence in activity and spending patterns across the three states and within their respective forested substate regions will be briefly noted by contrasting the percentages of recreation activity reported in the FHW data. Percentage differences for the activities and spending will be reported.

Participation patterns in various activities such as hunting, fishing, and wildlife observation are expected to be fairly consistent across the forested areas of the three states. (Indeed, assumptions to that effect had to be made to fill in some gaps for the original Governors'Conference analysis.) Climatic and natural resource similarities, and geographic proximity, should promote relatively similar patterns of outdoor recreation. Evaluation of the degree of inconsistency found will be subjective; evaluation of its reasonableness in terms of explanatory variables is beyond the scope of this thesis.

However, differences will be interpreted in light of available sampling statistics. (1985 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (FHW) reports include statistical parameters; SCORP reports generally do not.) The range of activity implied by the statistics plays an important role in determining the range of impacts.

Temporal and Spatial Considerations

Economic impact estimation must address the aggregation of time, space, and activity. Due to gaps in data, estimates for different time periods must often be employed. For example, recreation participation levels and spending patterns often will not coincide with the year on which the economic impact model is based (for the current version (2.0) of IMPLAN it is 1982). Even the use of sector-specific deflators may leave much to be desired in reconciling such data, as deflators are based on U.S. average sectoral inflation. These may differ from state inflation rates for sectors with the same SIC codes, but comprised of a different mix of industries.

The spatial issue is usually fairly straightforward in terms of delineating the region to be studied based on the study's purpose or as specified by research funding sources. However, input-output models for a particular state or region often do not exist (although these are fairly easy to construct for states or collections of counties if there is access to a nonsurvey input-output model such as IMPLAN). Also, many regions, such as national or state forests, do not follow county political boundaries perfectly; therefore, impacts must be extrapolated from models for regions that do not match the region of interest. Additionally, as previously mentioned, different deflators may be appropriate for use in different regional models.

The primary region modelled here exactly follows the regional delineation used for the Governors' Conference, consisting of the states of Michigan, Minnesota, and Wisconsin. In addition, IMPLAN models of other regions were developed to examine the applicability of some of the observations and results from the three-state models. In particular, Michigan IMPLAN models permitted a closer examination of alternative RPCs, subsequent multipliers, and related model validation issues.

Outdoor recreation final demand values should be converted to 1982 values for use with IMPLAN version 2.0. In turn, IMPLAN calculates further direct, indirect and induced impacts generated by the final demands, based on average 1982 economic relationships. Means of testing and evaluating how well IMPLAN's 1982 relationships represent actual relationships for 1982 have been alluded to in the first section of this chapter and will be further described below under the "RPC-based Trade Estimates" section.

Different I-O Sectorization Schemes

The IMPLAN modeling system contains a user-friendly aggregation module which made it convenient to test for the effects of aggregation error. Stevens (1987, p. 19) argues:

> "...it is desirable to maintain the highest possible level of disaggregation in regional I-O model construction if any survey data are to be used. At the same time, there are compelling reasons for avoiding aggregation in nonsurvey models as well because of errors generated in the calculation of impacts from aggregated models in comparison with disaggregated models..."
>
> "...error in the calculation of impacts increases systematically with the level of aggregation of the I-O matrix... ...Furthermore, sectoral aggregation predominately leads to over- rather than underestimation of impacts and multiplier effects. "

The number of economic sectors that will be viewed must be determined before multipliers are derived or values are inserted into IMPLAN. In its most detailed, disaggregated form, IMPLAN could provide information on over 500 economic sectors for the three-state region. However, such level of detail may be cumbersome and is seldom utilized in input-output analysis. The tendency is to illuminate those sectors affected by the subject of interest. Thus, sectors that have little or no relation to the economic activities being studied generally are viewed as less important and are more likely to be aggregated.

The 1987 Governors' Conference input-output study (Pedersen and Chappelle, 1988) delineated 48 sectors. In keeping with the study's objectives, the 48 sectors included a greater representation of forest product sectors relative to most other I-O studies. The same I-O sectorization scheme will be maintained in this study, except that the forest product sectors will be aggregated, resulting in a 31 sector model. In addition, four other sectorization schemes will be be devised and contrasted. One will be a more highly aggregated scheme, involving 16 sectors. This more highly aggregated scheme will also serve as a means to measure the influence of improper (or an absence of) margining.

Another more disaggregated scheme will have close to 150 sectors and provide additional detail on sectors affected by recreation spending. A completely disaggregated model, with over 500 sectors, will reflect the greatest level of detail IMPLAN provides for the Lake States' economy. A fifth model will be intermediate between the 150 and 500 sector models and will contain 308 sectors. Percentage differences between estimated Lake State impacts will be used to contrast multipliers generated by models with alternative sectorization schemes.

Allocation of Survey Spending Data to IMPLAN Sectors

Several outdoor recreation researchers (including Clawson and Knetsch, 1966, Arthur D. Little, 1967, and, more recently, Goeldner and Duea, 1984) have noted a consistent pattern in reported recreation or tourism expenditures (e.g., roughly 25% of spending goes to lodging, 25% to food, 25% to travel expenses, and 25% to other miscellaneous items). Archer (1973, p. 60-61) implies identifying tourist expenditure patterns is hindered by "the wide range and different number of expenditure categories used" in various tourist expenditure studies. He goes on to state, "A more useful picture emerges if the spending pattern in each survey is reduced to four headings: food, lodgings, transport and other purchases." He then cites Clawson and Knetsch and Arthur D. Little studies to support his position.

Consideration was given to constructing a composite "average" spending profile which allocates the bulk of spending to sectors corresponding with lodging, travel expenses, and food. Impact consequences from alternative distributions of the remaining spending for miscellaneous items (approximately 25% of total spending) could be estimated by conducting a sensitivity analysis. The sensitivity analysis would consist of combining the miscellaneous category of spending with high and low multipliers generated by I-O models, thus providing a measurement of the likely range of impacts for spending on miscellaneous items.

This approach was dropped in favor of devoting more time to refining detailed allocations of spending to IMPLAN sectors. One of the problems with the approach is that it may fit relatively well with some tourism expenditure measurement objectives, but it does not address

equipment and a wide range of other types of spending associated with outdoor recreation.

The problem of translating the spending into an I-O model's sector classification remains, even if survey spending only covers food, lodging, transportation, and "other" categories. Publications addressing the so-called "bridging" of spending from survey categories to IMPLAN sectors have previously been handicapped by an absence of data and have lacked precision. The availability of Bureau of Economic Analysis (BEA) detailed personal consumption expenditure worksheets has provided the opportunity to improve upon the precision in existing bridge tables (for example, the "Personal Consumption Expenditure Categories" table, Appendix E of the IMPLAN Analysis Guide). More refined bridge tables of FHW spending categories to IMPLAN sectors are a major project of this dissertation research. Details on the bridging are presented in chapter four and appendices associated with the chapter.

Most I-O tables, including IMPLAN, are based on producer prices with trade and transportation margins allocated to separate accounts. Data from recreation expenditure surveys should be converted from purchaser to producer prices in order to develop correct I-O input data. The influence on impact estimates of not using sector-specific pce data to bridge recreation spending data to IMPLAN sectors will be illustrated with a subset of recreation data. This subset includes most categories of recreation equipment. Differences will be examined between sector allocation of spending using the more aggregated pce I-O category versus more narrowly-defined pce items for the recreation equipment. This will illustrate what the potential influence on impact estimates may be if

the more aggregated pce categories are used rather than the more detailed, sector-specific pce data.

Influence of RPC-Based Trade Estimates

Five different sets of RPC values were substituted into Lake State IMPLAN models. Five sets of aggregation schemes were used for each set of RPCs. In turn, two types of multipliers, reflecting three types of economic variables multipliers (output, personal income, and employment) were generated and subsequently used to contrast the relative influences of the RPCs at different levels of sector aggregation. The same exact process was repeated for the state of Michigan, except six sets of RPCs were used.

Unmodified IMPLAN RPCs (and their corresponding model multipliers) served as the benchmark for statistical comparisons. This is different from most other analyses of nonsurvey techniques which have used a survey or "true" estimates (RPCs or multipliers) as the benchmark. Alternative sets of RPC values to be used include minimum, maximum, unchanged and "best guess" values. A vector of REMI RPCs were used as well for Michigan models. Summary statistics were calculated, including the mean absolute difference, the standardized absolute difference, and chi square statistic, as well as absolute and percentage differences. For purposes of comparison to Stevens et al. (1986), Theil's information index and the root mean square error will also be calculated for the disaggregated RPCs.

CHAPTER IV

PREPARATION OF INPUT DATA AND IMPLAN MODELS

Introduction

This chapter has two purposes. The first is to describe the stages followed in preparing data from the 1985 National Survey of Fishing, Hunting and Wildlife-Associated Recreation (U.S. Department of the Interior, Fish and Wildlife Service, 1988) to be used as inputs for IMPLAN models. The second purpose is to describe the construction of alternative IMPLAN models using the recreation data. The chapter is divided into two major subsections in line with these purposes.

Converting Fishing, Hunting, and Wildlife-Associated Data for Use with IMPLAN

The 1985 National Survey of Fishing, Hunting and Wildlife-Associated Recreation (FHW) contains both participation and spending data associated with fishing, hunting, and nonconsumptive wildlife recreation; the latter refers to the observation, photographing or feeding of wildlife. The 1985 FHW Survey, conducted by the U.S. Bureau of the Census, consisted of an initial telephone screening sample of almost 111,000 households. Subsequently, over 28,000 interviews were completed with fishermen and hunters and in excess of 26,600 interviews were completed with nonconsumptive recreationists (U.S. Department of the Interior, 1988, p. vii). Survey results are published in individual state reports and a national report. Data used in this analysis were from the Michigan, Minnesota, Wisconsin, and national reports.

The FHW Survey has several advantages as a source of data for outdoor recreation economic analysis. It is the seventh in a series of surveys dating back to 1955 and provides detail for all fifty states. This allows for trend analysis and consistency checks of the data. The substate data the survey provides further enhances its applicability and was of critical importance in this analysis. The Survey employs a classification of spending which enables the segmentation and analysis of particular types; for example, trip-related expenditures. Generally speaking, spending categories in the survey are more numerous and detailed than in most recreation surveys. This reduces the amount of error an analyst may make in translating survey spending categories to an impact model's economic sector classification scheme. The Survey differentiates between spending on used and new equipment, and includes durable equipment spending. These are spending categories some recreation surveys do not address. Finally, the presentation of statistical parameters for use with the reported data provides analysts with one means of measuring the reliability of the FHW estimates.

The 1985 FHW Survey also has limitations. It does not report all spending associated with outdoor recreation. The Survey only applies to wildlife-related recreation and does not address other forms of outdoor recreation in the absence of wildlife-related recreation. Examples of activities not covered by the FHW independently of wildlife recreation include skiing, boating for pleasure, and hiking. Another problem is that many FHW spending categories are too vague or general to use directly with an impact model, as will be further explained below in the discussion on disaggregating FHW spending categories.

Sample sizes for a few categories of FHW data are so inadequate that some values are not reported due to reliability problems. This is especially true for substate region estimates. Other reported values based on small sample sizes may be misleading in light of sampling errors associated with them. For example, for some Michigan, Minnesota, and Wisconsin spending data, one standard error's difference from the spending estimate was equivalent to or greater than the estimate itself. (This finding points to the need to utilize the statistical parameters published with the FHW data to gauge its sampling precision.) Also, a few estimates are reported that are highly suspect in light of other estimates. Problems with dubious estimates might not have been detected had this analysis used only one state's FHW data.

The 1985 FHW Survey remains a valuable source of data for measuring recreation impacts despite its limitations. Alternative sources of secondary data on recreation tend to have equal or greater limitations and primary data collection is often prohibitively expensive. Recognition of the FHW Survey as a valuable source of recreation data is indicated in the IMPLAN Analysis Guide (1985, p. 4-15) and by Alward, Sullivan, and Hoekstra (1985).

FHW data was converted into vectors of final demands and combined with IMPLAN multipliers to measure outdoor recreation economic impacts for the upper Lake States. This process will be described in terms of four major stages.

Stage 1: Compile 1985 Recreation Activity Levels for More Heavily Forested Areas of the Lake States

Step 1. Identify the more heavily forested subregions reported in the FHW state reports corresponding to the region analyzed for the 1987 Governors' Conference on Forestry

Individual state reports for Michigan, Minnesota, and Wisconsin of the 1985 National Survey of Fishing, Hunting and Wildlife-Associated Recreation (FHW) were used to construct recreation activity estimates. These state reports contain recreation activity data for subregions of the states in Table 23, "Fishermen and Hunters, Trips, and Days of Participation, by State Wildlife Management Region: 1985." The table provides estimates of resident and nonresident fishing and hunting activity within each state subregion, in terms of numbers of participants, days of participation, and trips. State subregions were identified which closely corresponded to those in the "wildland" region used in the 1987 Governors' Conference on Forestry. The resulting FHW upper Lake State area differed from the recreation region analyzed for the Governors' Conference. These differences stem from the subregions in the FHW being composed of different combinations of counties than those contained in SCORP data which were the basis of the "wildland" regionalization in the original Governors' Conference recreation study.

The differences between the two regions of analysis in terms of counties contained within them are as follows (with 1980 population figures in parentheses):

Additional Counties in the FHW Region

MI: Isabella (54,110), Midland (73,578), and Bay (119,881)

MN: Benton (25,187), Kittson (6,672), Marshall (13,027), Norman (9,379), Pennington (15,258), Polk (34,844), Red Lake (5,471) Sherburne (29,908), and Stearns (108,161)

Counties in the Governors' Conference Region, but not in the FHW Region

WI: Fond Du Lac (88,952), Green Lake (18,370), Marquette (11,672), and Sheboygan (100,935)

Thus, the FHW study area is larger, containing approximately ten percent more land area and population than the Governors' Conference area. FHW recreation activity would, therefore, be expected to be approximately ten percent greater in the area considered in this study.

Step 2. Compile recreation activity data for the identified state subregions and utilize FHW statistical parameters to develop low and high activity estimates

The object of this step was to develop estimates of the proportion of 1985 state recreation activity which took place in the FHW study region. This necessitated compiling FHW data for both the state subregions to be included in the FHW study area and state totals. Statistical parameters for each state from "Appendix B: Sample Design and Statistical Reliability" were used to construct standard errors of the participants, activity days and trips for both the FHW state subregion and each state. Low and high estimates were made on the basis of taking two standard errors from the initial participant, day, and trip data.

Estimates were then summed for the three states. Low and high ratios of the FHW study area totals to the state totals were then constructed. The low ratio values were based on subtracting two standard errors from the FHW study area data and dividing it by the three-state sum data plus two standard errors. The high ratio was formed on the basis of adding two standard errors to the FHW study area data and dividing it by the three-state sum data minus two standard errors. The resulting range of estimates is shown in Table 3, below. This table represents the range of percentages used with state spending data to develop low and high estimates of spending in the FHW study region. Extremely low or negative values for certain cells in the table

reflect small sample size. Data in the table imply that, proportionately fewer trips and days are spent in the study region than average, relative to the number of participants.

Table 3. FHW LAKE STATE STUDY AREA % OF 3 STATE RECREATION ACTIVITY

	PARTICIPANTS			DAYS OF PARTICIPATION			TRIPS		
ACTIVITY	LOW	ORIGINAL ESTIMATE	HIGH	LOW	ORIGINAL ESTIMATE	HIGH	LOW	ORIGINAL ESTIMATE	HIGH
TOTALS: FISHING	61.92%	74.35%	89.06%	32.60%	45.60%	63.37%	27.82%	38.78%	53.73%
HUNTING	59.88%	78.07%	101.34%	32.17%	54.65%	92.08%	28.43%	47.95%	80.36%
RES: FISHING	59.67%	74.07%	91.62%	28.58%	42.43%	62.36%	24.75%	36.63%	53.72%
HUNTING	58.63%	77.41%	101.70%	30.44%	52.62%	90.06%	27.32%	46.88%	79.84%
Big Game	56.41%	75.95%	101.64%	36.65%	63.82%	109.83%	32.27%	54.87%	92.69%
Small Game	40.13%	60.78%	90.16%	21.79%	45.37%	90.20%	20.80%	43.20%	85.75%
Migratory	25.82%	53.31%	103.00%	12.29%	39.61%	110.88%	13.08%	39.76%	107.98%
Other	3.65%	21.10%	64.73%	-1.48%	13.26%	87.51%	-1.22%	11.76%	77.58%
NONRES: FISHING	53.00%	75.09%	105.53%	36.25%	66.35%	118.59%	35.21%	61.46%	105.63%
HUNTING	20.75%	56.58%	144.19%	9.98%	51.49%	246.64%	8.16%	35.66%	144.55%

Stage 2: Estimate Study Area Recreation Spending Totals

Next, statewide spending data was compiled and used in conjunction with the ratios in Table 3 to estimate the amount of recreation spending in the study subregion. Data for this step was drawn from FHW tables 19, "Expenditures in the U.S. by State Residents for Fishing: 1985;" 20, "Expenditures in the U.S. by State Residents for Hunting: 1985;" 21, Expenditures by State Residents for Special and Auxiliary Equipment Purchased Primarily for Fishing or Hunting: 1985;" 22, "In-State Trip-Related Expenditures for Fishing and Hunting: 1985; 30, "Expenditures in the U.S. by State Residents for Nonconsumptive Wildlife-Related Recreation: 1985;" 45, "Trip-Related Expenditures for Fishing, Hunting, and Primary Nonresidential Activities, By State Where Spending Took Place;" and tables in Appendix B: Sample Design and Statistical Reliability.

The following steps were followed to develop spending estimates for the FHW study area:

Step 1. Compile reported statewide estimates for fishing, hunting, and nonconsumptive recreation spending for each state

Data for this step was drawn from FHW tables 19, 20, 21, 22, and 30. For each spending category where it applied, the reported "percent of equipment expenditures for new rather than used items" were used to derive estimates of new equipment purchases. Estimates of the percent of new equipment purchases are not reported for nonconsumptive spending for the U.S. or states. New equipment estimates of 60% for nonconsumptive special equipment and 90% for nonconsumptive auxiliary equipment were adopted, based on the percentages for similar fishing and hunting equipment in the region and U.S. averages. For special and auxiliary equipment, the percentages of new equipment purchases for hunting are 59% and 95%, for fishing they are 64% and 83%, respectively. For the region, fishing and hunting special equipment are reported together as is the auxiliary equipment for the two types of recreation. New special equipment amounted to 50% of total regional special equipment purchases, while 85% of auxiliary equipment purchases were new.

Step 2. Construct low and high estimates of spending

Statistical parameters from Appendix B in the state FHW reports were used to estimate standard errors. In turn, these were used to develop low and high estimates for each spending category reported in the state tables. Low and high estimates were made on the basis of adding and subtracting one standard error from initial spending estimates. The decision to use one standard error here was a relatively arbitrary decision. It was partially predicated on the earlier decision to employ two standard errors for the range of recreation activity. Use

of two standard errors for spending estimates would have generated inappropriate negative low estimates for some spending categories.

Step 3. Estimate the ratios of in-state trip-related spending to resident spending and use these to convert spending estimates to in-state resident and nonresident spending

Detailed expenditure tables for fishing, hunting, and nonconsumptive recreation (tables 19, 20, and 30) include expenditures by residents in other states. Trip-related estimates were adjusted by data contained in tables 22, "In-State Trip-Related Expenditures for Fishing and Hunting: 1985" and table 45, "Trip-Related Expenditures for Fishing, Hunting, and Primary Nonresidential Activities, By State Where Spending Took Place." Due to a lack of data, the assumption was made that all reported equipment expenditures were made within the state of residence.

Step 4. Sum the three states' spending estimates to derive low and high spending estimates for the FHW study region

Statistically, this results in a greater range between low and high estimates than the true range would be for the three state region. This is because standard errors for the three-state region would be based on the sum of the three states' sample sizes, reducing the probable sampling error. However, FHW reports do not present sampling sizes, so standard errors for the three-state region can not be calculated. Adopting the sum of the three states' low and high estimates as the three-state region's estimates may be viewed as a conservative approach to the estimation.

Spending categories were first matched with a ratio of FHW region to total Lake State activity measurement (participation, days, or trips). Thus, for example, equipment and food spending categories were

matched with the ratios of participants, whereas transportation was matched with the ratios for days. This was an attempt to reflect that the categories of spending would be more closely associated with particular types of activity measurement. Transportation could have been linked with the FHW region- to-Lake State trip ratios, however the trip ratios are only slightly lower than the day ratios. The measurement ratios were then multiplied by the three states' summed low and high spending amounts to derive low and high estimates of spending by category for the FHW region.

Nonconsumptive recreation activity is not delineated by substate region in the FHW state surveys. Nonconsumptive spending in the study area was assigned low and high ratios of total three state spending slightly lower than the fishing and hunting ratios. Nonconsumptive recreation activity refers to feeding, photographing, or observing fish, birds or other wildlife. The slightly lower ratios reflect the author's general impression that there is likely to be more nonconsumptive activity outside the FHW region relative to fishing and hunting. This impression is partly based on knowledge of bird, fish and wildlife sanctuaries with the three states, but outside of the FHW region.

Auxiliary and special equipment spending also required an extra step. Lump sum amounts for these two categories appear both in the fishing expenditures table (table 19) and in the hunting expenditures table (table 20). Table 21, "Expenditures by State Residents for Special and Auxiliary Equipment Purchased Primarily for Fishing or Hunting: 1985" further delineates subcategories of spending which fall within auxiliary and special equipment classifications, but the table combines both fishing and hunting expenditures for these types of equipment.

Fishing and hunting spending estimates for the FHW study area were calculated with respect to their separate ratios of activity in the study area to total three-state activity. Low and high amounts for special and auxiliary equipment spending from the separate state estimates of special and auxiliary expenditures for fishing (table 19) and hunting (table 20) were used with FHW study area fishing and hunting participant ratios to weight the FHW study area estimates for these spending categories.

These steps generated a complete set of low and high estimates of 1985 spending associated with resident and nonresident fishing, hunting, and nonconsumptive recreation in the FHW study area. Table 4, "FHW Lake State Study Area Spending Totals," presents this data.

Table 4. FHW Lake State Study Area Spending Totals

	SPENDING CATEGORY	1985 SPENDING ESTIMATES (1985 $)			
		RESIDENTS & NONRESIDENTS		NONRESIDENTS ONLY	
		LOW	HIGH	LOW	HIGH
	TOTAL SPENT	1656137192	4606529506	166681860	453756719
	TRIP-RELATED	780847326	1761962757	166681860	453756719
	food&lodging	457326683	963742975	97784729	242900499
	food	379102799	770519833	79653205	189635349
	lodging	78223883	193223142	18131525	53265150
	transportation	156244689	456017744	38294574	142605518
1	other	5578302	26622643	1413705	10204019
	rental& use fees	28810119	56182109	8723119	17738881
	boat fuel	56092174	105726637	9683197	19032785
	boat maintenance	18248782	48701439	1220628	3396978
	bait	49908306	89470997	7775963	14536675
	ice	8638272	15498212	1785944	3341365
	EQUIPMENT & OTHER	875289865	2844566750		
	guns & rifles	50133145	117295350		
	ammunition	16850942	32745642		
2	other hunting equip	41133645	86426819		
	field glasses	1295999	6165415		
	binoculars	7993398	47309958		
	film & dev.	11662630	63944055		
	other photo equip	10359849	69644146		
	carrying cases and clothing	3067522	19035050		
	bird seed	26427582	142923478		
3	other bird items	4940832	29509077		
4	other noncons equip	4761586	24423050		
	rods	28483013	55381930		
	reels	15147069	30457776		
	lines, hooks,etc.	16963921	30236818		
	lures & flies	25659365	47701426		
	tackle boxes	3130878	6294312		
	creels, nets	390674	735984		
	bait containers	704546	1267743		
	scales & knives	1053558	2168250		
5	other fishing equip	31155186	64759735		
	Licenses	43378888	77834072		
	Stamps,Tags&Permits	6502729	14293593		
	F&H AUXIL EQUIP Total	54980767	149843373		
	Camping Equip	10825992	29830741		
	Foul Weather Gear	5071973	12560638		
	Spec Clothing	22056471	60699838		
	Rubber Boots/Waders	6345510	16195281		
	Equip Maintenance	938077	4386746		
	Fish or Hunt Boots	5117635	13939228		
6	Other Aux Equip	4625110	12230900		

Table 4. (cont'd.)

	SPENDING CATEGORY	RESIDENTS &	NONRESIDENTS
	F&H SPEC EQUIP Total	265050068	959249150
	Boats & Canoes	129217752	389197274
	Boat Accessories	30245150	78929673
	Boat Trailer&Hitch	9968098	41603430
	Travel or Tent Trailer, Pickup, Van, Motor Home, or Cabin	67686868	292177683
	Off-Road Vehicles	25028944	150961533
	Ice Chests	2903255	6379557
7	Magazines,Dues,Leases	152477996	378370350
	Nonconsum Magazines	4128112	21959082
	Nonconsum Membership Fees	3941310	21625035
8	Nonconsum Spec Equip	41676626	330230391
9	Nonconsum Aux Equip	1838029	12735692

Table 4 Notes

1) includes nonconsumptive and hunting expenditures for "equipment rental (boats,camping equipment, etc.) and fees for guides, pack trips, public land use, and private land use."

2) "includes bows, arrows, archery equipment, telescopic sights, decoys and game calls, equipment or game cases or carriers, handloading equipment, hunting dogs, hunting knives, and other unspecified hunting equipment."

3) includes "nest boxes, bird houses, bird feeders, and bird baths"

4) undefined in FHW survey

5) "includes electronic fishing devices (depth finders, fish finders, etc.) rod holders and belts, spear fishing equipment, ice fishing equipment and other unspecified fishing equipment."

6) "Includes binoculars, field glasses, snow shoes and skis, processing and taxidermy costs and other unspecified equipment."

7) "includes magazine subscriptions, membership dues and contributions, and land leasing and ownership" fishing and hunting expenditures.

8) "Includes travel or tent trailers, off-the-road vehicles, pickups, campers or vans, motor homes and other unspecified equipment."

9) "Includes tents, tarps, frame packs and other backpacking equipment, other camping equipment, snowshoes and skis."

Stage 3: Disaggregate Spending Totals for Bridging with IMPLAN

Data on recreation spending by sector form the link between recreation activity surveys and I-O models. It is beneficial for the sake of precision to have spending categories as narrowly defined as the input-output model with which the spending estimates are to be used. This avoids aggregation error. However, survey spending profiles are often developed independently of the I-O model and rather aggregated spending categories are frequently used in the interests of survey brevity and a higher survey response rate. This sometimes results in mismatches between recreation survey data and the Standard Industrial Classification (SIC)-based sectorization schemes of most I-O models. Thus, for example, surveys may not delineate between food purchased at restaurants and bars versus food purchased at grocery stores. The result of using survey classification schemes which do not correspond with impact model classifications is that compromises must be made to match the survey data to I-O sectors. A consequence of such compromises may be impact estimates having poor reliability.

Substantial effort was devoted to bridging FHW spending data to the appropriate IMPLAN sectors. Publications addressing the bridging of recreation spending data to IMPLAN model economic sectors have tended to treat the subject superficially or in a relatively crude fashion. Much like improved RPCs, refinements in bridging of spending data will lead to improvements in both total impact and specific sectoral impact estimates. They may also help improve survey design to meet impact measurement objectives.

While a number of spending categories were adequately disaggregated, most of the spending items as they appeared in the state

reports could not be directly bridged to IMPLAN sectors. Five approaches were taken to further disaggregate the spending. The first consisted of utilizing available local studies. A second technique was to use ratios of spending from the U.S. FHW report which contains more detail than the state reports for certain spending categories. A third approach involved using extrapolations from national averages cited in other sources. A fourth approach involved reviewing the aggregated spending categories with Michigan State University Parks and Recreation Resources Department personnel for expert opinion as to the possible division of items within these categories. Finally, ad hoc judgment was used for some items.

The further disaggregation used the initial spending categories as control totals and subsequently allocated these totals among subcategories of spending items. FHW state and U.S. reports provide indications of what is included in various spending categories. Specifically, these reports contain a number of footnotes elaborating on the items contained in many spending categories. For example, a footnote for the hunting category, "Trip-related Other," indicates the spending in this category includes hunting expenditures for "...equipment rental (boats, camping equipment, etc.) and fees for guides, pack trips, public land use and private land use." In a number of cases, spending for these items could be identified directly in the corresponding national FHW report and their national ratios adopted for the study here.

FHW "food" spending was the major category for which there was substantial regional data that provided guidance as to how it could be further disaggregated. Four regional recreation studies were identified

that divided food between food for off premise consumption (groceries) and food purchased at restaurants and bars (eating and drinking places). The four studies included studies of recreation in three counties of Michigan's upper peninsula (Spotts and Mahoney, 1986), Michigan state parks (Fridgen, et al, 1986), Michigan state forest campgrounds (Nelson, 1988), and the more heavily forested areas of Minnesota (Kelly and Becker, 1985). Transportation was also divided between private automobiles and other forms of transportation (airlines, railroads, and buses) based on the three states' travel data (Gouldner and Duea, 1984).

National averages were used to allocate private transportation spending between automobile repairs and petroleum and oil. These averages were derived from 1977 U.S. Bureau of Economic Analysis (BEA) detailed personal consumption expenditure (pce) worksheets (1984). The difference between 1982 U.S. personal income and personal consumption expenditures was used to allocate lease payments to regional households' personal consumption expenditure. The "FHW Bridge Table" (Appendix F) includes a column, "Basis of Allocation" which spells out the basis for sector allocations of all spending that required further disaggregation from the original FHW spending categorization.

Stage 4: Allocate Spending to IMPLAN Sectors

Step 1. Margining

Most I-O tables, including IMPLAN's, are based on producer prices. Separate I-O economic accounts distinguish trade and transportation margins from producer goods. Margining refers to the process of converting purchaser prices to producer prices through separating the trade and transportation margins and allocating the remainder to

appropriate producer sectors. Data from recreation expenditure surveys must be margined in order to develop correct IMPLAN input data.

Close attention to margining may be very important if an objective is to measure sectoral impacts rather than merely total impacts. A relatively narrow range of multipliers may lead to only a modest difference in total impacts regardless of sector spending allocation. However, there will be dramatic differences in the size of spending for particular sectors -- especially trade sectors -- depending on whether the spending data is properly margined or not.

Margining is also particularly important for any sectors which do not exist in a region being modeled. Spending on items produced by sectors without regional output should still have their margins, representing the proportional amounts of distribution costs, allocated to corresponding regional trade and transportation sectors. In contrast, the producer's share of an expenditure for an item not produced in a region would be considered imported and it would not be included in the measurement of impacts.

It is not perfectly reflective of the real world to allocate all distribution margins to the regional economy in the case of sectors without regional production. For example, the major portion of transportation costs may occur outside of the region. However, the bulk of distribution costs are normally associated with the retail trade sector, and the majority of these costs occur within the region's retail trade industry.

There are numerous other spending allocation considerations. Some service sectors, such as hotels and lodging places and eating and drinking places, do not have trade and transportation margins associated

with them. For these, the recreation spending should be completely allocated to the corresponding sector. Used equipment purchases pose several complications. They do not represent current production and, therefore, no portion of used items should be allocated to the sector corresponding to new production of the equipment. Furthermore, purchases may be made through retail outlets or from other households. If from retail outlets, IMPLAN has specific margins associated with its used and secondhand goods sector which may be appropriate. If the purchase is from other households, the treatment of it should depend on whether the puchase is made by regional residents or nonresidents.

Appendix E of the IMPLAN Version 1.1 Analysis Guide provides national margins for most of 100+ personal consumption expenditure (PCE) I-O categories derived from detailed U.S. Bureau of Economic Analysis (BEA) worksheets. (Appendix B of "Use of IMPLAN with Public Area Recreation Visitor Survey (PARVS) Pretest Data: Findings and Recommendations" (Propst, 1988) contains similar data.)

Computerized files of the detailed BEA worksheets are also available indicating the detailed margins for the 1700+ PCE items within the 100 I-O categories. Use of the margins from the detailed BEA worksheets are too difficult and time consuming to wade through for most IMPLAN users.

The detailed BEA worksheets were utilized to bridge fishing, hunting, and wildlife-associated recreation spending in the FHW study area. The bridging included the process of converting from purchaser to producer prices. The resulting detailed bridging tables and associated computer spreadsheets may prove especially helpful for IMPLAN users measuring recreation impacts based on FHW data. However, the tables may

also be useful for other recreation I-O analyses. They cover a broad range of spending categories, incorporate standard SIC and PCE code numbers and names, and address issues such as used equipment spending.

The two major bridge tables produced are Appendix F: "FHW Bridge Table," and Appendix G: "FHW Used Equipment Sector Allocation Table." There are qualifications to the usefulness of the tables. They have not been extensively reviewed, sector allocations indicated in the tables apply to Lake State FHW recreation spending and may not be appropriate for other regions, and the allocations of FHW spending were sometimes made on the basis of ad hoc judgement with little information. Two examples of the latter include the disaggregation of the FHW spending categories of "camping equipment" and "hunting dogs and associated costs."

Step 2. Develop four different types of spending: trip-related, total, total minus special equipment, and nonresidential

Each of these types of spending contained spending subcategories with low and high estimates. A further distinction was developed on the basis of only allowing for the measurement of nonresidential payments to households. Thus, low and high estimates were further subdivided by a distinction as to whether payments by residents in the region to other residents of the region were counted.

Step 3. Deflate spending

I-O input data and models for different time periods must often be employed because of analysis objectives or gaps in data sets. Recreation participation levels and spending patterns often will not coincide with the year on which the economic impact model is based (for the current version (2.0) of IMPLAN it is 1982). Sometimes analysts have defaulted to using singular price deflators such as the Consumer Price Index (CPI)

to using singular price deflators such as the Consumer Price Index (CPI) to adjust their spending data to I-O models. Such an approach involves aggregation error as different economic sectors often experience significantly different rates of inflation. Prices consumers pay for goods will also vary from one region of the country to another.

A standard set of U.S. Bureau of Labor Statistics (BLS) deflators distributed with IMPLAN materials and often adopted by IMPLAN users covers price trends at a 105-sector level of aggregation (see, for example, Appendix D of the IMPLAN Version 1.1 Analysis Guide). Use of these deflators may still involve significant aggregation error as the IMPLAN model database contains 528 sectors. Of course, the potential error grows as the difference between input data and model year increases.

Sector-specific deflators for manufacturing industries are published in the BLS' monthly Producer Price Index (PPI) journal. The PPI provides up to seven-digit SIC detail which is much more than is required to match the maximum level of disaggregation in the IMPLAN database. These may be available in electronic form from the BLS and may be very easy to substitute for a majority of the more aggregated 105-sector deflators.

Admittedly, even the use of more precise sector-specific deflators may leave much to be desired because they will still be based on average inflation rates for the U.S. These may differ from regional inflation rates for sectors with the same SIC codes because of differences in local conditions from U.S. averages. However, regional deflators are also published by the Federal Government and there may be possibilities to use these in conjunction with more detailed sectoral deflators. In

distributed with the IMPLAN model warrants further attention. The 105-sector BLS deflators distributed with IMPLAN materials were used in this study as it was assumed the deflation of spending from 1985 to IMPLAN's 1982 base year would not introduce substantial aggregation error.

Step 4. Eliminate spending for sectors not in region

Comparisons of the deflated spending vectors were made to the vectors of sectors IMPLAN reported as existing in the three-state region. Spending for sectors which did not exist in the region were subsequently dropped from the analysis. This is equivalent to assuming the producer's share of expenditures for these sectors was wholly imported into the region, and thus had no impact. In contrast, the distributional margins associated with those sectors found in the region were included in the impact measurement.

Step 5. Aggregate spending to match sectorization schemes

The spending was then aggregated according to the five different sectorization schemes described in the next chapter through the use of computer spreadsheets specifically developed for this purpose.

Step 6. Multiply spending by multipliers to derive impact estimates

The final step was to take the alternative low and high estimates for the four types of recreation spending and combine them with the three sets of multipliers (output, personal income, and employment) for each aggregation scheme. This provided FHW recreation economic impact estimates for the forested study area. Chapter five describes the further analysis of these impact estimates in terms of the influences of variables on the size of the estimates.

Construction of Lake State IMPLAN Models

Once the FHW data had been converted to 1982 final demands as described in the steps above, it was used in conjunction with a variety of multipliers derived from alternative Lake State IMPLAN models. The discussion below focuses on how the alternative models were developed based on different sets of regional purchase coefficients (RPCs) and alternative sectorization schemes. The following chapter will contrast the alternative I-O models and present outdoor recreation impact results.

Development of Alternative RPC-Based Trade Estimates

Lake State region IMPLAN models were generated using five different sets of RPCs. These are presented in their entirety in Appendix C: "Alternative Lake State RPCs and RPCs used as Guides for the Estimation of the Lake State RPCs." They are identified as "SDP," "FLRLK," ALTFLK," "BSTLK," and UNCHLK" in the Appendix. Additionally, the Appendix table includes five other sets of RPCs which influenced the construction of the Lake State region RPCs. These other five include two sets of Michigan RPCs (one from IMPLAN and one from REMI), Minnesota and Wisconsin IMPLAN RPCs, and a set of RPCs for the Lake States generated from the corrected MRIO data set. Each set includes 528 RPCs, one for each sector in the fully disaggregated IMPLAN model (including about twenty sectors not present in the Lake State region).

Two of the sets of RPCs are standard IMPLAN outputs and required no significant user changes. One of these was a set of unchanged RPCs (UNCHLK) derived directly from IMPLAN and used without any modification. Another set of RPCs was based on the supply-demand pooling (SDP) trade estimation technique. The SDP values serve as ceiling RPC estimates

(given the levels of IMPLAN-estimated regional demand and output). The other three sets of RPCs required sector-by-sector examination and modification of RPC values.

A set of RPCs representing minimal or floor values (FLRLK) was generated based on adopting the minimum RPC values from among unchanged Michigan, Minnesota, Wisconsin, and Lake State IMPLAN models, a Michigan REMI model and calculated Lake State RPCs based on the corrected MRIO data for the three states. REMI RPC estimates were not available for all 528 sectors and the RPCs were for a different base year (1983 in contrast to 1982). A limitation on the MRIO data is that it is at a 124 sector level of aggregation.

A fourth set of RPCs was developed as an alternative set of floor RPC values (ALTFLK). The intent behind this set of RPCs was to address the questionable nature of many of the zero and near-zero RPC values found in the IMPLAN models. Alternative minimal RPCs were substituted for FLRLK RPCs for approximately fifty sectors; otherwise, the ALTFLRLK vector of RPCs is identical to the FLRLK vector. The substitution was done on the basis of a sector's FLRLK RPC appearing unreasonably low (generally less than .01) in contrast to the majority of other RPCs, especially the REMI, MRIO, and SDP estimates. While the value was selected on an ad hoc basis, the new ALTFLK RPC value adopted tended to be half the SDP value or the lowest RPC from among the remaining nonzero RPCs.

The fifth set of RPCs (BSTLK) represented the author's best judgement as to the probable magnitude of the RPC. This set was constructed on the basis of subjectively weighting the other sets of

RPCs. In a few instances, consideration was also given to 1982 U.S. Census data for the three states in the region.

Different I-O Sectorization Schemes

The five different sets of RPCs were used with five different sector aggregation schemes. One of the schemes involved no aggregation and resulted in Lake State models with 502 sectors. A second aggregation scheme involved an intermediate amount of aggregation resulting in models with 308 sectors. Part of the motivation behind this sectorization scheme was to reduce the total number of sectors to just below IMPLAN's upper limit (310 sectors) whereby the model can invert the Leontief matrix without partitioning it. IMPLAN's inversion routine slows down for models with more than 310 sectors, although by standards of a few years ago, the speed of the inversion is still quite respectable.

Two rules of thumb were followed in aggregating sectors. The first was to aggregate sectors as they appeared in IMPLAN version 1.1 to enable comparisons of recreation impacts with earlier analysis conducted with version 1.1. Aggregation of sectors is generally more viable than disaggregation. Version 1.1 of IMPLAN had 464 sectors whereas version 2.0 has 528. Version 2.0's 528 sectors can be aggregated in a straightforward fashion to identically match version 1.1 sectors. The second rule of thumb was to aggregate only relatively small and similar SIC sectors which did not have any, or only minimal, recreation spending associated with them (mining sectors, for example).

A third aggregation scheme represents the extreme case of aggregating all less important sectors into a "miscellaneous" (or "other") sector. This third sectorization scheme has 159 sectors, 158 of

which are relatively disaggregated. Sectors were first segregated on the basis of whether or not there was recreation spending associated with them. Those that had recreation spending associated with them remained relatively disaggregated. All sectors not associated with recreation spending were aggregated together. The only aggregation for the relatively disaggregated sectors was for the purpose of matching the aggregation scheme of the IMPLAN version 2.0 sectors to the aggregation scheme of version 1.1. The other (159th) sector is "all other". It is an aggregation of 326 sectors which had no recreation spending allocated to them in the 1987 Governors Conference study. The intention behind this aggregation scheme was to examine the issue of what happens when the analyst combines all other sectors together which are not of immediate interest.

The other two sectorization schemes are highly aggregated. One has 31 sectors. This scheme closely approximates a 2-digit SIC delineation which is probably the most common sectorization scheme seen in regional economics literature. It is quite similar to the original Governors' Conference on Forestry model (Pedersen and Chappelle, 1988), except that it lacks sectorization detail for forest product industries. The other aggregation scheme has only sixteen sectors. The major difference between it and the 31 sector model is that most manufacturing sectors and many service sectors have been further aggregated. The exceptions are recreation-related sectors (food, clothing, petroleum, and transportation services). Hotels and Lodging Places (IMPLAN sector 471) and Eating and Drinking Places (IMPLAN sector 491) were left unaggregated for both of these sectorization schemes.

The sector aggregation schemes and sector names for the four aggregated model types are presented in Appendix D: "IMPLAN Aggregation and Sectorization Schemes."

CHAPTER V

RESULTS

Introduction

This chapter describes results of the IMPLAN RPC analysis and subsequent analysis of alternative estimates of Lake State outdoor recreation economic impacts. The RPC analysis will be discussed first, followed by results pertaining to Lake State outdoor recreation economic impacts.

Examination and Documentation of Problems with IMPLAN's RPCs

Concerns regarding IMPLAN's RPCs were first encountered during the construction of a Lake States IMPLAN model (Pedersen and Chappelle, 1988). Between 50 to 60 of the original disaggregated sectors had obviously inappropriate RPC values equal to zero. Initial questioning and subsequent adjustment of RPC values was on the basis of IMPLAN reporting a zero or near-zero RPC, despite output for the sector being sizeable relative to demand for the sector, and on the basis of comparisons with RPCs from REMI models maintained by the three Lake States. Thus, for example, many service sectors with zero RPCs were questioned and subsequently changed, while most mining sectors and some manufacturing sectors with zero RPCs were left unchanged. Also, zero or near-zero RPCs tended to come in clusters and were relatively easy to identify. It was later observed that the basis for the cluster pattern was that IMPLAN's RPCs are initially estimated at a more aggregated level, based on MRIO 124 sector data.

IMPLAN models were subsequently generated for several Michigan counties and the states of Michigan, Minnesota, and Wisconsin. All

models contained dubious zero-valued RPCs as well as many questionable near-zero RPCs, reducing the size of estimated multipliers. For all the models, between ten and thirty percent of sectors with regional output had questionable RPCs at the fully disaggregated level. There appeared to be a high degree of consistency as to which commodity sectors were affected across the various models. Michigan and all Michigan counties had thirteen service sectors (IMPLAN sectors 478 through 490) with RPCs equal to zero, whereas Minnesota and Wisconsin RPCs were all above .5 for the same sectors. Two other categories of sectors had dubious negligible RPCs in all the models, in addition to the commodity sectors listed in Table 1 (p. 17). These were SIC 364, Electric Lighting and Wiring Equipment (including IMPLAN sectors 386, 387 and 388) and SIC 32, Stone and Clay Products (including IMPLAN sectors 257 through 279). Unchanged IMPLAN RPCs for Michigan, Minnesota, and Wisconsin are presented in Appendix C: "Alternative Lake State RPCs and RPCs Used as Guides for the Estimation of Lake State RPCs."

The number of sectors with questionable zero-valued RPCs was higher for the State of Michigan than it was for Michigan counties on an absolute basis. This is because the zero RPC estimates for certain manufacturing sectors at the county level coincided with those sectors not being present in the county, making the zero value the correct RPC value. At the state level, in contrast, the same manufacturing sectors often had substantial levels of output that made a negligible RPC estimate questionable. However, the Michigan county models examined did have a higher percentage (closer to thirty percent) of sectors with questionable zero RPC values than the state (which had between ten and fifteen percent).

This observation provides an indication that IMPLAN's RPC estimation problem may be more serious for substate or small models with relatively few sectors. IMPLAN models may be developed for single or multiple counties, in addition to individual states or multiple states. Smaller regions being modelled with IMPLAN will tend to have more distortion in their trade estimates in terms of the percentage of total model sectors affected. As Jensen (1988) has suggested, service (or "tertiary") sectors appear to be fairly universally found across most economies, large or small. Therefore, service sectors often comprise a greater proportion of the total number of sectors in small economies than in larger economies. Furthermore, RPCs for service industries are generally higher than those for manufactured goods. This reflects demand for service industries often being met by local suppliers in contrast to demand for manufacturing and other goods often being met by production outside a region. Therefore, the magnitude of error for service sectors with zero RPCs is generally greater than manufacturing sectors with zero RPCs.

These problems compound the existing nonsurvey I-O problem of extrapolating from national technical coefficients (the "A" matrix) to the small area economy. Generally, the smaller the region, the less likely the industry mix and production functions will reflect the national average. In sum, if service sector RPCs are in error, these may create worse problems for small economies being modeled than large economies.

A comparison between disaggregated 1983 REMI and IMPLAN (1982) RPCs for the State of Michigan revealed little overall correlation in the pattern of RPCs between these two models. Disaggregated REMI RPCs were

not available for agricultural, construction, or government sectors. The coefficient of multiple determination, R^2, goodness-of-fit measure was used to indicate the amount of correlation between major sector groupings of disaggregated RPCs. The regression results are shown in Table 5.

Table 5. Comparison of IMPLAN and REMI RPC's for Major Sector Groupings

Sectors Correlated	Number of Sectors	R^2
* All	440	.1578
Forestry & Fish Prdcts,& Mining	42	.0218
Mining	38	.0183
Manufacturing	370	.1527
Nondurable Manufacturing	158	.2295
Food & Kindred Products	49	.1900
Durable Manufacturing	206	.1063
Transportation, Communication, and Utilities	14	.0259
Finance, Insur, & Real Estate	7	.0180
Other Services	45	.0598

* "All" does not include agriculture, construction and government sectors, as REMI RPCs were not available for these sectors

The above comparison does not indicate IMPLAN's RPCs are of poor quality, but rather simply that there is little correspondence in the overall consistency between REMI and IMPLAN values. While some inconsistency should be expected in light of the different techniques used to derive their RPCs, the low level of correlation was less than what was expected.

Alward et al. (1989) report observed MRIO RPCs for service sectors that have been adopted by IMPLAN. Commodity sector coefficient values for independent variables in the RPC regression equation are published as well, but not corresponding commodity RPC values. The service sector RPCs are reported for all fifty states and Washington, D.C. Close

inspection indicates most states have two or more MRIO service sectors (corresponding to aggregations of IMPLAN sectors) with RPC estimates of zero. Many of these zero RPCs appear dubious in light of: 1) the same state having RPCs close to or equal to 1.0 for most other service sectors, 2) most other states having RPCs close to or equal to 1.0 for the same sector, and 3) service sectors are usually oriented towards supplying local markets.

A possible alternative to accepting zero RPC values for a particular service sector would be to substitute the average MRIO RPC observed for that sector in other states. This approach would assume the nonzero service sector RPC values are correct and it does not address questionable nonzero RPC values observed for commodity sectors. Also, an analysis of all service sector RPCs has revealed that there are extensive problems with the nonzero values as well. For example, New York has the lowest overall service sector RPCs -- less than half the average value of all other states -- despite the state being an important regional and national center for finance and other services.

It is not known whether the reported zero RPC values are the result of legitimate estimates from the original MRIO data, miscalculations, or data entry errors. In any case, many nonzero service sector RPCs are suspect as well. The questionable nature of the current IMPLAN service sector RPC estimates will be illustrated in tables 6 through 9. The pattern of IMPLAN's average state RPC values that emerges is not what one would expect to actually occur. For example, the economies of New York, Illinois, South Carolina, New Jersey and Indiana have average service sector RPCs less than 0.60, while Minnesota, Wisconsin, California, Nevada, and North Dakota have averages above 0.95. There is

no apparent basis for this pattern in terms of the size of states or their spatial or economic positions relative to surrounding states.

Substituting higher values for the zero RPC service sectors only slightly improves the resulting RPC estimates; a peculiar pattern of RPC values still remains. For example, even after dropping sectors with RPCs equal to zero, New York still has the lowest average service sector RPC. Its average service sector RPC value would remain under 0.37, less than half the average value of all other states.

New RPC estimates were calculated for the service sectors of all fifty U.S. states and Washington D.C. based on corrected MRIO data (see chapter 3, p. 78-81). These are presented as "Revised RPCs" in Table 6. The revised average service sector RPCs for the states have a much smaller standard deviation (0.0361) than the IMPLAN average service sector RPCs (0.1508). Mathematically, the smaller standard deviation for the revised RPC averages stems from there being few zero, near-zero, and unit-value RPCs among the revised service sector RPCs. The narrower range of the revised state service sector RPCs corresponds with observations regarding the similarity of service sector markets across states -- service sector demands are usually met locally.

The revised RPCs also more closely reflect what one would expect from regional economic theory in terms of the magnitude of the average state RPCs relative to each other. This is illustrated by Table 7 which lists the ten states with the lowest and highest revised average service sector RPCs.

Table 6. IMPLAN and Revised State Average Service Sector RPCs and Rankings By State

State	IMPLAN RPC	Rank	Revised RPC	Rank
NY	0.3487	1	0.8299	46
IL	0.4471	2	0.8255	43
SC	0.5468	3	0.7777	19
NJ	0.5497	4	0.7938	27
IN	0.5591	5	0.7635	13
AK	0.5825	6	0.7982	29
WV	0.5905	7	0.7240	2
NC	0.5950	8	0.7992	30
PA	0.5978	9	0.8206	39
OH	0.6070	10	0.7639	15
HI	0.6314	11	0.8044	33
MS	0.6418	12	0.7665	17
AL	0.6421	13	0.7649	16
FL	0.6449	14	0.8242	41
CT	0.6487	15	0.7912	25
MI	0.6666	16	0.7787	20
GA	0.6790	17	0.8310	47
VT	0.6981	18	0.7518	9
UT	0.6981	19	0.8162	37
WA	0.7099	20	0.8077	35
NH	0.7109	21	0.7377	6
AZ	0.7162	22	0.8249	42
AR	0.7283	23	0.7581	12
KY	0.7539	24	0.7526	10
TX	0.7575	25	0.8295	45
OR	0.7681	26	0.7937	26
WY	0.7751	27	0.7277	3
CO	0.7833	28	0.8553	51
NM	0.7843	29	0.7809	22
OK	0.7932	30	0.8213	40
RI	0.8051	31	0.7006	1
ID	0.8271	32	0.7637	14
SD	0.8291	33	0.7301	4
NE	0.8485	34	0.8158	36
LA	0.8671	35	0.7804	21
DC	0.8671	36	0.7463	7
MD	0.8807	37	0.8061	34
TN	0.8860	38	0.8034	31
ME	0.9007	39	0.7556	11
VA	0.9040	40	0.8259	44
KS	0.9124	41	0.8042	32
MA	0.9194	42	0.8178	38
MO	0.9215	43	0.8398	49
DE	0.9280	44	0.7311	5
MT	0.9389	45	0.7828	23
IA	0.9438	46	0.7852	24
MN	0.9511	47	0.8380	48
WI	0.9700	48	0.7735	18
CA	0.9722	49	0.8515	50
NV	1.0000	50	0.7944	28
ND	1.0000	51	0.7492	8
Average:	0.7594		0.7884	
Standard Deviation:	0.1508		0.0361	

Table 7. Ten Lowest and Highest Revised MIRO Average Service Sector RPCs

Lowest Average RPCs			Highest Average RPCs		
Rank	State	RPC	Rank	State	RPC
1	Rhode Island	.7006	42	Arizona	.8249
2	West Virginia	.7240	43	Illinois	.8255
3	Wyoming	.7277	44	Virginia	.8259
4	South Dakota	.7301	45	Texas	.8295
5	Delaware	.7311	46	New York	.8299
6	New Hampshire	.7377	47	Georgia	.8310
7	Washington D.C.	.7463	48	Minnesota	.8380
8	North Dakota	.7492	49	Missouri	.8398
9	Vermont	.7518	50	California	.8515
10	Kentucky	.7526	51	Colorado	.8553

Table 7 illustrates a discernible, logical pattern to the revised RPCs based on the corrected MRIO data. Small revised average service sector RPCs tend to be characteristic of small and/or relatively isolated states, while higher average RPC values tend to be associated with larger and more highly developed state economies that are regionally dominant.

Table 8 illustrates how revised estimates of RPCs based on the corrected MRIO data compare to current IMPLAN estimates for particular service sectors for the states of Michigan, New Jersey, New York, and North Dakota. There are substantial differences between the two sets of RPCs. Table 8 illustrates the severe distortion an analyst might encounter using version 2.0 of IMPLAN to measure tourism or recreation impacts. Note for example that IMPLAN's current New York Hotel and Lodging sector RPC is .182 (see Table 8). This is less than one-fourth of the average for the fifty states and implies that 80% of demand for temporary lodging within the State of New York is met out-of-state. However, despite consistently appearing to be inappropriately on the low side, IMPLAN's New York service sector RPC estimates at least have a pattern compared to New Jersey's service sector RPC estimates. Consider

the transportation and tourism implications of IMPLAN's New Jersey RPCs. Except for private automobiles, IMPLAN's RPCs imply railroads are the only form of transportation New Jersey residents and businesses use. The zero RPCs for MRIO sectors 98 (eating & drinking) and 106 (hotels and lodging) imply state residents never patronize New Jersey restaurants and bars or accomodations.

Table 8. Comparison of Recreation-Related Service Sector RPCs for Michigan, New Jersey, New York, and North Dakota

MRIO		MI RPCs		NJ RPCs		NY RPCs		ND RPCs	
#	SECTOR NAME	IMPLAN	REVISED	IMPLAN	REVISED	IMPLAN	REVISED	IMPLAN	Revised
85	Railroads	0.4440	0.5593	0.9574	0.8362	0.5005	1.0000	1.0000	1.0000
86	Local Transit	0.5506	0.4673	0.0000	0.8000	0.3061	0.7262	1.0000	0.5187
87	Motor Freight	0.3911	1.0000	0.0000	1.0000	0.3574	0.9034	1.0000	0.8477
88	Water Transportation	0.4019	0.6727	0.0000	1.0000	0.3035	1.0000	1.0000	0.0000
89	Air Transportation	0.4228	0.2527	0.0000	0.3496	0.2219	0.4801	1.0000	0.2686
97	Wholesale Trade	0.6044	0.6274	0.2755	0.9704	0.5003	0.9949	1.0000	0.5789
98	Eating & Drinking	0.6020	0.8901	0.0000	0.8084	0.5001	0.8145	1.0000	0.9002
*	RETAIL INDUSTRY (AGGD)	0.5596	0.9500	1.0000	0.9500	0.2404	0.9500	1.0000	0.94
106	Hotels & Lodging	0.6252	0.7232	0.0000	0.5205	0.1822	0.5230	1.0000	0.8000
111	Amusements	1.0000	0.8379	0.0000	0.8500	0.2848	0.8500	1.0000	0.8222
Ave All Service Sectors		0.6666	0.7787	0.5497	0.7938	0.3487	0.8299	1.0000	0.7492
STD DEV	" "	0.2847	0.2095	0.4358	0.2216	0.1431	0.1789	0.0000	0.2571

* revised retail RPCs are based on aggregating four retail sectors

New York and New Jersey are admittedly extreme illustrations of the problems with IMPLAN's current RPCs. However, all IMPLAN models suffer from poor RPC estimation for some sectors. As illustrated by tables 6 through 8 and more extensive analysis conducted for the Lake States, the RPC estimates could be improved by using the corrected MRIO data to re-estimate IMPLAN's RPCs.

How large are the consequences of errors in IMPLAN's RPC estimates on impact estimates? If New York's "true" service sector RPCs are only the average of the other fifty states, then direct service sector

impacts may be estimated by IMPLAN at well under half of what they should be. In other words, more than two-thirds of New York demand for services is probably being met by New York service suppliers, rather than approximately only the one-third share IMPLAN currently estimates. In fact, it is likely that New York's true RPCs are higher than average due to its economic size, diversity, and national importance. The revised average based on the corrected MRIO data (.8299, versus IMPLAN's unadjusted estimate of .3487) is much more in line with these factors.

Indirect effects may be subject to worse distortions as the underestimation (or overestimation as is the case for North Dakota and certain other states) is compounded with multiple rounds of spending. At a minimum, indirect and induced portions of multipliers should be expected to have the same sign and somewhat reflect the average differences between RPCs based on the original MRIO data and the corrected MRIO data. Table 9 provides a contrast of State of Michigan multipliers for recreation-related sectors generated by IMPLAN using the two alternative sets of trade estimates. As expected, the resulting relative differences between revised and unchanged multiplier values displayed in Table 9 reflect differences between IMPLAN and revised Michigan RPCs presented in Table 8. For example, the mean Type III service sector output multiplier for the revised RPCs (1.81) is approximately sixteen percent larger than the mean Type III service sector output multiplier for the unchanged RPCs (1.56). This is very similar to the difference between the IMPLAN and revised average RPC for all service sectors (.6666 and .7787, respectively, as indicated in Table 8).

Table 9. Michigan Output Multipliers for Recreation-Related Sectors

SECTOR NAME	REVISED RPCs TYPE I	REVISED RPCs III	UNCHANGED RPCs TYPE I	UNCHANGED RPCs III
85 Railroads	1.38	1.74	1.29	1.55
86 Local Transit	1.19	1.61	1.12	1.43
87 Motor Freight	1.27	1.64	1.17	1.44
88 Water Transportation	1.47	1.68	1.32	1.45
89 Air Transportation	1.33	1.58	1.25	1.42
97 Wholesale Trade	1.28	1.44	1.14	1.24
98 Eating & Drinking	1.46	2.23	1.33	1.89
* RETAIL INDUSTRY (AGGD)	1.23	1.99	1.11	1.67
106 Hotels & Lodging	1.50	2.43	1.30	1.97
111 Amusements	1.34	1.97	1.21	1.66
Mean for All Service Sectors:	1.37	1.81	1.24	1.56

* revised retail RPCs are based on aggregating four retail sectors

A more complete RPC comparison is presented in Appendix B: "Comparison of IMPLAN, REMI, and Corrected MRIO RPCs." This appendix presents RPCs for all sectors in the three Lake States and the Lake State region based on the corrected MRIO data. It also presents IMPLAN and REMI RPCs based on the MRIO 124-sector aggregation scheme. These RPC calculations confirmed that the corrected MRIO data does not have the zero or near zero RPCs observed in the IMPLAN models and reported for IMPLAN service sector RPC values.

Absolute and percentage differences were calculated between all IMPLAN and MRIO Michigan sectors and are presented in Appendix B. The average RPC difference across all sectors on an output-weighted basis was approximately .14. The corrected MRIO Michigan RPCs were 31.8 percent higher than the IMPLAN RPCs on a weighted average basis.

Regressions were also conducted on the Michigan RPCs to determine the correlation between them at this level of aggregation. Quite surprisingly, the REMI and corrected MRIO RPCs had an R^2 of approximately .54 (with 94 degrees of freedom), while the IMPLAN and

corrected MRIO R^2 was close to .23 (with 113 degrees of freedom). Differences in the degrees of freedom stem from RPCs not being available for REMI agriculture, construction, and government sectors. IMPLAN's R^2 with the corrected MRIO data for only those sectors which also had REMI RPCs was .22. These regression results were unexpected as both the IMPLAN RPCs and corrected MRIO RPCs were developed from the same original MRIO database, whereas the REMI RPCs were developed largely from the Transportation Census. These results do not confirm the accuracy of either the REMI or corrected MRIO RPC estimates, but they do imply that these models have similar RPC patterns that are currently not present in the IMPLAN model.

Sector Allocation of Outdoor Recreation Spending

Information from the U.S. Bureau of Economic Analysis (BEA) computer tape "Personal Consumption Expenditures and Gross Private Fixed Investment Item Detail" (1984) was used to bridge FHW recreation spending in this study's forested area of the Lake States. The detail contained on the BEA tape allows much more precise allocation of spending to IMPLAN sectors than the sector allocation bridges in the IMPLAN Analysis Guide (USDA Forest Service, 1985) and published in conjunction with PARVS (Propst, 1988). These two bridge tables are based on approximately one hundred aggregated personal consumption expenditure (pce) categories. In contrast, the BEA tape contains 1,790 different consumption items and their corresponding SIC codes, total 1977 U.S. expenditures, and the breakdown of these expenditures between producer and distribution shares.

The pce I-O category #9400, "pce wheel goods, durable toys, sport equipment, boats & pleasure aircraft," will be used to illustrate problems associated with adopting aggregated I-O pce categories to allocate recreation survey spending. Pce I-O category 9400 contains the majority of equipment items associated with outdoor recreation. Table 10 presents a listing of the 108 items contained within the category and their corresponding pce item numbers.

Trade and transportation margins and producer shares of expenditures for all 1790 pce items have been bridged to IMPLAN sectors by IMPLAN personnel. Additionally, these shares have been used to derive the percentage distribution of purchaser spending among producer and margin shares for the pce I-O categories and some subtotals within the categories. Table 11 presents the percentage distribution of spending on specific items within pce I-O category 9400 under the column heading "% OF PCE I-O CATEGORY 9400." Table 11 also shows the distribution of spending among IMPLAN sectors for three subcategories of pce I-O category 9400: small arms (pce item #1481), optical goods (pce items #1534-6), and boat building and repair (pce item #1507). The percentage distribution among IMPLAN sectors for these items was calculated by this author based on the detailed BEA national expenditure data.

Table 11 also presents Lake State Type I and III output multipliers, based on revised (BSTLK) IMPLAN RPCs, for the IMPLAN sectors associated with pce I-O category # 9400.

Table 12 shows the results of combining the percentage distribution estimates and output multipliers for the four types of industry groupings (I-O category 9400, and the three pce item subcategories)

Table 10. Pce I-O Category 9400:Wheel Goods, Durable Toys, Sport Equipment, Boats & Pleasure Aircraft

ITEM #	PCE ITEM DESCRIPTION
1481:	SMALL ARMS
1482:	TEXTILE BAGS
1483:	CANVAS PRODUCTS, NSK
1484:	CAMPING TENTS
1485:	OTHER CANVAS PRODUCTS
1486:	FABRICATED TEXTILES, NEC, NSK
1487:	SLEEPING BAGS
1488:	PARACHUTES
1489:	BICYCLE CASINGS&SINGLE TUBE TIRES
1490:	BICYCLE INNER TUBES
1491:	BOATS, PONTOONS, LIFE RAFTS
1492:	LEATHER GOODS N.S.K.
1493:	LEATHER NOVELTIES
1494:	SADDLERY & HARNESS & ACCOUTERMENTS
1495:	DOG COLLARS, LEASHES & OTH PET ACCESS.
1496:	OTHER LEATHER GOODS
1497:	BEA COVERAGE ADJUSTMENT
1498:	CUTLERY,SCISSORS,SHEARS,TRIMMERS,& SNIPS
1499:	POCKET KNIVES &OTHER FOLDING-BLADE KNIVES
1500:	MARINE HARDWARE
1501:	STEEL WIRE CAGES
1502:	OUTBOARD ENGINES
1503:	STORAGE BATTERIES-SLI-AIRCRAFT & MARINE
1504:	STORAGE BATTERIES-SLI-AIRCRAFT & MARINE
1505:	COMPLETE AIRCRAFT, PERS & UTILITY
1506:	YACHTS, UNDER 65 FT
1507:	BOAT BUILDING & REPAIRING, NSK
1508:	OUTBOARD MOTORBOATS
1509:	INBOARD MOTORBOATS, NSK
1510:	INBOARD RUNABOUTS
1511:	INBOARD CABIN CRUISERS, UNDER 26 FT
1512:	INBOARD CABIN CRUISERS, 26 FT AND OVER
1513:	HOUSEBOATS
1514:	INBOARD-OUTDRIVE BOATS, NSK
1515:	INBOARD-OUTDRIVE BOATS, UNDER 20 FT
1516:	INBOARD-OUTDRIVE BOATS, 20FT & OVER
1517:	BOATS, NEC, NSK
1518:	SAILBOATS
1519:	OTHER BOATS, NEC
1520:	BOAT REPAIR, NONMILITARY
1521:	BEA COVERAGE ADJUSTMENT
1522:	MOTORCYCLES, BICLES & PARTS, NSK
1523:	BICYCLES, COMPLETE
1524:	BICYCLE PARTS
1525:	MOTORCYCLES AND TRAIL VEHICLES
1526:	TRANSPORTATION NEC. NSK.
1527:	PARTS FOR SELF-PROPELLED GOLF CARTS
1528:	SELF-PROPELLED GOLF CARTS
1529:	SELF-PROPELLED SNOWMOBILES
1530:	PARTS FOR SELF-PROPELLED SNOWMOBILES
1531:	BOAT TRAILERS
1532:	ALL-TERRAIN VEHICLES
1533:	PARTS FOR ALL-TERRAIN VEHICLES
1534:	OPTICAL INSTRUMENTS&LENSES, NSK
1535:	OPTICAL INSTRUMENTS, COMP., LENSES, NSK
1536:	BINOCULARS,OPTICAL ALIGNMENT&DISPLAY INSTRMNTS
1537:	HAND HELD STILL CAMERAS
1538:	FLASH UNITS-ELECTRONIC & NONELECTRONIC
1539:	PROJECTORS, SLIDE & STRIP
1540:	STILL PICTURE EQUIP,PARTS,ATTACH,&ENLARGERS
1541:	8&16 MM MOTION PICTURE CAMERAS
1542:	16MM SOUND & SILENT PROJECTORS
1543:	ALL OTHER 8MM PROJECTORS
1544:	8MM SILENT PROJECTORS LESS THAN $100
1545:	PROJECTION SCREENS
1546:	8&16MM MOTION PICTURE PARTS,ATTACH, ETC
1547:	BABY CARRIAGES AND CHILDREN'S VEHICLES
1548:	SPORTING&ATHLETIC GOODS,NEC. NSK
1549:	GOLF BALLS AND GOLF CLUBS
1550:	GOLF BAGS & OTHER GOLF EQUIPMENT
1551:	HOME PLAYGROUND EQUIPMENT
1552:	HEALTH,PHYSICAL FITNESS&EXERCISING EQUIP
1553:	BILLIARD AND POOL, TABLES & SUPPLIES
1554:	BOWLING BALLS
1555:	TEAM SPORTS EQUIPMENT
1556:	SIDEWALK AND RINK ROLLER SKATES
1557:	ICE SKATES
1558:	WATER SKIS AND SURFBOARDS
1559:	SNOW SKIS
1560:	WINTER SPORTS EQUIPMENT
1561:	UNDERWATER SPORTS EQUIPMENT
1562:	BEA COVERAGE ADJUSTMENT
1563:	MISC. FABRICATED PRODUCTS, NEC., NSK
1564:	OTHER MISC. FABRICATED PRODUCTS, NEC., NSK.
1565:	MISC. FABRICATED PRODUCTS, NEC.
1566:	WELDING REPAIR
1567:	HOUSEHOLD FLIGHT INSTRUMENT REPAIR
1568:	SNOWMOBILE REPAIR
1569:	LOCK SMITHS, GUNSMITHS
1570:	REPAIR SERVICE FOR OPTICAL GOODS
1571:	MOTORCYCLE REPAIR
1572:	HOUSEHOLD TENT REPAIR
1573:	SPORTING GOODS INCLUDING BICYCLE REPAIR
1574:	CAMERA AND PHOTO EQUIP REPAIR
1575:	USED OPTICAL GOODS
1576:	USED OPTICAL GOODS
1577:	USED SPORTING GOODS
1578:	USED SPORTING GOODS
1579:	USED MOTORCYCLES THRU USED MERCH. STORE
1580:	USED MOTORCYCLES THRU USED MERCH. STORE
1581:	USED WHEEL GOODS SPORTS EQUIP, ETC
1582:	USED WHEEL GOODS SPORTS EQUIP, ETC
1583:	USED WHEEL GOODS SPORTS EQUIP, ETC
1584:	USED WHEEL GOODS SPORTS EQUIP, ETC
1585:	USED WHEEL GOODS SPORTS EQUIP, ETC
1586:	USED PLEASURE BOATS
1587:	USED PLEASURE BOATS THRU RETAIL
1588:	USED BABY EQUIPMENT

presented in Table 11. For each of the four groupings, this process involved multiplying the two types of output multipliers by any proportional share of spending in each multiplier's corresponding sector. Thus, for example, railroads and related services (IMPLAN #446) multipliers of 1.45 and 1.92 were multiplied by .00069 for I-O category #9400, .00011 for small arms, 0 for optical goods, and .00065 for boat building and repair, resulting in the corresponding output impacts shown in Table 12. The estimates shown in Table 12's columns may be viewed as depicting the distribution of output impact among sectors per average dollar spent for the four pce groupings of industries.

The sums of the columns at the bottom of Table 12 indicate the total output impacts for each of the four pce industry groupings according to type of multiplier (Type I or III). The corresponding percentage differences in total output impacts from pce I-O category #9400 are shown below the sums for the three pce subcategories.

Table 11. Contrast of Sector Allocations Based on I-O Category #9400 * Versus Small Arms, Optical Goods, and Boat Building & Repair PCE Items Within I-O Category #9400

BEA INDUSTRY NAME OR NUMBER	IMPLAN INDUSTRY NAME	IMPLAN #	LAKE STATE BSTLK IMPLAN OUTPUT MULTIPLIERS TYPE I	III	% OF PCE I-O CATEGORY #9400 *	% OF PCE #1481 SMALL ARMS (IMP #79)	% OF PCE #1534-6 OPTICAL GOODS (IMP #423)	% OF PCE #1507 BOAT BLDG & REPAIR (IMP #409)
RAIL MARGIN	RAILROADS AND RELATED SERVICES	446	1.45	1.92	0.069%	0.011%	0.000%	0.065%
TRUCK MARGIN	MOTOR FREIGHT TRANSPORT	448	1.41	1.95	0.580%	0.080%	0.090%	0.717%
WATER MARGIN	WATER TRANSPORTATION	449	1.63	1.91	0.156%	0.000%	0.000%	0.228%
AIR MARGIN	AIR TRANSPORTATION	450	1.45	1.77	0.035%	0.000%	0.090%	0.130%
PIPE MARGIN	PIPE LINES, EXCEPT NAT GAS	451	1.46	1.64	0.000%	0.000%	0.000%	0.000%
WHLSALE MRGN-REC	RECREATION-RELATED WHOLESALE TRADE	460	1.36	1.61	6.269%	11.550%	5.750%	0.000%
WHOLESALE MARGIN	OTHER WHOLESALE TRADE	461	1.36	1.93	1.323%	0.000%	0.000%	7.264%
RETAIL MRGN-REC	RECREATION-RELATED RETAIL TRADE	462	1.30	1.61	27.445%	34.822%	34.861%	0.000%
RETAIL MARGIN	OTHER RETAIL TRADE	463	1.30	2.31	2.659%	0.000%	0.000%	0.000%
INSURANCE MARGIN	INSURANCE CARRIERS	467	1.83	2.50	0.000%	0.000%	0.000%	0.000%
130500	SMALL ARMS	79	1.32	1.91	3.400%	53.536%		
190301	TEXTILE BAGS	154	1.25	1.82	0.264%			
190302	CANVAS PRODUCTS	155	1.21	2.13	1.189%			
190306	FABRICATED TEXTILE PRODUCTS	159	1.24	1.62	0.629%			
320100	TIRES AND INNER TUBES	240	1.39	1.73	0.130%			
320302	FABRICATED RUBBER PRODUCTS	243	1.42	2.03	0.063%			
340305	LEATHER GOODS, N.E.C	254	1.50	2.77	1.089%			
420100	CUTLERY	319	1.57	2.07	0.791%			
420300	HARDWARE, N.E.C.	322	1.36	1.72	0.156%			
420500	MISCELLANEOUS FABRICATED WIRE PROD	325	1.40	1.93	0.032%			
430200	INTERNAL COMBUSTION ENGINES	331	1.57	2.14	1.512%			
580100	STORAGE BATTERIES	396	1.46	1.84	0.024%			
600100	AIRCRAFT	405	1.41	1.84	3.114%			
610100	SHIP BUILDING AND REPAIR	408	1.34	1.78	0.880%			
610200	BOAT BUILDING AND REPAIR	409	1.66	2.06	19.058%			91.596%
610500	MOTORCYCLES, BICYCLES, AND PARTS	411	1.59	1.97	10.058%			
610700	TRANSPORTATION EQUIPMENT, N.E.C.	415	1.53	1.91	1.849%			
630100	OPTICAL INSTRUMENTS AND LENSES	423	1.28	1.58	0.504%		59.209%	
630300	PHOTOGRAPHIC EQUIPMENT AND SUPPLIE	425	1.35	1.65	5.806%			
640301	GAMES, TOYS, AND CHILDRENS VEHICLE	431	1.48	2.09	1.544%			
640400	SPORTING AND ATHLETIC GOODS, N.E.C	433	1.40	1.89	6.840%			
641200	MANUFACTURING INDUSTRIES, N.E.C.	445	1.42	1.98	0.100%			
730101	MISCELLANEOUS REPAIR SHOPS	478	1.18	1.50	1.967%			
810002	USED AND SECONDHAND GOODS	524	1.00	1.00	0.464%			
	Sums:				1.00	1.00	1.00	1.00

* I-O category #9400 is comprised of pce wheel goods, durable toys, sport equipment, boats and pleasure aircraft

Table 12. Contrast of Lake State Output Impacts Based on I-O Category #9400 Versus Small Arms, Optical Goods, and Boat Building & Repair PCE Items Within I-O Category #9400

		I-O CATEGORY #9400 OUTPUT IMPACT BASED ON		SMALL ARMS OUTPUT IMPACT BASED ON		OPTICAL GOODS OUTPUT IMPACT BASED ON		BOAT BLDG & REPAIR OUTPUT IMPACT BASED ON	
IMPLAN INDUSTRY NAME	IMPLAN #	TYPE I	TYPE III	TYPE I	TYPE III	TYPE I	TYPE III	TYPE I	TYPE III
RAILROADS AND RELATED SERVICES	446	0.0010	0.0013	0.0002	0.0002	0	0	0.0009	0.0013
MOTOR FREIGHT TRANSPORT	448	0.0082	0.0113	0.0011	0.0016	0.0013	0.0018	0.0101	0.0140
WATER TRANSPORTATION	449	0.0025	0.0030	0	0	0	0	0.0037	0.0044
AIR TRANSPORTATION	450	0.0005	0.0006	0	0	0.0013	0.0016	0.0019	0.0023
PIPE LINES, EXCEPT NAT GAS	451	0	0	0	0	0	0	0	0
RECREATION-RELATED WHOLESALE TRADE	460	0.0852	0.1007	0.1571	0.1855	0.0782	0.0924	0	0
OTHER WHOLESALE TRADE	461	0.0180	0.0256	0	0	0	0	0.0988	0.1404
RECREATION-RELATED RETAIL TRADE	462	0.3565	0.4410	0.4524	0.5596	0.4529	0.5602	0.0000	0.0000
OTHER RETAIL TRADE	463	0.0345	0.0615	0	0	0	0	0	0
INSURANCE CARRIERS	467	0	0	0	0	0	0	0	0
SMALL ARMS	79	0.0448	0.0651	0.7057	1.0244				
TEXTILE BAGS	154	0.0033	0.0048						
CANVAS PRODUCTS	155	0.0144	0.0253						
FABRICATED TEXTILE PRODUCTS	159	0.0078	0.0102						
TIRES AND INNER TUBES	240	0.0018	0.0022						
FABRICATED RUBBER PRODUCTS	243	0.0009	0.0013						
LEATHER GOODS, N.E.C	254	0.0164	0.0302						
CUTLERY	319	0.0124	0.0164						
HARDWARE, N.E.C.	322	0.0021	0.0027						
MISCELLANEOUS FABRICATED WIRE PRDC	325	0.0004	0.0006						
INTERNAL COMBUSTION ENGINES	331	0.0238	0.0324						
STORAGE BATTERIES	396	0.0004	0.0004						
AIRCRAFT	405	0.0439	0.0572						
SHIP BUILDING AND REPAIR	408	0.0118	0.0156						
BOAT BUILDING AND REPAIR	409	0.3161	0.3934					1.5191	1.8908
MOTORCYCLES, BICYCLES, AND PARTS	411	0.1595	0.1986						
TRANSPORTATION EQUIPMENT, N.E.C.	415	0.0282	0.0353						
OPTICAL INSTRUMENTS AND LENSES	423	0.0065	0.0079			0.7597	0.9336		
PHOTOGRAPHIC EQUIPMENT AND SUPPLIE	425	0.0784	0.0961						
GAMES, TOYS, AND CHILDRENS VEHICLE	431	0.0228	0.0322						
SPORTING AND ATHLETIC GOODS, N.E.C	433	0.0954	0.1292						
MANUFACTURING INDUSTRIES, N.E.C.	445	0.0014	0.0020						
MISCELLANEOUS REPAIR SHOPS	478	0.0233	0.0295						
USED AND SECONDHAND GOODS	524	0.0046	0.0046						
Sums:		1.43	1.84	1.32	1.77	1.29	1.59	1.63	2.05
% of I-O Category #9400 Impact Sum:				92.2%	96.4%	90.6%	86.5%	114.5%	111.7%

The percentage differences shown at the bottom of Table 12 indicate that some items within pce I-O category #9400 are associated with sectors that generate larger output impacts than the category as a whole, while other items are associated with sectors that generate smaller impacts. Specifically, boat building and repair has output impacts that exceed #9400's by more than ten percent, while the output impacts for small arms and optical goods are between five and fifteen percent below those for #9400. Thus, if only the pce I-O categories are used to bridge spending data, the error involved in measurement of total impacts will depend on what specific items are being considered.

Pce I-O categories may also include producer sectors not represented in the regional economy. This is especially true for smaller regions. Sectors not represented in the regional economy will have no multiplier impact associated with them beyond what impacts are associated with their distribution margins. Bridging spending to such sectors results in the expenditure being eliminated from the subsequent impact analysis. Use of the pce I-O categories can err in both directions. Spending may be distributed to a range of sectors in the region when, in reality, the spending should go to a sector not in the regional economy (i.e., imports). Alternatively, spending may be distributed among a range of sectors not represented in the region when, in reality, it should all be allocated to an existing regional sector. Using the pce I-O categories to allocate spending invites errors of this nature. In contrast, use of the detailed pce items will enable more precise allocation of spending to sectors, whether they exist in the region or not. It should be noted, however, that bridging based on the detailed pce items assumes national margins are appropriate for the

sectors and region being modelled. This may not always be the case, but regional data on margins is seldom available to use in place of the national margins.

Tables 10, 11 and 12 illustrate that it is essential to use the detailed pce item information if measurement of differential impacts among sectors is important. Different items have different margins associated with them and the pattern exhibited by the overall pce I-O category may vary greatly from individual items within the category. For example, there is no boat building and repair retail margin, while the margin for pce I-O category #9400 as a whole is above twenty-seven percent for recreation-related retail trade and over two percent for other retail trade (see Table 11). The direct impact to the boat building and repair sector would be understated by close to thirty percent if the I-O category's margins were used in place of the BEA detailed margins for boat building and repair. Total impacts for the sector would be understated by an even greater amount, as the boat building and repair sector has larger output multipliers than the recreation-related retail trade sector. (See Table 11).

Allocating the producer's share of expenditures to the proper sectors is especially important from the standpoint of sectoral impacts. The producer's share of consumer expenditures usually exceeds the combined share of distribution margins. (Table 11 indicates the approximate producer's share of small arms is 54%, for optical goods it is 59%, and for boat building and repair it is 92%.) The use of pce I-O categories distributes this producer's share of spending among a range of sectors which may not be at all associated with the particular spending under consideration, or worse, not exist in the region.

Appendices E and F, ("FHW Bridge Table" and "FHW Used Equipment Allocation Table," respectively) represent the work devoted in this research to more narrowly define the sector allocations of FHW spending to IMPLAN sectors. These tables and the computer spreadsheets they are based on may help to make the task of bridging spending to I-O sectors more accurate and less time-consuming. They need to be further reviewed and refined for greater ease of use however, as time constraints prohibited extensive review and refinement prior to the completion of this research.

Lake State Outdoor Recreation Economic Impacts

Differences Between Lake State IMPLAN Model RPCs

Five sets of RPCs were used to develop Lake States IMPLAN models. The models and what they represent are as follows:

SDP - trade estimates are based on the supply-demand pooling trade estimation technique; these represent ceiling values for the IMPLAN RPCs

FLRLK - RPCs are based on the minimum RPC values for the three Lake States, including questionable low RPCs

ALTFLK - RPCs are the same as for FLRLK except for those RPCs which appeared highly contradictory to SDP, MRIO, REMI, and Census estimates. ALTFLK RPCs represent a more accurate set of minimum RPCs.

BSTLK - this author's best judgment of the approximate value of Lake State RPCs, based on MRIO and unchanged IMPLAN RPC values for the three individual Lake States and the Lake States as a whole, REMI RPC values for Michigan, and Lake State SDP and ALTFLK RPC values.

UNCHLK - IMPLAN (version 2.0) RPC estimates, without changes

It should also be noted that, with the exception of UNCHLK, all the models required adjustment to IMPLAN sectors 461 (other wholesale trade)

and 462 (recreation-related retail trade). These sectors have inappropriately low value added and output estimates in the microcomputer version of IMPLAN. (The problem with sector 461, which is of greater magnitude than the problem with sector 462, has been noted by IMPLAN personnel and has been communicated to IMPLAN users in IMPLAN News, September, 1989, p. 3). Following changes to sectors 461 and 462, some SDP RPC values were below the UNCHLK RPCs. This was particularly true for service sectors, where SDP values subsequently were often several percentage points below the UNCHLK RPCs. In this light, the SDP RPCs represent ceiling values for Lake State models with modifications to sectors 461 and 462.

A more inexplicable occurrence was the generation of a few unchanged Lake State RPCs that were lower than any of the RPCs for the states of Michigan, Minnesota, and Wisconsin. This was true for sectors 162, 224, 401 and 402, although the differences for sectors 224 and 401 are only slight and can be discounted as possible rounding errors (see Appendix C). Theoretically, this should not be possible. Demand for the region can not be greater than the sum of the individual state's demands, whereas the region's intraregional trade can be greater than the sum of each state's intraregional trade. The intraregional trade value comprises the numerator of the RPC, while regional demand is the denominator. Thus, with the only possibility of change being an increase in the numerator (intraregional trade) value, Lake State RPCs should not be smaller than all three of the individual state's RPC values. This can be represented for any sector i as follows:

$$\text{Lake State intragregional trade} = X_i^{l,l},$$

$$\text{Michigan intraregional trade} = X_i^{mi,mi},$$

Minnesota intraregional trade - $X_i^{mn,mn}$,

Wisconsin intraregional trade - $X_i^{wi,wi}$,

The first superscript represents the producing region and the second represents the purchasing region; l - Lake States, mi - Michigan, mn - Minnesota, and wi - Wisconsin. Lake State intraregional trade includes trade that occurs between the Lake states, in addition to the intraregional trade within the individual states depicted above. Thus, Lake State intraregional trade, $X_i^{l,l}$, encompasses:

$X_i^{mi,mi}$	$X_i^{mi,mn}$	$X_i^{mi,wi}$
$X_i^{mn,mn}$	$X_i^{mn,mi}$	$X_i^{mn,wi}$
$X_i^{wi,wi}$	$X_i^{wi,mi}$	$X_i^{wi,mn}$

In contrast, there is no additional demand (D_i) for the Lake States region beyond the sum of the individual states' demands:

$$D_i^l = D_i^{mi} + D_i^{mn} + D_i^{wi}.$$

The RPC for any Lake State sector is equal to $X_i^{l,l}/D_i^l$. As the sum of any positive proportions cannot be less than the least of those proportions, no Lake State RPC should be less than the least of the three RPCs for the individual Lake States. There were only four Lake State sectors exhibiting the lower RPCs. The sectors were not important sectors for this study and the discrepancies were not large.

A number of statistical tools were used to measure differences betweeen the RPCs. These were described in chapter three (pages 80-81). Results of these measurements are presented in Table 13.

Table 13. MEASUREMENT OF LAKE STATE MODEL RPC DIFFERENCES

Dependent variable = UNCHLK (unchanged IMPLAN RPCs)

Model:	SDP	FLRLK	ALTFLK	BSTLK	UNCHLK
Measure					
MEAN	0.6467	0.1699	0.2266	0.4435	0.4362
SQUARE ERROR	70.4155	73.6130	59.8931	11.1668	
MEAN SQUARE ERROR (MSE)	0.1334	0.1394	0.1134	0.0211	
ROOT MEAN SQUARE ERROR (RMSE)	0.3652	0.3734	0.3368	0.1454	
CORRELATION COEFFICIENT (r)	0.6497	0.6791	0.6716	0.9133	
STANDARD DEVIATION	0.3573	0.2240	0.2332	0.3150	0.3558
ROOT MEAN SQUARE (RMS)	0.7389	0.2812	0.3252	0.5440	0.5629
MEAN ABSOLUTE DIFFERENCE (MAD)	0.2168	0.2695	0.2491	0.0649	
THEIL'S INEQUALITY INDEX (U)	0.2805	0.4424	0.3792	0.1314	
Um, bias	0.3323	0.5086	0.3872	0.0025	
Us, variance	0.0000	0.1245	0.1324	0.0785	
Uc, covariance	0.6677	0.3669	0.4804	0.9190	
U sum (=1.000)	1	1	1	1	

The measurement indices reported in Table 13 provide several indications of the differences between the alternative RPCs and unchanged IMPLAN Lake State (UNCHLK) RPCs. These indices consistently indicate the vector of BSTLK RPCs is the most similar to the UNCHLK RPCs. This is indicated by the close proximity of their means (and RMS values) to each other relative to the other three sets of RPCs. Their means fall almost exactly between the mean of .2266 for ALTFLK and the mean of .6467 for SDP.

The small difference between UNCHLK and BSTLK RPCs is further indicated by several measures of distance between the alternative sets of RPCs and UNCHLK. These distance measures, including the MSE, RMSE, and MAD, have values for BSTLK RPCs that are less than half the other RPC sets' values. The similarity between BSTLK and UNCHLK is also indicated by their correlation coefficient value of .9133 versus correlation coefficients closer to .65 for UNCHLK and the other sets of RPCs. The SDP, FLRLK, and ALTFLK RPCs appear quite similar in terms of

their absolute differences versus the UNCHLK RPCs on the basis of their MSE, RMSE, and MAD values.

Theil's Inequality Index and its components conform to the results provided by the other measures. The closer to zero the U index is, the lower the inequality between the variables being measured. The BSTLK RPCs appear distinctively closer to the UNCHLK RPCs than the other sets of RPCs on the basis of its Theil Index. The BSTLK U value (.1314) is less than half of the SDP value (.2805), which is the next lowest U value. The U_m component reflects differences in mean values; FLRLK has the greatest difference in mean value from UNCHLK and also the highest U_m value. The U_s component reflects variance differences; SDP and UNCHLK standard deviations are virtually identical and, therefore, the SDP U_s value is zero (rounded to the nearest ten-thousandths). Finally, the BSTLK value for the U_c component would be expected to be highest as this component relates random error not accounted for by bias and variance sources of differences.

Differences Between Lake State IMPLAN Model Multipliers

It is important to what extent the differences between the sets of RPCs are reflected in subsequent multiplier and impact estimates. Differences between sets of multipliers were examined across the five different Lake State aggregation schemes used and two types of multipliers (IMPLAN's type I and III) for each of three types of economic variables (output, personal income, and employment). Additionally, two other measures, chi square and standardized mean absolute differences, were used in measuring multiplier differences. Overall results were quite similar to those found for the RPCs. Only mean values and general indications of the differences are reported

here; a complete set of the measurement values generated is presented in Appendix H: "Lake State RPC and Multiplier Analysis." Table 14 presents mean multiplier values for the five different aggregation schemes, five different sets of RPCs and three different economic variables.

BSTLK multipliers tended to be the most similar to the UNCHLK multipliers across all aggregation schemes and types of multipliers. Means and root mean square values were similar to the results for the RPCs. The BSTLK and UNCHLK values were closer to each other than values for the other models and fairly equidistant between the two minimum sets of multipliers (FLRLK and ALTFLK) and the SDP multipliers.

Measures relating the distance between the vectors of UNCHLK multipliers and the corresponding sector multipliers for the other RPC models further indicate BSTLK multipliers were closest to UNCHLK multipliers. This is true also for the two additional measures not used with the RPCs, chi square and SMAD. BSTLK multipliers generally had distance measures less than half the value of the other models. There were inconsistencies. For example, the ALTFLK type I personal income multipliers have slightly lower MAD, SMAD, and chi square values than BSTLK for the completely disaggregated model, but not for any of the other aggregated models. Sometimes the SDP values were closest to BSTLK's distance measure values, more often the ALTFLK values were.

Most correlation coefficients between the other sets of multipliers and UNCHLK are higher than they were for the RPCs. They tend to be close to or above .90 with BSTLK correlation coefficients being the highest. This represents a significant increase for the UNCHLK, FLRLK AND ALTFLK models over their RPC correlation coefficient values which were in the neighborhood of .65.

Table 14. Mean Values of Lake State Model Multipliers

Multiplier:	OUTPUT TYPE I					OUTPUT TYPE III				
Model: Aggregation	SDP	FLRLK	ALTFLK	BSTLK	UNCHLK	SDP	FLRLK	ALTFLK	BSTLK	UNCHLK
502 Sector	1.61	1.19	1.26	1.49	1.40	2.31	1.44	1.54	2.07	1.94
308 Sector	1.70	1.17	1.23	1.48	1.41	2.44	1.39	1.48	2.03	1.93
159 Sector	1.72	1.17	1.24	1.50	1.43	2.51	1.40	1.50	2.06	1.97
31 Sector	1.65	1.17	1.23	1.45	1.40	2.37	1.38	1.48	1.99	2.01
16 Sector	1.64	1.18	1.24	1.47	1.44	2.45	1.44	1.53	2.09	2.23

Multiplier:	PERSONAL INCOME TYPE I					PERSONAL INCOME TYPE III				
Model: Aggregation	SDP	FLRLK	ALTFLK	BSTLK	UNCHLK	SDP	FLRLK	ALTFLK	BSTLK	UNCHLK
502 Sector	1.74	1.27	1.37	1.65	1.50	2.53	1.57	1.72	2.34	2.10
308 Sector	1.94	1.23	1.33	1.66	1.52	2.84	1.50	1.65	2.32	2.13
159 Sector	2.15	1.30	1.40	1.82	1.67	3.28	1.60	1.74	2.61	2.38
31 Sector	1.81	1.19	1.28	1.56	1.49	2.57	1.42	1.55	2.13	2.07
16 Sector	1.89	1.24	1.30	1.65	1.60	2.81	1.51	1.61	2.34	2.38

Multiplier:	EMPLOYMENT TYPE I					EMPLOYMENT TYPE III				
Model: Aggregation	SDP	FLRLK	ALTFLK	BSTLK	UNCHLK	SDP	FLRLK	ALTFLK	BSTLK	UNCHLK
502 Sector	1.82	1.27	1.38	1.69	1.57	2.63	1.57	1.72	2.38	2.20
308 Sector	2.03	1.27	1.38	1.74	1.65	2.98	1.55	1.71	2.45	2.33
159 Sector	2.16	1.29	1.44	1.83	1.73	3.20	1.56	1.72	2.57	2.43
31 Sector	1.89	1.20	1.31	1.63	1.57	2.75	1.46	1.61	2.27	2.20
16 Sector	1.98	1.26	1.33	1.73	1.70	2.89	1.53	1.63	2.41	2.39

As would be expected, multipliers generated from the two sets of minimum RPCs had the lowest standard deviations, reflecting their lower RPC values and resulting lower multiplier values.

Theil's U Index results conform with the results provided by the other measures, indicating BSTLK multipliers were closest to the UNCHLK multipliers. However, there were inconsistencies across the various sectorization schemes and economic variables. For example, the U_m value (reflecting bias) varied from a high of .5585 for the disaggregated BSTLK type I output multipliers to a low of .2766 for the same multipliers at a 16-sector aggregation scheme. For corresponding multipliers, FLRLK and ALTFLK U_m values moved in the opposite direction, increasing from .7414 to .8462 and from .5681 to .7720 respectively. Similarly, the BSTLK U_m value went from .3536 for the disaggregated type I employment multiplier to .0345 for the same multiplier at the 16-sector aggregation level, while the SDP U_m went from a disaggregated value of .1779 to a 16-sector aggregation value of .4603. These results and other U_m estimates are presented in Table 15.

In summary, the measures used to analyze the sets of multipliers tended to conform with the RPC results. Differences between the RPC and multiplier measurements were more of quantity than quality. BSTLK multipliers appear to be closer to UNCHLK multipliers than the other multipliers. However, they do not appear uniformly across all sectorization schemes and sets of multipliers to be as dramatically close to UNCHLK multipliers as BSTLK RPCs are to UNCHLK RPCs.

Table 15. Lake State Multiplier U_m (Theil Index Bias) Measurements

Multiplier:	OUTPUT TYPE I				OUTPUT TYPE III			
Model: Aggregation	SDP	FLRLK	ALTFLK	BSTLK	SDP	FLRLK	ALTFLK	BSTLK
502 Sector	.6778	.7414	.5681	.5585	.7967	.6800	.5829	.1583
308 Sector	.7415	.7566	.6201	.5161	.7505	.7957	.7299	.1988
159 Sector	.8007	.7454	.6320	.5808	.7413	.7581	.6898	.1247
31 Sector	.6336	.8618	.7781	.4585	.2463	.5391	.4614	.0008
16 Sector	.6367	.8462	.7720	.2766	.0675	.5232	.4667	.0355

Multiplier:	PERSONAL INCOME TYPE I				PERSONAL INCOME TYPE III			
Model: Aggregation	SDP	FLRLK	ALTFLK	BSTLK	SDP	FLRLK	ALTFLK	BSTLK
502 Sector	.5281	.4728	.2861	.4219	.5495	.5525	.4448	.3586
308 Sector	.5744	.5067	.3799	.4332	.5986	.5911	.5138	.3857
159 Sector	.5056	.3933	.2947	.3865	.5449	.5330	.4697	.3391
31 Sector	.5760	.4357	.3138	.3981	.4057	.5425	.4627	.0171
16 Sector	.5181	.3832	.3173	.2158	.2470	.5549	.5124	.0043

Multiplier:	EMPLOYMENT TYPE I				EMPLOYMENT TYPE III			
Model: Aggregation	SDP	FLRLK	ALTFLK	BSTLK	SDP	FLRLK	ALTFLK	BSTLK
502 Sector	.1779	.2989	.1888	.3536	.2240	.4589	.3848	.3899
308 Sector	.4474	.3795	.2967	.2864	.5204	.5124	.4671	.2529
159 Sector	.4330	.3553	.2778	.2328	.4867	.4810	.4313	.2337
31 Sector	.5132	.3067	.2234	.1978	.5712	.4607	.4005	.1499
16 Sector	.4603	.2358	.2008	.0345	.5133	.3551	.3273	.0162

Theil Index results, along with similar changes in other measures, indicate the level of aggregation can influence results from the measurement indices across models, across economic variables, and between RPCs and their corresponding multipliers. This implies it would be appropriate to use a battery of statistical measures (as most nonsurvey I-O researchers have) at different aggregation levels and with different economic variables to avoid spurious measurement results and to cover a wide range of possible I-O model applications.

Estimates of Lake State Outdoor Recreation Economic Impacts

A complete listing of estimated economic impacts are presented in Appendix E: "Lake State Outdoor Recreation Impacts." The discussion here will summarize the estimates and differences between them according to variables considered in the analysis. Those variables include: the range and types of spending, I-O model sectorization schemes, I-O model RPCs, comparison with spending estimates generated for the 1987 Governors' Conference on Forestry, resident versus nonresident impacts, and recreation sectoral multipliers versus average multipliers.

Range of FHW Impact Estimates by Major Spending Category

Table 16 presents Lake State disaggregated BSTLK economic impacts for different categories of FHW spending. The impacts result from combining recreation spending profiles for the spending categories with BSTLK disaggregated model multipliers. The resulting pattern shown in Table 16 reflects the relative magnitudes of impacts across spending categories for other models as well. Spending categories other than "Nonresidents Only" include both resident and nonresident spending.

Table 16. Lake State Economic Impacts from Upper Lake State Fishing, Hunting, & Wildlife-Associated Recreation, Based on Disaggregated, Adjusted RPCs (BSTLK) IMPLAN Model *

OUTPUT (millions of 1982 $)

Estimate:	Low		High	
Multiplier:	Type I	Type III	Type I	Type III
Spending Category				
Nonresidents Only	241	355	659	950
Trip Spending Only	1,180	1,664	2,547	3,703
Total less Spec Equip	1,720	1,638	4,046	5,779
Total	2,078	2,915	5,906	8,117

PERSONAL INCOME (millions of 1982 $)

Estimate:	Low		High	
Multiplier:	Type I	Type III	Type I	Type III
Spending Category				
Nonresidents Only	59	91	158	242
Trip Spending Only	278	427	621	947
Total less Spec Equip	451	655	1,120	1,608
Total	595	831	1,714	2,337

EMPLOYMENT (thousands of full and part-time jobs)

Estimate:	Low		High	
Multiplier:	Type I	Type III	Type I	Type III
Spending Category				
Nonresidents Only	5	6	12	17
Trip Spending Only	21	30	47	66
Total less Spec Equip	29	41	70	99
Total	34	48	89	126

* Direct payments by region residents to other residents are not included in any of the spending categories

Low impact estimates were consistently less than half the size of high impacts. This was true for all four spending categories and is in accordance with the differences between the initial low and high FHW spending estimates shown in table 4. Low to high ratios differed little by model aggregation, economic variable, or type of multiplier (I or III). The ratios differed somewhat by spending category. Across all economic variables, model aggregations, and types of multipliers, they averaged about 37% for nonresident spending, 46% for trip spending, 43% for total spending less special equipment, and 37% for total spending.

It is significant that the high impact estimate exceeded the low impact estimate by more than the size of the low estimate. This was not an unexpected finding in light of the difference in the initial spending range estimates discussed in chapter 4; however, the impact estimates make the ramifications of the spending range more apparent. For example, estimates in Table 16 imply between 3 billion and 8 billion dollars of sales (in 1982 dollars) were generated in the Lake States by 1985 FHW recreation in the more heavily forested areas of the region, based on IMPLAN's type III multipliers. Decisionmakers are not likely to be satisfied with such a broad range and people may be hesitant to report it. There was not an overly conservative bias in the use of FHW statistical parameters; the range of impacts reflects underlying data sample sizes and associated uncertainty in activity and spending levels. These should not be ignored. For the activity and area examined in this study, more intensive sampling is required or, at a minimum, crosschecks with other studies and secondary data sources would need to be utilized, to reliably report sales estimates in a narrower range than the 3 to 8 billion dollars reported here.

Relationships Among Categories of Lake State FHW Recreation Spending

Several points may be highlighted regarding relationships among the four categories of Lake State FHW recreation spending. Table 17 presents the percentage impacts for the three subcategories of spending comprise of total (resident and nonresident) Lake State FHW spending impacts. These are based on the disaggregated BSTLK model and are representative of the pattern for other models.

An important point illustrated by Table 17 is the degree to which impacts will differ depending upon what spending is being measured. Comparisons across studies are made difficult by the studies not including the same types of spending in their analyses. Substantially different impact measurements may be developed depending upon the spending being considered.

For example, one objective may be to measure gains to the economic base of the Lake States as indicated by nonresident FHW expendituress. Table 17 indicates such impacts are only between nine and fourteen percent of the total impacts associated with both resident and nonresident FHW recreation expenditures. (A qualification on this is that, due to lack of data, equipment expenditures are assumed to occur in recreationists' state of residence. Therefore, estimates of nonresident expenditures are biased downward.) If only trip spending is considered, then the nonresident share of spending is between twenty and twenty-five percent. This can be derived from Table 17 by dividing nonresident percentages by trip spending only percentages. The analysis for the 1987 Governors' Conference on Forestry did not include major durable equipment expenditures (such as boats and vehicles). This is quite comparable to Table 17's "Total less Spec Equip" (total spending

Table 17. Lake State Subcategories of Recreation Spending as a Percent of Total Upper Lake State Fishing, Hunting, & Wildlife-Associated Recreation, Based on Disaggregated, Adjusted RPCs (BSTLK) IMPLAN Model *

OUTPUT (millions of 1982 $)

Estimate:	% of Low Disag BSTLK Sum		% of High Disag BSTLK Sum	
Multiplier:	Type I	Type III	Type I	Type III
Spending Category				
Nonresidents Only	11.64%	12.19%	11.10%	11.70%
Trip Spending Only	54.53%	57.09%	43.12%	45.61%
Total less Spec Equip	78.84%	81.00%	68.51%	71.20%
Total	100.00%	100.00%	100.00%	100.00%

PERSONAL INCOME (millions of 1982 $)

Estimate:	% of Low Disag BSTLK Sum		% of High Disag BSTLK Sum	
Multiplier:	Type I	Type III	Type I	Type III
Spending Category				
Nonresidents Only	9.95%	10.97%	9.26%	10.34%
Trip Spending Only	46.68%	51.44%	36.24%	40.51%
Total less Spec Equip	75.78%	78.78%	65.33%	66.81%
Total	100.00%	100.00%	100.00%	100.00%

EMPLOYMENT (thousands of full and part-time jobs)

Estimate:	% of Low Disag BSTLK Sum		% of High Disag BSTLK Sum	
Multiplier:	Type I	Type III	Type I	Type III
Spending Category				
Nonresidents Only	13.56%	13.56%	13.30%	13.30%
Trip Spending Only	63.45%	63.45%	52.27%	52.27%
Total less Spec Equip	86.35%	86.35%	78.37%	78.37%
Total	100.00%	100.00%	100.00%	100.00%

* Direct payments by region residents to other residents are not included in any of the spending categories

minus special equipment) category, of which nonresident spending comprises about fifteen percent.

Measured impacts also differ depending upon what economic variable and type of multiplier are being considered. For example, trip spending accounts for less than 40% of the high estimate for personal income type I impacts, in contrast to it accounting for over 60% of the low estimate for employment type I impacts.

Influence of Sectorization Scheme on Lake State FHW Impacts

Table 18 expresses as percentages the ratios of BSTLK impact sums for the various sectorization schemes relative to the impact estimates for the completely disaggregated, 502 sector BSTLK model. Percentage figures presented in Table 18 indicate the various sectorization schemes used in this analysis had little effect on most impact estimates. Part of the differences may stem from the aggregation of recreation trade sectors with other trade sectors to conform with the 1987 Governors' Conference study. This was done for all aggregation schemes other than the fully disaggregated scheme. The unchanged IMPLAN model has errors associated with its "other wholesale trade" and "recreational related retail trade" sectors, as mentioned previously. The adjustments to these may have affected the resulting aggregated wholesale and retail trade sector multipliers relative to the disaggregated multipliers.

The only other minor note on the influence of the sectorization schemes is the difference between the low and high estimates. In particular, the 159 sector model, which consists of many relatively disaggregated sectors and one large "all other" sector, has lower "high" output and personal income multipliers. However, overall, the different aggregation schemes tended to produce quite similar results.

Table 18. Impacts of Lake State FHW Recreation Spending for Different Sectorization Schemes as a Percent of the Disaggregated, Adjusted RPCs (BSTLK) IMPLAN Model *

OUTPUT (millions of 1982 $)

Estimate:	% of Low Disag BSTLK		% of High Disag BSTLK	
Multiplier:	Type I	Type III	Type I	Type III
Aggregation Scheme				
308 Sectors	98.81%	101.21%	98.87%	101.88%
159 Sectors	98.78%	101.54%	86.35%	90.62%
31 Sectors	99.90%	102.10%	92.31%	96.37%
16 Sectors	100.67%	101.20%	91.42%	94.09%

PERSONAL INCOME (millions of 1982 $)

Estimate:	% of Low Disag BSTLK		% of High Disag BSTLK	
Multiplier:	Type I	Type III	Type I	Type III
Aggregation Scheme				
308 Sectors	99.39%	101.55%	99.35%	102.13%
159 Sectors	97.53%	101.87%	86.01%	91.39%
31 Sectors	101.38%	102.90%	98.83%	100.84%
16 Sectors	94.17%	96.77%	90.48%	93.56%

EMPLOYMENT (thousands of full and part-time jobs)

Estimate:	% of Low Disag BSTLK		% of High Disag BSTLK	
Multiplier:	Type I	Type III	Type I	Type III
Aggregation Scheme				
308 Sectors	108.91%	108.25%	111.72%	111.05%
159 Sectors	107.67%	107.00%	101.34%	100.71%
31 Sectors	109.41%	107.95%	109.04%	107.58%
16 Sectors	104.31%	103.13%	103.01%	101.85%

* Direct payments by region residents to other residents are not included in any of the spending categories

Influence of RPCs on Lake State FHW Impacts

RPC influences were very similar across the four major spending categories. Table 19 shows the percentage differences of total impact estimates for the alternative RPC disaggregated models from disaggregated, unadjusted IMPLAN (UNCHLK) total impacts. The most extreme percentage differences for any of the four spending categories were incorporated into the table. Thus, Table 19 indicates BSTLK impact estimates ranged between ninety percent and one hundred and seven percent of the UNCHLK impact estimates across all spending categories, economic variables, and multipliers.

The percentage figures in Table 19 indicate impacts associated with supply-demand pooling (SDP) trade estimates were consistently the largest, while impacts associated with FLRLK were consistently the lowest. This is what was expected in light of the RPC and multiplier statistical analysis (e.g. SDP means were highest, while FLRLK's were lowest). ALTFLK model impacts were slightly higher than FLRLK impacts, reflecting increases in approximately ten percent of the RPCs from their zero or near-zero FLRLK values.

BSTLK impacts were slightly higher than the unchanged IMPLAN impacts, except for type III output and personal income impacts. (The lower type III BSTLK output and personal income impacts are due to the errors associated with unadjusted IMPLAN trade sectors described previously.) The relative closeness of BSTLK and UNCHLK impacts could have been predicted on the basis of their close RPCs and multipliers. In this regard, it is important to point out that IMPLAN's unadjusted RPCs for the Lake States are not as suspect as they are for many other states and for smaller regions within the Lake States. For example, Michigan,

Table 19. Impacts of Lake State FHW Recreation Spending for Different Sets of RPCs as a Percent of the Disaggregated, Unadjusted (UNCHLK) IMPLAN Model *

OUTPUT (millions of 1982 $)

Estimate:	% of Low UNCHLK		% of High UNCHLK	
Multiplier:	Type I	Type III	Type I	Type III
RPCS: SDP	116.85%	109.37%	119.11%	111.15%
FLRLK	79.50%	61.07%	79.55%	60.75%
ALTFLK	83.13%	64.81%	83.21%	64.49%
BSTLK	103.44%	91.25%	103.79%	90.14%

PERSONAL INCOME (millions of 1982 $)

Estimate:	% of Low UNCHLK		% of High UNCHLK	
Multiplier:	Type I	Type III	Type I	Type III
RPCS: SDP	117.97%	110.68%	120.18%	112.51%
FLRLK	84.17%	63.71%	83.80%	62.89%
ALTFLK	89.71%	68.97%	89.42%	68.15%
BSTLK	105.47%	92.80%	105.48%	91.52%

EMPLOYMENT (thousands of full and part-time jobs)

Estimate:	% of Low UNCHLK		% of High UNCHLK	
Multiplier:	Type I	Type III	Type I	Type III
RPCS: SDP	114.93%	120.18%	117.89%	123.28%
FLRLK	88.48%	77.77%	87.72%	77.11%
ALTFLK	93.10%	82.91%	92.96%	82.79%
BSTLK	105.45%	106.29%	106.25%	107.09%

* Direct payments by region residents to other residents are not included in any of the spending categories

and subregions within the state of Michigan, will have greater differences in impacts for adjusted RPCs than were found for the Lake States, corresponding with proportionally greater numbers of sectors having erroneous (zero and near-zero) RPCs.

Comparison to Outdoor Recreation Impact Estimates Prepared for the 1987 Lake State Governors' Conference on Forestry

a. Updated 1987 estimates

Profiles of nonresident and combined resident and nonresident outdoor recreation spending were used for the 1987 Governors' Conference on Forestry (Pedersen, Chappelle, and Lothner, 1989). These were converted from their original disaggregated IMPLAN version 1.1 format to four of the version 2.0 aggregation schemes used in this study. The profiles were not converted to the fully disaggregated sectorization scheme as to do so would have required making several arbitrary assumptions regarding how to disaggregate the IMPLAN version 1.1 sectors to the version 2.0 sectors. The translation of the profiles to the aggregated schemes was based on a perfect correspondence between the version 1.1 sectors which were aggregated and the resulting version 2.0 sector.

Changes in the IMPLAN modeling system and different sectorization schemes resulted in modest changes in total estimated impacts from those reported in Pedersen et al. (1989). The original estimates and BSTLK re-estimated estimates are presented in Table 20. The impacts reported are based on IMPLAN's type III multipliers. The re-estimated BSTLK impacts were quite similar across the four sectorization schemes. They differed from each other by less than five percent; Table 20 presents their average.

Table 20. Comparison of Estimated Type III Impacts Based on 1987 Recreation Spending Profiles

	OUTPUT (million 1982 $)	PERSONAL INCOME (million 1982 $)	EMPLOYMENT (thousand jobs)
Nonresidents Only			
Original 1987 Gov. Conf. Est.	1223	340	25.5
Re-estimated Average	1399	369	25.6
Total			
Original 1987 Gov. Conf. Est	4245	1143	85.2
Re-estimated Average	4729	1274	88.1

b. Comparison of Governors' Conference and FHW Impact Estimates

Table 21 relates the four FHW spending impacts to the re-estimated 1987 Governors' Conference impacts in terms of the former's percentage of the latter. The FHW nonresident category is stated as a percentage of the Governors' Conference nonresident impacts, whereas the other three categories'impacts are related as a percent of the total resident and nonresident Governors' Conference impacts.

There are several differences between the FHW recreation economic spending data and the 1987 Governors' Conference data. The latter incorporated many more types of recreation than the FHW data, but for an area in the Lake States that was about ten percent smaller than the FHW study area. Major durable equipment expenditures were not included in the 1987 data; however, there were some nonresident equipment expenditures in the area that were included. Also, the 1987 analysis used point estimates rather than a range of estimates.

The range of FHW impact estimates appear reasonable relative to the 1987 estimates, given the differences between the 1987 analysis and the FHW data used here. FHW nonresident impacts range between 25% to about 65% of the 1987 nonresident spending. The lower FHW estimates are due to three factors. The 1987 data included more recreation activities; it included some nonresident expenditures on equipment; and the nonresident share of FHW activities was lower than the 20% to 25% share of recreation activities attributed to nonresidents in the 1987 study.

The FHW spending category which best mirrors the spending items included in the 1987 analysis is the category of total spending minus special equipment. (The FHW "special" equipment category is largely comprised of major durable equipment expenditures.) This FHW category ranges from a low estimate of about 50% of the 1987 total recreation economic impact estimate, to a high estimate above the 1987 estimate. This illustrates that fishing, hunting, and wildlife-associated recreation comprise a large share of outdoor recreation in the forested areas of the Lake States.

Table 21. BSTLK % of 1987 Lake State Outdoor Recreation Impact Estimates

	OUTPUT		PERSONAL INCOME		EMPLOYMENT	
	Low	High	Low	High	Low	High
Nonresidents Only	25%	67%	25%	65%	25%	64%
Trip Spending Only	35%	77%	34%	75%	33%	73%
Total less Spec Equip	50%	123%	53%	130%	49%	116%
Total	63%	176%	68%	193%	59%	158%

Comparison of Recreation Multipliers to "Average" Multipliers

Multipliers associated with recreation spending were compared to average multipliers in order to relate recreation spending impacts to average sectoral impacts. Average sales, employment, and personal

income multipliers for the BSTLK, 31-sector model were derived and then multiplied by four categories of recreation spending. The four categories included both types of spending considered in the 1987 Governors' Conference analysis (nonresident spending only and both resident and nonresident spending) and low and high estimates of nonresident FHW spending. The resulting impact estimates were then compared to the sums that resulted by multiplying sector-specific spending by sector-specific multipliers for the same four recreation spending categories.

Table 22 presents a comparison of the impact estimates. The comparison includes absolute impact magnitudes and the impacts derived from sector-specific spending and multipliers expressed as a percentage of the impacts derived from total spending and average multipliers. This ratio of impacts provides an indication of the size of outdoor recreation impacts relative to the average for the rest of the economy. The results conform with the expectation that outdoor recreation generates many more jobs than the average sector, but lower amounts of personal income. This is due to the disproportionate amount of outdoor recreation spending in service sectors which typically employ more people, but at lower wages. It is worth noting, however, that the personal income type III impacts are higher than the average sector impacts (see Table 22). This implies the induced effect associated with recreation sectors more than offsets the relatively lower direct and indirect personal income. Slightly more output than average was generated by the sector-specific outdoor recreation impact estimates, but the difference was not not appreciable.

Differences between the impacts associated with using sector-specific multipliers versus average multipliers also illustrate the error that may be introduced by borrowing "average" multipliers from other studies, or applying the same multiplier across different economic variables (e.g. using a sales multiplier for employment or income impact estimates).

Table 22. Contrast of Impacts from Using Average Vs. Sector-Specific Multipliers for Recreation Spending, Based on a 31 Sector Model and Revised (BSTLK) IMPLAN RPCs

	1987 GOV CONF NONRESIDENTS ONLY		1987 GOV CONF BOTH RES & NONRS		FHW LOW EST NONRESIDENTS ONLY		FHW HIGH EST NONRESIDENTS ONLY	
	TYPE I	TYPE III	TYPE I	TYPE III	TYPE I	TYPE III	TYPE I	TYPE III
(1982 million $) MULTIPLIERS USED	OUTPUT		OUTPUT		OUTPUT		OUTPUT	
AVERAGE:	896	1224	3062	4184	224	306	613	838
SECTOR SPECIFIC:	958	1404	3195	4741	243	356	657	955
RATIO OF SECTOR-SPECIFIC TO AVERAGE:	106.9%	114.7%	104.3%	113.3%	108.3%	116.2%	107.1%	114.0%
(1982 million $) MULTIPLIERS USED	PERSONAL INCOME		PERSONAL INCOME		PERSONAL INCOME		PERSONAL INCOME	
AVERAGE:	267	358	911	1225	67	90	183	245
SECTOR SPECIFIC:	245	370	852	1285	60	92	164	247
RATIO OF SECTOR-SPECIFIC TO AVERAGE:	91.8%	103.1%	93.5%	104.9%	90.4%	102.4%	89.6%	100.7%
(jobs) MULTIPLIERS USED	EMPLOYMENT		EMPLOYMENT		EMPLOYMENT		EMPLOYMENT	
AVERAGE:	13471	18792	46035	64222	3368	4699	9221	12864
SECTOR SPECIFIC:	18310	25544	63476	88554	4632	6463	12240	17075
RATIO OF SECTOR-SPECIFIC TO AVERAGE:	135.9%	135.9%	137.9%	137.9%	137.5%	137.5%	132.7%	132.7%

CHAPTER VI

SUMMARY, IMPLICATIONS, AND CONCLUSION

Introduction

This study has addressed issues relating to nonsurvey I-O models, estimation of outdoor recreation economic impacts using IMPLAN, and specific factors influencing the size of Lake State outdoor recreation economic impacts. Implications of this study for nonsurvey I-O models and specifically for the IMPLAN modelling system will be summarized first. This is followed by a presentation of conclusions regarding the measurement of outdoor recreation impacts, as illustrated by the measurement of impacts for the Lake States. Several further research needs are summarized at the end of the chapter.

Use of Nonsurvey I-O Models

The nature of the debate regarding nonsurvey models is conveyed in Jensen's comments regarding the five "ready-made" modeling systems reviewed by Brucker et al. (1987, p. 21):

> "In the evaluation of any method of economic model compilation there can, at the bottom line, be only two fundamental questions of concern, namely does the method produce a model which is representative of reality within professionally acceptable limits and do the results of the model have professionally acceptable levels of integrity in the real world?"

Jensen goes on to pose a series of eight questions specifically aimed at nonsurvey models. None of these eight questions, nor his "two fundamental questions of concern" address whether nonsurvey models will be used -- let alone experience an increase in use -- or whether they can be improved. Most literature on nonsurvey I-O does not address these questions. The answer to both of these unaddressed questions is "yes."

Nonsurvey models will be increasingly used partly because of advancements in computer hardware and partly due to improvements in input-output model software. The speed at which computer developments have occurred was not envisioned even as recently as 1985, when Richardson predicted the future lay with hybrid (partial survey) I-O models. The high costs, in terms of both time and money, for conducting surveys are additional negative factors mitigating against their use. It now appears the greatest number of I-O applications will not entail developing I-O models using a mix of survey and nonsurvey methods. Future I-O applications largely will be done entirely with nonsurvey models due to the advent of high speed, powerful computers and inexpensive, user-friendly modeling systems.

Relatively inexpensive, "ready-made," input-ouput modeling systems are now available that operate on personal computers. A prime example is the USDA Forest Service's IMPLAN model which is receiving wider and wider use. At a cost of only a few hundred dollars, regional economic models can often be generated with IMPLAN software in under a few hours. In the face of a proliferation of nonsurvey models, the practical issue for regional economists is how to improve these models and their use, not whether survey I-O tables are superior to nonsurvey tables. The issue of survey model superiority is essentially moot if funding is not available for them and nonsurvey models and nonsurvey applications are proliferating. The gap is likely to increase between the costs of conducting primary surveys and the costs of simply using a nonsurvey model. At the same time, decisionmakers generally will not be concerned or knowledgeable enough to distinguish between the sources of impact

estimates, nor be able to differentiate between experienced I-O analysts and I-O novices.

The paramount role regional economists can play in this situation is to help refine the reliability of I-O models that will be used. Advice from regional economists is also appropriate on how to best utilize scarce survey funding to supplement or crosscheck nonsurvey model estimates. For example, subject to funding constraints, priorities for surveying should include sectors which are the focus of the study (e.g.- hotels and lodging or eating and drinking establishments for recreation and tourism studies), sectors which account for large proportions of the region's economic activity, and sectors which have peculiar values in the nonsurvey model relative to other sectors in the model or relative to the same sector in other regions or studies (e.g. the zero-RPC sectors in the current IMPLAN model). It is also appropriate to encourage surveys in the case of modeling small regions, such as cities or counties. It is generally more feasible to survey a smaller region's establishments and there is a greater likelihood of error in nonsurvey I-O extrapolations from national averages to small regions. However, advice on expeditious surveys should be accompanied by research and advice on other means to improve nonsurvey models and their use.

Questions such as Jensen's "do the ready-made methods satisfactorily fulfill our professional obligations and standards in producing reliable and high quality advice?" (Ibid., p. 21) miss the point that nonsurvey models and methods are not static. The current performance of nonsurvey models is not the only practical concern; there is evidence that the models may be made more reliable. The focus of

attention should be on how the models and their use can be improved, especially if it is true that many or most I-O applications will be carried out on ready-made models by persons without extensive I-O knowledge. Regional economists' "professional obligations," to the extent they exist, are not static. Nor do they exist in a vacuum. Regional economists should be responsive to and help mold the direction applications are proceeding. This would be a more substantial contribution to furthering I-O analysis than comments on the current status of I-O models or bemoaning the fact that certain ideals (e.g. all I-O models be based on surveys) will not be achieved.

IMPLAN

Nonsurvey methods are being refined. Richardson (1985, p. 623) noted that the RPC approach was "a welcome change from endlessly repetitive and mechanical location quotient methods..." The adoption of an alternative RPC estimation procedure in the IMPLAN modeling system represented a further advancement in terms of breaking new ground. There are many other developments associated with the IMPLAN modeling system that have enhanced its use as an impact measurement tool. The personal computer version incorporates a wide array of user-friendly features. To name just a few of these, they include: the ability to generate a vast array of user-selected reports; a fast, user-friendly sector aggregation module and data editing software; and the disaggregation of sectors that are particularly useful for specific applications (recreation-related retail and wholesale trade, for example). In addition, there are continually-improving training workshops and materials for first-time users. These include the provision of sector-specific deflators and personal consumption expenditure data.

Another development with the IMPLAN model is that it is being converted to a social accounting matrix (SAM) format. Adelman and Robinson (1986) explain the distinction between SAM and I-O accounting formats in the following manner:

> "A standard input-output model includes the intersectoral flows of intermediate inputs, and so captures one major source of linkages in the economy. However, the input-ouput model ignores the flows from producing sectors to factors of production (value added), and then on to entities such as government and households, and finally back to demand for goods. A Social Accounting Matrix (SAM) expands the input-output accounts to include a complete specification of the circular flow in the economy." (p. 4)

Adoption of the SAM format will permit better illumination of transfers between institutions and facilitate analyses that are constrained by the traditional I-O accounting framework.

Along with continually increasing enhancements in computing power and storage capabilities, the IMPLAN modeling system has made it relatively easy to generate economic impact estimates in very short periods of time. However, there are many problems remaining with the reliability and interpretation of such estimates for regional economists to address. These problems stem from both the accuracy of input data used with IMPLAN and the construction of the modeling system itself.

Input data pitfalls are substantial, especially for outdoor recreation applications. Problems include the very basic delineation of activities that constitute outdoor recreation and identification of sector-specific spending associated with those activities. Accurate recreation participation and spending profiles need to be constructed before reliable recreation economic impacts may be estimated. Spending profiles may then be converted into final demand vectors which, in turn, "drive" input-output (I-O) models. Thus, the levels of direct,

indirect, and induced sales, value-added, income, or employment impacts generated by a recreation I-O analysis critically depend on participation and spending estimates.

As noted in the first chapter, the reliability of recreation participation levels and spending profiles are probably at least as important and in need of improvement as the input-output model used to generate the economic impact estimates. The examination here of FHW activity participation and spending support this contention. The greatest range in economic impacts for the Lake States (besides the issue of what spending categories were included in the impacts) stemmed from low and high estimates of spending which reflected limited survey sample sizes. This is an acute problem for many recreation studies.

On the other hand, problems with an I-O model sometimes may be identified and rectified, resulting in universal improvements for future users of the I-O model system. It is argued here that potentially large improvements in the accuracy of IMPLAN impact estimates can be achieved by making more detailed sector allocation bridge tables available to IMPLAN users and by re-calculating trade estimates used in the IMPLAN model system. More narrowly defined sector-specific deflators are a possible further enhancement.

Bridge tables devised as part of this research are preliminary and need further review and refinement before they are widely distributed. However they, or other sector allocation schemes based on BEA's detailed pce worksheets, will be far superior to other bridge tables that are aggregated at the pce I-O category level. Many sectors unrelated to the spending being bridged will likely be included at the gross I-O category level, reducing the precision of sector spending allocation and

subsequent impacts. Simply removing the obviously inappropriate sectors does not address their influence on distribution margins. The solution is to use disaggregated, detailed pce items and aggregate these where necessary to fit survey spending categories. This issue is further discussed and illustrated in a paper by Propst and Siverts (1990).

Many RPC values currently being generated by IMPLAN are highly questionable and may lead to significant distortions in economic impact estimates. This is especially true for particular industries, including many sectors affected by recreation. The extent of distortion and sectors affected differ from state to state. Current and alternative IMPLAN RPC estimates were examined for different sectors and regions. Alternative trade estimates were developed and used in the generation of IMPLAN models for different-sized regions. The influence of trade values on impact estimates was then observed. Results indicate IMPLAN's trade estimates should be revised, incorporating data from the reconciled 1977 MRIO database. New trade estimates can be calculated for the entire IMPLAN modeling system with little difficulty. This was illustrated by calculations of RPCs for the service sectors of all fifty states and for all economic sectors in the Lake States.

It should be noted that, for any particular region, means probably do not exist to establish which industries will have high or low RPCs on a completely objective, secondary basis. Differences in regional economies, trade relations, and other variables prevent any possibility of establishing an absolutely precise nonsurvey means for determining RPCs. It will always be appropriate for impact analysts to review their estimates carefully and take advantage of opportunities to crosscheck the estimates against other data sources. Industry associations, state

and local government personnel, and other federal or private information sources may provide additional direction for the task of improving RPCs and subsequent impact estimates. Similar qualifications apply to the use of standardized bridge tables and sector-specific deflators.

Outdoor Recreation Economic Impacts

Several points originally presented in chapters one and two warrant review here. The size of estimated outdoor recreation impacts will depend on a number of factors besides the quality of the input data and I-O model. A major influence will be the objectives of the study which, in turn, will determine the definition of outdoor recreation and what recreation activities are included in an analysis.

Two types of objectives may be differentiated. One type of objective is to estimate economic impact benefits (sometimes mistakenly identified as total impacts) associated with recreationists' spending. The purpose of impact analysis under this objective is to quantify the economic effects associated with recreation, but only as narrowly defined by resident and nonresident recreationists' expenditures. Such an analysis should not be considered as providing a comprehensive description of recreation's contribution to a regional economy. It only describes economic impacts associated with a particular configuration of economic sectors linked to recreationists' spending.

A second type of objective is to gain insight into the contributions of outdoor recreation to a region's economic development. This objective entails a more difficult, challenging undertaking for it requires more extensive analysis. Following economic base theory, which maintains that exports provide the basis of a region's economic growth,

the analysis may only include nonresidents' recreation expenditures. However, excluding the examination of resident spending may be a mistake. There may be significant impact differentials between sectors and between subregions within the region being analyzed from the transfer of spending by resident recreationists. Also, the issue of import substitution -- in this case, recreating more within the region rather than outside of it -- may also be important.

In any case, the objective of analyzing recreation's economic development potential requires more of a comparative analysis or net benefit approach. Costs incurred to provide the recreation experience need to be considered and compared to benefits. These costs encompass a myriad of governmental costs. Opportunity costs to extractive industries and other affected private interests should also be considered. A truly comprehensive effort will address social costs, such as analyzing changes in the size and composition of a community and impacts relating to community identification. Resource and institutional constraints may also be important. Consideration should be given to distributional effects. These may be partly analyzed within the context of an I-O analysis if the household sector is disaggregated according to income (as it is within version 2.0 of IMPLAN). In sum, simply using an I-O model to express economic impacts stemming from recreationists' spending is inadequate if the goal is to assess the economic development contribution of outdoor recreation.

The use of social accounting matrices ("SAMs") also will not provide a comprehensive picture of economic development issues. IMPLAN's SAM format will present a greater elaboration of economic flow relationships between institutions. It will offer more insights into

some distributional and governmental spending issues than a standard I-O table. It will remain limited, however, due to data constraints. The more extensive SAM format will use data currently incorporated in IMPLAN's I-O format, plus additional secondary data on transfers between institutions. In this author's opinion, the SAM's greater elaboration of economic relationships between institutions will be based on data that are probably less reliable than data used as the basis for IMPLAN's current nonsurvey I-O tables. For example, secondary data on transfers between institutions are more limited and less subject to crosschecking than data on sales and employment. At a minimum, the more elaborate SAM framework entails more opportunity for error. Also, extensive examination of the economic relationships depicted in SAM models, such as those between value added and final demand sectors, will not be forthcoming for some time. Furthermore, the SAM, like I-O tables generally, will only depict market transactions. Important nonmarket factors, including those that feed back upon markets such as amenity influences on business location decisions, will remain outside the models.

Influences on the Size of Lake State Outdoor Recreation Impacts

Some of the results of this study apply only to the Lake States and particular recreation activities in the study's designated forested area of the Lake States. In particular, many of the results regarding Lake State outdoor recreation impacts may not apply to other regions or models with different economic structures and sector aggregations. However, influences on the size of Lake State outdoor recreation impacts may also influence impacts for other regions. An examination of these

influences will indicate their relative importance for consideration by recreation analysts.

The results presented in chapter five indicated that the small sample size of recreation participants contributed to the greatest variability in impact measurement. Another critical issue was the specific categories of spending being considered. For example, there was a significant difference found between trip-related spending versus spending which included equipment expenditures as well. Trip-related spending was less than half of total FHW-reported spending.

The influence of RPCs was not large for the Lake States. This was indicated by several statistical measures of differences between the unadjusted (UNCHLK) and adjusted (BSTLK) multipliers and small differences between these two models' summary impact estimates. Wisconsin and Minnesota had relatively high unadjusted service sector RPCs, while Michigan's were not extremely low either. Differences between multipliers based on alternative trade estimates were found for individual sector impacts. However, multiplier differences between the unaltered RPC model and the "best" RPC model were not substantial.

Errors in IMPLAN's RPCs for the Lake States model involve both underestimation and overestimation. The overestimated and underestimated RPCs will partially negate each other when multipliers are derived. Larger RPC influences were found for the State of Michigan. The evidence presented on average service sector RPCs indicates much greater RPC influences on impacts are likely to be found for other states, such as New York and New Jersey, which have RPC estimation error more uniformly underestimated or overestimated.

IMPLAN models of small, substate areas may also have more bias introduced to their multipliers from inaccurate RPC estimates. Small, substate economies will tend to have a greater representation of service sectors as a proportion of the total number of sectors in their economies. Errors in IMPLAN's RPC estimates appear to be more pronounced with service sectors than commodity sectors. This is true in part because a higher proportion of service sector demands are generally met by local production than are commodity demands. This means that average service sector RPCs should be expected to be higher than average commodity sector RPCs. Therefore, zero or near-zero service sector RPCs are more divergent from true, real-world values than zero or near-zero commodity RPCs. Differences in the derivation of IMPLAN's RPCs may account for there appearing to be more dubious service sector RPCs than commodity sector RPCs. Commodity sector RPCs were derived econometrically, service sector RPCs were adopted directly from the original Jack Faucett Associates 1977 MRIO data.

Aggregation of sectors also did not appear to significantly affect impact results. Differences between impact sums were generally under ten percent. The only slight exception to the lack of any pattern being observed was with regards to the aggregation scheme which lumped all nonessential sectors into one large "miscellaneous" or "other" sector. This aggregation scheme tended to overestimate impacts relative to alternative aggregation schemes, even in comparison to models with fewer sectors.

The results regarding aggregation should be interpreted in light of available software and hardware and user ease of incorporating different practices relating to input data or IMPLAN model parameters. Although

model aggregation did not appear to affect Lake State impact results dramatically, greater model size generally does not pose computer difficulties or significant additional computing time requirements. This should be interpreted as lending support to the contention that it is best for impact analysts to work at the most disaggregated level possible. The availability of computer spreadsheet software significantly minimizes the required time to aggregate results for further interpretation and presentation to other interested parties.

The large range in Lake State FHW spending estimates suggests that recreation economic impact studies should more prominently address the precision implications of sample sizes and related qualifications regarding the variability of impact estimates. This author was told by FHW report staff that there are seldom inquiries about or discussion of the statistical parameters appearing in FHW reports. It was their impression that the FHW sampling statistics are almost universally ignored.

This is not unique to recreation studies; most economic impacts are presented as deterministic point estimates. The excuse for multipliers and other outputs from nonsurvey models is that sampling and nonsampling errors are unknown, in part due to such models employing a variety of data sources and reconciliation procedures in their construction. For example, the "corrected" MRIO data employed the RAS procedure to eliminate data errors and balance the original Jack Faucett data which, in turn, was based on reconciling many sources of secondary economic data. It is difficult, if not impossible, to say how precise the corrected MRIO data are, although it can be said that its I-O accounts have been balanced and appear consistent. Also, from a regional

economic perspective, trade estimates derived from the corrected MRIO data appear much more reasonable than those contained in IMPLAN.

It is misleading to only present point estimates when information on sampling errors is available. Sampling errors are often known or may be derived for recreation data that are used as final demand inputs for I-O models. These may be used to derive ranges of impacts based on these sampling errors. In contrast, the precision of many I-O model parameters are likely to remain unknown; however, an examination of parameter values may reveal impact estimates (or RPCs, multipliers, etc.) are likely to fall within certain ranges. For example, this study developed floor, ceiling, and "best estimate" multipliers based on crosschecking estimated RPCs against RPC values for other regions and alternative secondary data sources. Presentation of recreation economic impacts in the form of ranges may be important not only to reflect what is known about the estimates' precision, but also to draw attention to the reliability of such estimates. Larger FHW samples or improved sample design appear necessary to improve the precision of recreation spending estimates for substate areas.

The ease of examining and incorporating more detailed sector allocations and refined RPCs also implies a sizeable savings of time and energy can be achieved if this is done at the modeling system level rather than by users. Most IMPLAN users do not have a fraction of the time this author took to research the RPC issue or develop a detailed sector allocation bridge. Many IMPLAN users may not even have the knowledge or experience to evaluate the need to perform such tasks. Generic changes in RPC estimates should take place with the IMPLAN modeling system and materials supplied in conjunction with its use. This

would assure some improvement in the model's use which otherwise may not take place if left up to IMPLAN model users.

Further Research Needs

Several points have been made throughout this thesis regarding further research needs. These may be summarized in terms of the IMPLAN modeling system and the measurement of outdoor recreation economic impacts.

The foremost conclusion of this research is that adequate evidence exists to indicate IMPLAN's RPCs should be re-estimated using the corrected MRIO database. This should be done with the econometric procedures utilized in the original IMPLAN RPC estimation process, although alternative independent variables could be considered. Re-estimation of RPCs would improve the reliability of IMPLAN's impact estimates for most regional models and sectors. Efforts to re-estimate IMPLAN RPCs with alternative independent variables alone will not enhance the quality of the RPC estimates as long as a faulty database (the original MRIO data) is used to generate initial RPC dependent variable values.

Another major emphasis of this research has been to refine the allocation of reported FHW recreation spending to IMPLAN's sectors. The resulting detailed bridge tables represent an improvement over past bridge tables that were based on aggregated pce I-O categories. However, the tables prepared as part of this research are in need of further review. Also, improvements could be made to their design to enhance their use by a wider audience, especially for non-FHW applications and I-O models other than IMPLAN.

There is little hope for standardizing outdoor recreation definitions and measurements. This is due to the diverse nature of outdoor recreation and its association with a broad array of resources and interests. These range from tourism and leisure studies through environmental and land or water use issues. Accurate, universally applicable spending profiles of recreationists are virtually precluded by these factors. What activities are counted in outdoor recreation studies will always be somewhat arbitrary, reflecting a study's particular objectives and data availablity.

This does not mean that contrasts across studies can not be made. Contrasts of comprehensive efforts at recreation economic impact assessment may be especially helpful. Comparisons of existing studies across states and regions, such as Keiner's 1985 report, are invaluable in terms of indicating how methods and data may be improved. They enable progress in identifying better secondary data sources and the treatment of particular issues. They foster standardization in the proper identification and description of what is actually measured. For example, studies focusing only on recreationists' expenditures are often referred to as being economic development studies or "total" recreation economic impact studies. Comparisons of different studies will illustrate that studies of economic development or total impacts from recreation encompass cost factors and other issues besides merely recreationists' expenditures.

Public costs for recreation deserve further research to help balance the usual presentation of recreation economic benefits. A major benefit and advancement in measuring outdoor recreation economic impacts could come from identification and examination of data sources

pertaining to public costs for recreation. A further extension of research on public costs would be to convert them for use with IMPLAN when the modeling system is fully converted to the SAM format.

Conclusion

Three major findings stem from this analysis. The first is that IMPLAN's Version 2.0 RPCs are seriously flawed and can be significantly improved by being re-estimated using a corrected 1977 MRIO database. The second is that point (deterministic) estimates of outdoor recreation economic impacts are misleading because they ignore variability implied by sampling errors. A third finding is that estimates of recreationists' spending impacts may vary by a factor of several multiples, depending on what categories of spending are included. Recreation impacts that include all equipment expenditures may be more than twice the size of impacts which only include trip expenditures.

Advancements in computer speed and capacities along with improvements in I-O software design can be expected to continue. Impact analysis that previously took weeks, if not months, of work may now be accomplished in minutes. For example, once familiarity with IMPLAN is achieved (which only takes a matter of a few days training or construction of a few models), the time it takes from selecting a region through printing out sets of multipliers may be under an hour. (This author completed such a process for Kalamazoo County, Michigan in under twenty minutes, despite bugs in an early version of Micro IMPLAN being used at the time.)

Fast turnaround in generating impact estimates provide the opportunity for abuse, partly because the more software is "user friendly" the less care and knowledge is required to use it. Also, the

time devoted to the task of preparing and reviewing the impacts may decrease commensurately with the faster generation of the impact estimates. Some savings in time may be applied to more crosschecking and sensitivity analysis if impact analysts are made aware of the efficacy of engaging in these tasks.

Most IMPLAN users will probably continue to take their impact results and IMPLAN materials at face value without extensive examination. It is important for the modeling system to maximize its precision while minimizing potential user error in these circumstances. Prospects for improving the IMPLAN model system identified in this thesis merely reduce the potential problems from accepting the model as is and provide its users with a more solid basis upon which to further improve impact estimates. Additional improvements, let alone the proper use of the model and correct interpretation of the results, ultimately depend upon model users and the regional science profession.

APPENDICES

APPENDIX A: INDUSTRY CLASSIFICATION OF THE MICRO-IMPLAN 528 SECTOR INPUT/OUTPUT TABLES*

APPENDIX N. Industry Classification of the Micro-IMPLAN 528 sector Input/Output tables

No.	Sector Name	BEA Commodity	Standard Industry Classification (SIC)
1	DAIRY FARM PRODUCTS	(1.0100)	0241
			Also : part of 0191, 0259, 0291
2	POULTRY AND EGGS	(1.0200)	0251 0252 0253
			Also : part of 0191, 0219, 0259, 0291
3	RANCH FED CATTLE	(1.0311)	part of 0191, 0212, 0219, 0259, 0291
4	RANGE FED CATTLE	(1.0312)	part of 0191, 0212, 0219, 0259, 0291
5	CATTLE FEEDLOTS	(1.0313)	0211
			Also : part of 0191, 0219, 0259, 0291
6	SHEEP, LAMBS AND GOATS	(1.0314)	0214
			Also : part of 0191, 0219, 0259, 0291
7	HOGS, PIGS AND SWINE	(1.0315)	0213
			Also : part of 0191, 0219, 0259, 0291
8	OTHER MEAT ANIMAL PRODUCTS	(1.0316)	part of 0191, 0219, 0259, 0291
9	MISCELLANEOUS LIVESTOCK	(1.0302)	0271 0272
			Also : part of 0191, 0219, 0259, 0279, 0291
10	COTTON	(2.0100)	0131
			Also : part of 0191, 0219, 0259, 0291
11	FOOD GRAINS	(2.0201)	0111 0112
			Also : part of 0191, 0219, 0259, 0291
12	FEED GRAINS	(2.0221)	0115
			Also : part of 0139, 0191, 0219, 0259, 0291
13	HAY AND PASTURE	(2.0222)	part of 0139, 0191, 0219, 0259, 0291
14	GRASS SEEDS	(2.0203)	part of 0139, 0191, 0219, 0259, 0291
15	TOBACCO	(2.0300)	0132
			Also : part of 0191, 0219, 0259, 0291
16	FRUITS	(2.0401)	0171 0172 0174 0175
			Also : part of 0179, 0191, 0219, 0259, 0291
17	TREE NUTS	(2.0402)	part of 0173, 0179, 0191, 0219, 0259, 0291
18	VEGETABLES	(2.0501)	0134 0161
			Also : part of 0119, 0139, 0191, 0219, 0259, 029
19	SUGAR CROPS	(2.0502)	0133
			Also : part of 0191, 0219, 0259, 0291
20	MISCELLANEOUS CROPS	(2.0503)	part of 0119, 0139, 0191, 0219, 0259, 0291
21	OIL BEARING CROPS	(2.0600)	0116
			Also : part of 0119, 0139, 0173, 0219, 0259, 029
22	FOREST PRODUCTS	(2.0701)	part of 0181, 0191, 0219, 0259, 0291
23	GREENHOUSE AND NURSERY PRODUCTS	(2.0702)	0182 0189
			Also : part of 0181, 0191, 0219, 0259, 0291
24	FORESTRY PRODUCTS	(3.0001)	0810 0820 0840 0970
25	COMMERCIAL FISHING	(3.0002)	0910
26	AGRICULTURAL, FORESTRY, FISHERY SERVICES	(4.0001)	0710 0720 0750 0760 0254 0850 0920
			Also : part of 0279
27	LANDSCAPE AND HORTICULTURAL SERVICES	(4.0002)	0780
28	IRON ORES	(5.0100)	1011
29	FERROALLOY ORES, EXCEPT VANADIUM	(5.0200)	1061
30	COPPER ORES	(6.0100)	1021
31	LEAD AND ZINC ORES	(6.0201)	1031
32	GOLD ORES	(6.0202)	1041
33	SILVER ORES	(6.0203)	1044
34	BAUXITE AND OTHER ALUMINUM ORES	(6.0204)	1051
35	METAL MINING SERVICES	(6.0205)	1081
36	MERCURY ORES	(6.0306)	1092
37	URANIUM-RADIUM-VANADIUM ORES	(6.0207)	1094
38	METAL ORES, NOT ELSWHERE CLASSIFIED	(6.0208)	1099
39	ANTHRACITE AND ANTHRACITE MINING SERVICES	(7.0100)	1111
			Also : part of 1112
40	BITUMINOUS AND LIGNITE MINING, SERVICES	(7.0200)	1211
			Also : part of 1213
41	NATURAL GAS	(8.0101)	Caution : 1310 is split between 8.0101 and 8.0102
42	CRUDE PETROLEUM	(8.0102)	1310
			Caution : 1310 is split between 8.0101 and 8.0102
43	NATURAL GAS LIQUIDS	(8.0200)	1321
44	DIMENSION STONE	(9.0100)	1411
45	CRUSHED AND BROKEN LIMESTONE	(9.0201)	1422
46	CRUSHED AND BROKEN GRANITE	(9.0202)	1423
47	CRUSHED AND BROKEN STONE, N. E. C.	(9.0203)	1429
48	CONSTRUCTION SAND AND GRAVEL	(9.0301)	1442
49	INDUSTRIAL SAND	(9.0302)	1446

APPENDIX N. Industry Classification of the Micro-IMPLAN 528 sector Input/Output tables, continued.

No.	Sector Name	BEA Commodity	Standard Industry Classification (SIC)
50	BENTONITE	(9.0400)	1452
51	FIRE CLAY	(9.0500)	1453
52	FULLER'S EARTH	(9.0600)	1454
53	KAOLIN AND BALL CLAY	(9.0700)	1455
54	CLAY, CERAMIC, REFRACTORY MINERALS, N.E.C.	(9.0800)	1459
55	NONMETALLIC MINERALS (EXCEPT FUELS) SERVICE	(9.0900)	1481
56	GYPSUM	(9.1000)	1492
57	TALC, SOAPSTONE, AND BORATE MINERALS	(9.1100)	1496
58	MISC. NONMETALLIC MINERALS, N.E.C.	(9.1200)	1499
59	BARITE	(10.0100)	1472
60	FLOURSPAR	(10.0200)	1473
61	POTASH, SODA, AND BORATE MINERALS	(10.0300)	1474
62	PHOSPHATE ROCK	(10.0400)	1475
63	ROCK SALT	(10.0500)	1476
64	SULFUR	(10.0600)	1477
65	CHEMICAL, FERTILIZER MINERAL MINING, N.E.C.	(10.0700)	1479
66	NEW RESIDENTIAL STRUCTURES	(11.0100)	1521 1522 1530 In reality : pt. of the corresponding SICs
67	NEW INDUSTRIAL AND COMMERCIAL BUILDINGS	(11.0200)	1541 1542 In reality pt. of the corresponding SICs
68	NEW UTILITY STRUCTURES	(11.0300)	1623 Also : part of 1629
69	NEW HIGHWAYS AND STREETS	(11.0400)	1611 1622
70	NEW FARM STRUCTURES	(11.0500)	
71	NEW MINERAL EXTRACTION FACILITIES	(11.0600)	part of 108, 1112, 1213, 136, 148
72	NEW GOVERNMENT FACILITIES	(11.0700)	1629 In reality pt. of 1629
73	MAINTENANCE AND REPAIR, RESIDENTIAL	(12.0100)	pt of 1389
74	MAINTENANCE AND REPAIR OTHER FACILITIES	(12.0200)	pt of 1389
75	MAINTENANCE AND REPAIR OIL AND GAS WELLS	(12.0215)	1380 In reality pt. of 138
76	COMPLETE GUIDED MISSILES	(13.0100)	3761
77	AMMUNITION, EXCEPT FOR SMALL ARMS, N.E.C	(13.0200)	3483
78	TANKS AND TANK COMPONENTS	(13.0300)	3795
79	SMALL ARMS	(13.0500)	3484
80	SMALL ARMS AMMUNITION	(13.0600)	3482
81	OTHER ORDNANCE AND ACCESSORIES	(13.0700)	3489
82	MEAT PACKING PLANTS	(14.0101)	2011
83	SAUSAGES AND OTHER PREPARED MEATS	(14.0102)	2013
84	POULTRY DRESSING PLANTS	(14.0103)	2016
85	POULTRY AND EGG PROCESSING	(14.0104)	2017
86	CREAMERY BUTTER	(14.0200)	2021
87	CHEESE, NATURAL AND PROCESSED	(14.0300)	2022
88	CONDENSED AND EVAPORATED MILK	(14.0400)	2023
89	ICE CREAM AND FROZEN DESSERTS	(14.0500)	2024
90	FLUID MILK	(14.0600)	2026
91	CANNED AND CURED SEA FOODS	(14.0700)	2091
92	CANNED SPECIALTIES	(14.0800)	2032
93	CANNED FRUITS AND VEGETABLES	(14.0900)	2033
94	DEHYDRATED FOOD PRODUCTS	(14.1000)	2034
95	PICKLES, SAUCES, AND SALAD DRESSINGS	(14.1100)	2035
96	FRESH OR FROZEN PACKAGED FISH	(14.1200)	2092
97	FROZEN FRUITS, JUICES AND VEGETABLES	(14.1301)	2037
98	FROZEN SPECIALTIES	(14.1302)	2038
99	FLOUR AND OTHER GRAIN MILL PRODUCTS	(14.1401)	2041
100	CEREAL PREPARATIONS	(14.1402)	2043
101	BLENDED AND PREPARED FLOUR	(14.1403)	2045
102	DOG, CAT, AND OTHER PET FOOD	(14.1501)	2047
103	PREPARED FEEDS, N.E.C	(14.1502)	2048
104	RICE MILLING	(14.1600)	2044
105	WET CORN MILLING	(14.1700)	2046
106	BREAD, CAKE, AND RELATED PRODUCTS	(14.1801)	2051
107	COOKIES AND CRACKERS	(14.1802)	2052
108	SUGAR	(14.1900)	2061 2062 2063
109	CONFECTIONERY PRODUCTS	(14.2001)	2065
110	CHOCOLATE AND COCOA PRODUCTS	(14.2002)	2066
111	CHEWING GUM	(14.2003)	2067
112	MALT LIQUORS	(14.2101)	2082

APPENDIX N. Industry Classification of the Micro-IMPLAN 528 sector Input/Output tables, continued.

No.	Sector Name	BEA Commodity	Standard Industry Classification (SIC)
113	MALT	(14.2102)	2083
114	WINES, BRANDY, AND BRANDY SPIRITS	(14.2103)	2084
115	DISTILLED LIQUOR, EXCEPT BRANDY	(14.2104)	2085
116	BOTTLED AND CANNED SOFT DRINKS	(14.2200)	2086
117	FLAVORING EXTRACTS AND SYRUPS, N.E.C	(14.2300)	2087
118	COTTONSEED OIL MILLS	(14.2400)	2074
119	SOYBEAN OIL MILLS	(14.2500)	2075
120	VEGETABLE OIL MILLS, N.E.C	(14.2600)	2076
121	ANIMAL AND MARINE FATS AND OILS	(14.2700)	2077
122	ROASTED COFFEE	(14.2800)	2095
123	SHORTENING AND COOKING OILS	(14.2900)	2079
124	MANUFACTURED ICE	(14.3000)	2097
125	MACARONI AND SPAGHETTI	(14.3100)	2098
126	FOOD PREPARATIONS, N.E.C	(14.3200)	2099
127	CIGARETTES	(15.0101)	2110
128	CIGARS	(15.0102)	2120
129	CHEWING AND SMOKING TOBACCO	(15.0103)	2130
130	TOBACCO STEMMING AND REDRYING	(15.0200)	2140
131	BROADWOVEN FABRIC MILLS AND FINISHING	(16.0100)	2210 2220 2230 2261 2262
132	NARROW FABRIC MILLS	(16.0200)	2240
133	YARN MILLS AND FINISHING OF TEXTILES NEC	(16.0300)	2269 2281 2282 2283
134	THREAD MILLS	(16.0400)	2284
135	FLOOR COVERINGS	(17.0100)	2270
136	FELT GOODS, N.E.C	(17.0200)	2291
137	LACE GOODS	(17.0300)	2292
138	PADDING AND UPHOLSTERY FILLING	(17.0400)	2293
139	PROCESSED TEXTILE WASTE	(17.0500)	2294
140	COATED FABRICS, NOT RUBBERIZED	(17.0600)	2295
141	TIRE CORD AND FABRIC	(17.0700)	2296
142	CORDAGE AND TWINE	(17.0900)	2298
143	NONWOVEN FABRICS	(17.1001)	2297
144	TEXTILE GOODS, N.E.C	(17.1002)	2299
145	WOMENS HOSIERY, EXCEPT SOCKS	(18.0101)	2251
146	HOSIERY, N.E.C	(18.0102)	2252
147	KNIT OUTERWEAR MILLS	(18.0201)	2253
148	KNIT UNDERWEAR MILLS	(18.0202)	2254
149	KNITTING MILLS, N.E.C	(18.0203)	2259
150	KNIT FABRIC MILLS	(18.0300)	2257 2258
151	APPAREL MADE FROM PURCHASED MATERIALS	(18.0400)	2310 2320 2330 2340 2350 2360 2370 2380 Also : part of 3999
152	CURTAINS AND DRAPERIES	(19.0100)	2391
153	HOUSEFURNISHINGS, N.E.C	(19.0200)	2392
154	TEXTILE BAGS	(19.0301)	2393
155	CANVAS PRODUCTS	(19.0302)	2394
156	PLEATING AND STITCHING	(19.0303)	2395
157	AUTOMOTIVE AND APPAREL TRIMMINGS	(19.0304)	2396
158	SCHIFFI MACHINE EMBROIDERIES	(19.0305)	2397
159	FABRICATED TEXTILE PRODUCTS, N.E.C	(19.0306)	2399
160	LOGGING CAMPS AND LOGGING CONTRACTORS	(20.0100)	2410
161	SAWMILLS AND PLANING MILLS, GENERAL	(20.0200)	2421
162	HARDWOOD DIMENSION AND FLOORING MILLS	(20.0300)	2426
163	SPECIAL PRODUCT SAWMILLS, N.E.C	(20.0400)	2429
164	MILLWORK	(20.0501)	2431
165	WOOD KITCHEN CABINETS	(20.0502)	2434
166	VENEER AND PLYWOOD	(20.0600)	2435 2436
167	STRUCTURAL WOOD MEMBERS, N.E.C	(20.0701)	2439
168	PREFABRICATED WOOD BUILDINGS	(20.0702)	2452
169	WOOD PRESERVING	(20.0800)	2491
170	WOOD PALLETS AND SKIDS	(20.0901)	2448
171	PARTICLEBOARD	(20.0902)	2492
172	WOOD PRODUCTS, N.E.C	(20.0903)	2499
173	WOOD CONTAINERS	(21.0000)	2441 2449
174	WOOD HOUSEHOLD FURNITURE	(22.0101)	2511
175	HOUSEHOLD FURNITURE, N.E.C	(22.0102)	2519
176	WOOD TV AND RADIO CABINETS	(22.0103)	2517
177	UPHOLSTERED HOUSEHOLD FURNITURE	(22.0200)	2512
178	METAL HOUSEHOLD FURNITURE	(22.0300)	2514
179	MATTRESSES AND BEDSPRINGS	(22.0400)	2515

APPENDIX N. Industry Classification of the Micro-IMPLAN 528 sector Input/Output tables, continued.

No.	Sector Name	BEA Commodity	Standard Industry Classification (SIC)
180	WOOD OFFICE FURNITURE	(23.0100)	2521
181	METAL OFFICE FURNITURE	(23.0200)	2522
182	PUBLIC BUILDING FURNITURE	(23.0300)	2531
183	WOOD PARTITIONS AND FIXTURES	(23.0400)	2541
184	METAL PARTITIONS AND FIXTURES	(23.0500)	2542
185	BLINDS, SHADES, AND DRAPERY HARDWARE	(23.0600)	2591
186	FURNITURE AND FIXTURES, N.E.C	(23.0700)	2599
187	PULP MILLS	(24.0100)	2610
188	PAPER MILLS, EXCEPT BUILDING PAPER	(24.0200)	2620
189	PAPERBOARD MILLS	(24.0300)	2630
190	ENVELOPES	(24.0400)	2642
191	SANITARY PAPER PRODUCTS	(24.0500)	2647
192	BUILDING PAPER AND BOARD MILLS	(24.0602)	2660
193	PAPER COATING AND GLAZING	(24.0701)	2641
194	BAGS, EXCEPT TEXTILE	(24.0702)	2643
195	DIE-CUT PAPER AND BOARD	(24.0703)	2645
196	PRESSED AND MOLDED PULP GOODS	(24.0704)	2646
197	STATIONERY PRODUCTS	(24.0705)	2648
198	CONVERTED PAPER PRODUCTS, N.E.C	(24.0706)	2649
199	PAPERBOARD CONTAINERS AND BOXES	(25.0000)	2650
200	NEWSPAPERS	(26.0100)	2710
201	PERIODICALS	(26.0200)	2720
202	BOOK PUBLISHING	(26.0301)	2731
203	BOOK PRINTING	(26.0302)	2732
204	MISCELLANEOUS PUBLISHING	(26.0400)	2740
205	COMMERCIAL PRINTING	(26.0501)	2751 2752 2754
206	LITHOGRAPHIC PLATEMAKING AND SERVICES	(26.0502)	2795
207	MANIFOLD BUSINESS FORMS	(26.0601)	2760
208	BLANKBOOKS AND LOOSELEAF BINDERS	(26.0602)	2782
209	GREETING CARD PUBLISHING	(26.0700)	2770
210	ENGRAVING AND PLATE PRINTING	(26.0801)	2753
211	BOOKBINDING AND RELATED WORK	(26.0802)	2789
212	TYPESETTING	(26.0803)	2791
213	PHOTOENGRAVING	(26.0804)	2793
214	ELECTROTYPING AND STEREOTYPING	(26.0805)	2794
215	INDUSTRIAL INORGANIC, ORGANIC CHEMICALS	(27.0100)	2810 2865 2869 In reality only pt. of 2819
216	NITROGENOUS AND PHOSPHATIC FERTILIZERS	(27.0201)	2873 2874
217	FERTILIZERS, MIXING ONLY	(27.0202)	2875
218	AGRICULTURAL CHEMICALS, N.E.C	(27.0300)	2879
219	GUM AND WOOD CHEMICALS	(27.0401)	2861
220	ADHESIVES AND SEALANTS	(27.0402)	2891
221	EXPLOSIVES	(27.0403)	2892
222	PRINTING INK	(27.0404)	2893
223	CARBON BLACK	(27.0405)	2895
224	CHEMICAL PREPARATIONS, N.E.C	(27.0406)	2899
225	PLASTICS MATERIALS AND RESINS	(28.0100)	2821
226	SYNTHETIC RUBBER	(28.0200)	2822
227	CELLULOSIC MAN-MADE FIBERS	(28.0300)	2823
228	ORGANIC FIBERS, NONCELLULOSIC	(28.0400)	2824
229	DRUGS	(29.0100)	2830
230	SOAP AND OTHER DETERGENTS	(29.0201)	2841
231	POLISHES AND SANITATION GOODS	(29.0202)	2842
232	SURFACE ACTIVE AGENTS	(29.0203)	2843
233	TOILET PREPARATIONS	(29.0300)	2844
234	PAINTS AND ALLIED PRODUCTS	(30.0000)	2850
235	PETROLEUM REFINING	(31.0101)	2910
236	LUBRICATING OILS AND GREASES	(31.0102)	2992
237	PETROLEUM AND COAL PRODUCTS, N.E.C.	(31.0103)	2999
238	PAVING MIXTURES AND BLOCKS	(31.0200)	2951
239	ASPHALT FELTS AND COATINGS	(31.0300)	2952
240	TIRES AND INNER TUBES	(32.0100)	3010
241	RUBBER AND PLASTICS FOOTWEAR	(32.0200)	3020
242	RECLAIMED RUBBER	(32.0301)	3030
243	FABRICATED RUBBER PRODUCTS, N.E.C	(32.0302)	3060
244	MISCELLANEOUS PLASTICS PRODUCTS	(32.0400)	3070
245	RUBBER AND PLASTICS HOSE AND BELTING	(32.0500)	3040
246	LEATHER TANNING AND FINISHING	(33.0001)	3110

APPENDIX N. Industry Classification of the Micro-IMPLAN 528 sector Input/Output tables, continued.

No.	Sector Name	BEA Commodity	Standard Industry Classification (SIC)
247	FOOTWEAR CUT STOCK	(34.0100)	3130
248	SHOES, EXCEPT RUBBER	(34.0201)	3143 3144 3149
249	HOUSE SLIPPERS	(34.0202)	3142
250	LEATHER GLOVES AND MITTENS	(34.0301)	3150
251	LUGGAGE	(34.0302)	3160
252	WOMENS HANDBAGS AND PURSES	(34.0303)	3171
253	PERSONAL LEATHER GOODS	(34.0304)	3172
254	LEATHER GOODS, N.E.C	(34.0305)	3190
255	GLASS AND GLASS PRODUCTS, EXC CONTAINERS	(35.0100)	3210 3229 3230
256	GLASS CONTAINERS	(35.0200)	3221
257	CEMENT, HYDRAULIC	(36.0100)	3240
258	BRICK AND STRUCTURAL CLAY TILE	(36.0200)	3251
259	CERAMIC WALL AND FLOOR TILE	(36.0300)	3253
260	CLAY REFRACTORIES	(36.0400)	3255
261	STRUCTURAL CLAY PRODUCTS, N.E.C	(36.0500)	3259
262	VITREOUS PLUMBING FIXTURES	(36.0600)	3261
263	VITREOUS CHINA FOOD UTENSILS	(36.0701)	3262
264	FINE EARTHENWARE FOOD UTENSILS	(36.0702)	3263
265	PORCELAIN ELECTRICAL SUPPLIES	(36.0800)	3264
266	POTTERY PRODUCTS, N.E.C	(36.0900)	3269
267	CONCRETE BLOCK AND BRICK	(36.1000)	3271
268	CONCRETE PRODUCTS, N.E.C	(36.1100)	3272
269	READY-MIXED CONCRETE	(36.1200)	3273
270	LIME	(36.1300)	3274
271	GYPSUM PRODUCTS	(36.1400)	3275
272	CUT STONE AND STONE PRODUCTS	(36.1500)	3280
273	ABRASIVE PRODUCTS	(36.1600)	3291
274	ASBESTOS PRODUCTS	(36.1700)	3292
275	GASKETS, PACKING AND SEALING DEVICES	(36.1800)	3293
276	MINERALS, GROUND OR TREATED	(36.1900)	3295
277	MINERAL WOOL	(36.2000)	3296
278	NONCLAY REFRACTORIES	(36.2100)	3297
279	NONMETALLIC MINERAL PRODUCTS, N.E.C	(36.2200)	3299
280	BLAST FURNACES AND STEEL MILLS	(37.0101)	3312
281	ELECTROMETALLURGICAL PRODUCTS	(37.0102)	3313
282	STEEL WIRE AND RELATED PRODUCTS	(37.0103)	3315
283	COLD FINISHING OF STEEL SHAPES	(37.0104)	3316
284	STEEL PIPE AND TUBES	(37.0105)	3317
285	IRON AND STEEL FOUNDRIES	(37.0200)	3320
286	IRON AND STEEL FORGINGS	(37.0300)	3462
287	METAL HEAT TREATING	(37.0401)	3398
288	PRIMARY METAL PRODUCTS, N.E.C	(37.0402)	3399
289	PRIMARY COPPER	(38.0100)	3331
290	PRIMARY LEAD	(38.0200)	3332
291	PRIMARY ZINC	(38.0300)	3333
292	PRIMARY ALUMINUM	(38.0400)	3334 Also part of 2819
293	PRIMARY NONFERROUS METALS, N.E.C	(38.0500)	3339
294	SECONDARY NONFERROUS METALS	(38.0600)	3340
295	COPPER ROLLING AND DRAWING	(38.0700)	3351
296	ALUMINUM ROLLING AND DRAWING	(38.0800)	3353 3354 3355
297	NONFERROUS ROLLING AND DRAWING, N.E.C	(38.0900)	3356
298	NONFERROUS WIRE DRAWING AND INSULATING	(38.1000)	3357
299	ALUMINUM CASTINGS	(38.1100)	3361
300	BRASS, BRONZE, AND COPPER CASTINGS	(38.1200)	3362
301	NONFERROUS CASTINGS, N.E.C.	(38.1300)	3369
302	NONFERROUS FORGINGS	(38.1400)	3463
303	METAL CANS	(39.0100)	3411
304	METAL BARRELS, DRUMS AND PAILS	(39.0200)	3412
305	METAL SANITARY WARE	(40.0100)	3431
306	PLUMBING FIXTURE FITTINGS AND TRIM	(40.0200)	3432
307	HEATING EQUIPMENT, EXCEPT ELECTRIC	(40.0300)	3433
308	FABRICATED STRUCTURAL METAL	(40.0400)	3441
309	METAL DOORS, SASH, AND TRIM	(40.0500)	3442
310	FABRICATED PLATE WORK (BOILER SHOPS)	(40.0600)	3443
311	SHEET METAL WORK	(40.0700)	3444
312	ARCHITECTURAL METAL WORK	(40.0800)	3446
313	PREFABRICATED METAL BUILDINGS	(40.0901)	3448

APPENDIX N. Industry Classification of the Micro-IMPLAN 528 sector Input/Output tables, continued.

No.	Sector Name	BEA Commodity	Standard Industry Classification (SIC)
314	MISCELLANEOUS METAL WORK	(40.0902)	3449
315	SCREW MACHINE PRODUCTS AND BOLTS, ETC	(41.0100)	3450
316	AUTOMOTIVE STAMPINGS	(41.0201)	3465
317	CROWNS AND CLOSURES	(41.0202)	3466
318	METAL STAMPINGS, N.E.C.	(41.0203)	3469
319	CUTLERY	(42.0100)	3421
320	HAND AND EDGE TOOLS, N.E.C.	(42.0201)	3423
321	HAND SAWS AND SAW BLADES	(42.0202)	3425
322	HARDWARE, N.E.C.	(42.0300)	3429
323	PLATING AND POLISHING	(42.0401)	3471
324	METAL COATING AND ALLIED SERVICES	(42.0402)	3479
325	MISCELLANEOUS FABRICATED WIRE PRODUCTS	(42.0500)	3495 3496
326	STEEL SPRINGS, EXCEPT WIRE	(42.0700)	3493
327	PIPE, VALVES, AND PIPE FITTINGS	(42.0800)	3494 3498
328	METAL FOIL AND LEAF	(42.1000)	3497
329	FABRICATED METAL PRODUCTS, N.E.C.	(42.1100)	3499
330	STEAM ENGINES AND TURBINES	(43.0100)	3511
331	INTERNAL COMBUSTION ENGINES, N.E.C.	(43.0200)	3519
332	FARM MACHINERY AND EQUIPMENT	(44.0001)	3523
333	LAWN AND GARDEN EQUIPMENT	(44.0002)	3524
334	CONSTRUCTION MACHINERY AND EQUIPMENT	(45.0100)	3531
335	MINING MACHINERY, EXCEPT OIL FIELD	(45.0200)	3532
336	OIL FIELD MACHINERY	(45.0300)	3533
337	ELEVATORS AND MOVING STAIRWAYS	(46.0100)	3534
338	CONVEYORS AND CONVEYING EQUIPMENT	(46.0200)	3535
339	HOISTS, CRANES, AND MONORAILS	(46.0300)	3536
340	INDUSTRIAL TRUCKS AND TRACTORS	(46.0400)	3537
341	MACHINE TOOLS, METAL CUTTING TYPES	(47.0100)	3541
342	MACHINE TOOLS, METAL FORMING TYPES	(47.0200)	3542
343	SPECIAL DIES AND TOOLS AND ACCESSORIES	(47.0300)	3544 3545
344	POWER DRIVEN HAND TOOLS	(47.0401)	3546
345	ROLLING MILL MACHINERY	(47.0402)	3547
346	METALWORKING MACHINERY, N.E.C.	(47.0403)	3549
347	FOOD PRODUCTS MACHINERY	(48.0100)	3551
348	TEXTILE MACHINERY	(48.0200)	3552
349	WOODWORKING MACHINERY	(48.0300)	3553
350	PAPER INDUSTRIES MACHINERY	(48.0400)	3554
351	PRINTING TRADES MACHINERY	(48.0500)	3555
352	SPECIAL INDUSTRY MACHINERY, N.E.C.	(48.0600)	3559
353	PUMPS AND COMPRESSORS	(49.0100)	3561 3563
354	BALL AND ROLLER BEARINGS	(49.0200)	3562
355	BLOWERS AND FANS	(49.0300)	3564
356	INDUSTRIAL PATTERNS	(49.0400)	3565
357	POWER TRANSMISSION EQUIPMENT	(49.0500)	3566 3568
358	INDUSTRIAL FURNACES AND OVENS	(49.0600)	3567
359	GENERAL INDUSTRIAL MACHINERY, N.E.C.	(49.0700)	3569
360	CARBURETORS, PISTONS, RINGS, VALVES	(50.0001)	3592
361	MACHINERY, EXCEPT ELECTRICAL, N.E.C.	(50.0002)	3599
362	ELECTRONIC COMPUTING EQUIPMENT	(51.0101)	3573
363	CALCULATING AND ACCOUNTING MACHINES	(51.0102)	3574
364	SCALES AND BALANCES	(51.0300)	3576
365	TYPEWRITERS AND OFFICE MACHINES, N.E.C.	(51.0400)	3572 3579
366	AUTOMATIC MERCHANDISING MACHINES	(52.0100)	3581
367	COMMERCIAL LAUNDRY EQUIPMENT	(52.0200)	3582
368	REFRIGERATION AND HEATING EQUIPMENT	(52.0300)	3585
369	MEASURING AND DISPENSING PUMPS	(52.0400)	3586
370	SERVICE INDUSTRY MACHINES, N.E.C.	(52.0500)	3589
371	INSTRUMENTS TO MEASURE ELECTRICITY	(53.0100)	3825
372	TRANSFORMERS	(53.0200)	3612
373	SWITCHGEAR AND SWITCHBOARD APPARATUS	(53.0300)	3613
374	MOTORS AND GENERATORS	(53.0400)	3621
375	INDUSTRIAL CONTROLS	(53.0500)	3622
376	WELDING APPARATUS, ELECTRIC	(53.0600)	3623
377	CARBON AND GRAPHITE PRODUCTS	(53.0700)	3624
378	ELECTRICAL INDUSTRIAL APPARATUS, N.E.C.	(53.0800)	3629
379	HOUSEHOLD COOKING EQUIPMENT	(54.0100)	3631
380	HOUSEHOLD REFRIGERATORS AND FREEZERS	(54.0200)	3632
381	HOUSEHOLD LAUNDRY EQUIPMENT	(54.0300)	3633

APPENDIX N. Industry Classification of the Micro-IMPLAN 528 sector Input/Output tables, continued.

No.	Sector Name	BEA Commodity	Standard Industry Classification (SIC)
382	ELECTRIC HOUSEWARES AND FANS	(54.0400)	3634
383	HOUSEHOLD VACUUM CLEANERS	(54.0500)	3635
384	SEWING MACHINES	(54.0600)	3636
385	HOUSEHOLD APPLIANCES, N.E.C.	(54.0700)	3639
386	ELECTRIC LAMPS	(55.0100)	3641
387	LIGHTING FIXTURES AND EQUIPMENT	(55.0200)	3645 3646 3647 3648
388	WIRING DEVICES	(55.0300)	3643 3644
389	RADIO AND TV RECEIVING SETS	(56.0100)	3651
390	PHONOGRAPH RECORDS AND TAPE	(56.0200)	3652
391	TELEPHONE AND TELEGRAPH APPARATUS	(56.0300)	3661
392	RADIO AND TV COMMUNICATION EQUIPMENT	(56.0400)	3662
393	ELECTRON TUBES	(57.0100)	3671 3672 3673
394	SEMICONDUCTORS AND RELATED DEVICES	(57.0200)	3674
395	ELECTRONIC COMPONENTS, N.E.C.	(57.0300)	3675 3676 3677 3678 3679
396	STORAGE BATTERIES	(58.0100)	3691
397	PRIMARY BATTERIES, DRY AND WET	(58.0200)	3692
398	X-RAY APPARATUS AND TUBES	(58.0300)	3693
399	ENGINE ELECTRICAL EQUIPMENT	(58.0400)	3694
400	ELECTRICAL EQUIPMENT, N.E.C.	(58.0500)	3699
401	TRUCK AND BUS BODIES	(59.0100)	3713
402	TRUCK TRAILERS	(59.0200)	3715
403	MOTOR VEHICLES	(59.0301)	3711
404	MOTOR VEHICLE PARTS AND ACCESSORIES	(59.0302)	3714
405	AIRCRAFT	(60.0100)	3721
406	AIRCRAFT AND MISSILE ENGINES AND PARTS	(60.0200)	3724 3764
407	AIRCRAFT AND MISSILE EQUIPMENT, N.E.C.	(60.0400)	3728 3769
408	SHIP BUILDING AND REPAIRING	(61.0100)	3731
409	BOAT BUILDING AND REPAIRING	(61.0200)	3732
410	RAILROAD EQUIPMENT	(61.0300)	3740
411	MOTORCYCLES, BICYCLES, AND PARTS	(61.0500)	3750
412	TRAVEL TRAILERS AND CAMPERS	(61.0601)	3792
413	MOBILE HOMES	(61.0602)	2451
414	MOTOR HOMES	(61.0603)	3716
415	TRANSPORTATION EQUIPMENT, N.E.C.	(61.0700)	3799
416	ENGINEERING AND SCIENTIFIC INSTRUMENTS	(62.0100)	3811
417	MECHANICAL MEASURING DEVICES	(62.0200)	3823 3824 3829
418	AUTOMATIC TEMPERATURE CONTROLS	(62.0300)	3822
419	SURGICAL AND MEDICAL INSTRUMENTS	(62.0400)	3841
420	SURGICAL APPLIANCES AND SUPPLIES	(62.0500)	3842
421	DENTAL EQUIPMENT AND SUPPLIES	(62.0600)	3843
422	WATCHES, CLOCKS, AND PARTS	(62.0700)	3870
423	OPTICAL INSTRUMENTS AND LENSES	(63.0100)	3830
424	OPHTHALMIC GOODS	(63.0200)	3850
425	PHOTOGRAPHIC EQUIPMENT AND SUPPLIES	(63.0300)	3860
426	JEWELRY, PRECIOUS METAL	(64.0101)	3911
427	JEWELERS MATERIALS AND LAPIDARY WORK	(64.0102)	3915
428	SILVERWARE AND PLATED WARE	(64.0104)	3914
429	COSTUME JEWELERY	(64.0105)	3961
430	MUSICAL INSTRUMENTS	(64.0200)	3930
431	GAMES, TOYS, AND CHILDRENS VEHICLES	(64.0301)	3944
432	DOLLS	(64.0302)	3942
433	SPORTING AND ATHLETIC GOODS, N.E.C.	(64.0400)	3949
434	PENS AND MECHANICAL PENCILS	(64.0501)	3951
435	LEAD PENCILS AND ART GOODS	(64.0502)	3952
436	MARKING DEVICES	(64.0503)	3953
437	CARBON PAPER AND INKED RIBBONS	(64.0504)	3955
438	ARTIFICIAL TREES AND FLOWERS	(64.0600)	3962
439	BUTTONS	(64.0701)	3963
440	NEEDLES, PINS, AND FASTENERS	(64.0702)	3964
441	BROOMS AND BRUSHES	(64.0800)	3991
442	HARD SURFACE FLOOR COVERINGS	(64.0900)	3996
443	BURIAL CASKETS AND VAULTS	(64.1000)	3995
444	SIGNS AND ADVERTISING DISPLAYS	(64.1100)	3993
445	MANUFACTURING INDUSTRIES, N.E.C.	(64.1200)	3999
446	RAILROADS AND RELATED SERVICES	(65.0100)	In reality pt. of 3999 4010 4040 4740 Also part of 4789
447	LOCAL, INTERURBAN PASSENGER TRANSIT	(65.0200)	4110 4120 4130 4140 4150 4170

APPENDIX N. Industry Classification of the Micro-IMPLAN 528 sector Input/Output tables, continued.

No.	Sector Name	BEA Commodity	Standard Industry Classification (SIC)
448	MOTOR FREIGHT TRANSPORT AND WAREHOUSING	(65.0300)	4210 4220 4230
			Also part of 4789
449	WATER TRANSPORTATION	(65.0400)	4410 4420 4430 4440 4450 4460
450	AIR TRANSPORTATION	(65.0500)	4510 4520 4580
451	PIPE LINES, EXCEPT NATURAL GAS	(65.0600)	4610
452	TRANSPORTATION SERVICES	(65.0701)	4710 4723 4780
			In reality pt. of 4780
453	ARRANGEMENT OF PASSENGER TRANSPORTATION	(65.0702)	4722
454	COMMUNICATIONS, EXCEPT RADIO AND TV	(66.0000)	4810 4820 4890
455	RADIO AND TV BROADCASTING	(67.0000)	4830
456	ELECTRIC SERVICES	(68.0100)	4910
			Also part of 493
457	GAS PRODUCTION AND DISTRIBUTION	(68.0200)	4920
			Also part of 493
458	WATER SUPPLY AND SEWERAGE SYSTEMS	(68.0301)	4940 4952
459	SANITARY SERVICES AND STEAM SUPPLY	(68.0302)	4953 4959 4960 4970
			Also part of 493
460	RECREATIONAL RELATED WHOLESALE TRADE	(69.0101)	5041 5043
461	OTHER WHOLESALE TRADE	(69.0102)	5010 5020 5030 5042 5050 5060 5070 5080 5090 5100
462	RECREATIONAL RELATED RETAIL TRADE	(69.0201)	5551 5561 5941 5946 5947 5948
463	OTHER RETAIL TRADE	(69.0202)	5200 5300 5400 5510 5520 5530 5540 5570 5590 5600
			5700 5910 5920 5930 5942 5943 5944 5945 5949 5960
			5980 5990 7396 8042
464	BANKING	(70.0100)	6000
465	CREDIT AGENCIES	(70.0200)	6100 6710 6720 6733 6790
466	SECURITY AND COMMODITY BROKERS	(70.0300)	6200
467	INSURANCE CARRIERS	(70.0400)	6300
468	INSURANCE AGENTS AND BROKERS	(70.0500)	6400
469	OWNER-OCCUPIED DWELLINGS	(71.0100)	
470	REAL ESTATE	(71.0200)	6500 6600
			Also pt. of 1531 ; Excluding pt. of 6552.
471	HOTELS AND LODGING PLACES	(72.0100)	7000
472	LAUNDRY, CLEANING AND SHOE REPAIR	(72.0201)	7210 7250
473	FUNERAL SERVICE AND CREMATORIES	(72.0202)	7260
474	PORTRAIT AND PHOTOGRAPHIC STUDIOS	(72.0203)	7220 7290
475	ELECTRICAL REPAIR SERVICES	(72.0204)	7620
476	WATCH, CLOCK, JEWELRY AND FURNITURE REPAIR	(72.0205)	7630 7640
477	BEAUTY AND BARBER SHOPS	(72.0300)	7230 7240
478	MISCELLANEOUS REPAIR SHOPS	(73.0101)	7690
479	SERVICES TO BUILDINGS	(73.0102)	7340
480	PERSONNEL SUPPLY SERVICES	(73.0103)	7360
481	COMPUTER AND DATA PROCESSING SERVICES	(73.0104)	7370
482	MANAGEMENT AND CONSULTING SERVICES	(73.0105)	7391 7392 7397
483	DETECTIVE AND PROTECTIVE SERVICES	(73.0106)	7393
484	EQUIPMENT REPAIR AND LEASING	(73.0107)	7394
485	PHOTOFINISHING, COMMERCIAL PHOTOGRAPHY	(73.0108)	7332 7333 7395
486	OTHER BUSINESS SERVICES	(73.0109)	7320 7331 7339 7350 7399
487	ADVERTISING	(73.0200)	7310
488	LEGAL SERVICES	(73.0301)	8110
489	ENGINEERING, ARCHITECTURAL SERVICES	(73.0302)	8910
490	ACCOUNTING, AUDITING AND BOOKKEEPING	(73.0303)	8930 8990
491	EATING AND DRINKING PLACES	(74.0000)	5800
			Also part of 70
492	AUTOMOBILE RENTAL AND LEASING	(75.0001)	7510
493	AUTOMOBILE REPAIR AND SERVICES	(75.0002)	7530 7549
494	AUTOMOBILE PARKING AND CAR WASH	(75.0003)	7520 7542
495	MOTION PICTURES	(76.0100)	7800
496	DANCE HALLS, STUDIOS AND SCHOOLS	(76.0200)	7910
497	THEATRICAL PRODUCERS, BANDS ETC.	(76.0201)	7920
498	BOWLING ALLEYS AND POOL HALLS	(76.0202)	7930
499	COMMERCIAL SPORTS EXCEPT RACING	(76.0203)	7941
500	RACING AND TRACK OPERATION	(76.0204)	7948
501	MEMBERSHIP SPORTS AND RECREATION CLUBS	(76.0205)	7997
502	AMUSEMENT AND RECREATION SERVICES, NEC	(76.0207)	7992 7993 7996 7999
503	DOCTORS AND DENTISTS	(77.0100)	8010 8020 8030 8041
504	HOSPITALS	(77.0200)	8060
505	NURSING AND PROTECTIVE CARE	(77.0301)	8050
506	OTHER MEDICAL AND HEALTH SERVICES	(77.0302)	0740 8049 8070 8080 8090

APPENDIX N. Industry Classification of the Micro-IMPLAN 528 sector Input/Output tables, continued.

No.	Sector Name	BEA Commodity	Standard Industry Classification (SIC)
507	ELEMENTARY AND SECONDARY SCHOOLS	(77.0401)	8210
508	COLLEGES, UNIVERSITIES, SCHOOLS	(77.0402)	8220
509	OTHER EDUCATIONAL SERVICES	(77.0403)	8230 8240 8290
510	BUSINESS ASSOCIATIONS	(77.0501)	8610 8620
511	LABOR AND CIVIC ORGANIZATIONS	(77.0502)	8630 8640
512	RELIGIOUS ORGANIZATIONS	(77.0503)	8660
513	OTHER NONPROFIT ORGANIZATIONS	(77.0504)	8400 8650 8690 6732 8922
514	RESIDENTIAL CARE	(77.0800)	8361
515	SOCIAL SERVICES, N.E.C.	(77.0900)	8321 8399 8331 8351
516	U.S. POSTAL SERVICE	(78.0100)	4311
517	FEDERAL ELECTRIC UTILITIES	(78.0200)	part of 491
518	OTHER FEDERAL GOVERNMENT ENTERPRISES	(78.0400)	--
519	LOCAL GOVERNMENT PASSENGER TRANSIT	(79.0100)	part of 41
520	STATE AND LOCAL ELECTRIC UTILITIES	(79.0200)	part of 491
521	OTHER STATE AND LOCAL GOVT ENTERPRISES	(79.0300)	--
522	NONCOMPARABLE IMPORTS	(80.0000)	--
523	SCRAP	(81.0001)	--
524	USED AND SECONDHAND GOODS	(81.0002)	--
525	GOVERNMENT INDUSTRY	(82.0000)	--
526	REST OF THE WORLD INDUSTRY	(83.0000)	--
527	HOUSEHOLD INDUSTRY	(84.0000)	8800
528	INVENTORY VALUATION ADJUSTMENT	(85.0000)	--

*Source: Alward, Gregory S. et al. (1989). Micro IMPLAN Software Manual. Appendix N. Industry Classification of the Micro-IMPLAN 528 sector Input/Output tables.

APPENDIX B: COMPARISON OF IMPLAN, REMI, AND CORRECTED MRIO RPCS

(Sectors in capital letters are unaggregated)

MRIO SECTOR # NAME, CORRESPONDING IMPLAN #s	MICHIGAN IMPLAN	MICHIGAN REMI	MICHIGAN MRIO	MICH DIFFERENCES IMPLAN - MRIO	MICH DIFFERENCES IMP-MRIO /IMP (%)	WISCONSIN MRIO	MINNESOTA MRIO	LAKE STATES MRIO
1 DAIRY FARM PRODUCTS, 1	0.9839		0.9689	0.0151	2%	0.9965	0.9923	0.9912
2 Livestock, 2-9	0.4423		0.5168	-0.0744	-17%	0.5419	0.9465	0.7184
3 Cotton,Grain, Tobacco,10-15	0.4594		0.7706	-0.3112	-68%	0.3635	0.4712	0.5256
4 Misc Crops, 16-23,26	0.5714		0.8089	-0.2374	-42%	0.5210	0.9106	0.7813
* 5 Forestry Products, 24	0.7272	0.97	0.3465	0.3807	52%	0.7676	0.3145	0.4719
* 6 Commercial Fishing, 25	0.0393	0.85	0.1975	-0.1581	-402%	0.0390	0.1723	0.1415
** 7 Iron Ores Mining, 28-29	0.0006		0.4802	-0.4796	-75620%	0.0000	0.7742	0.5490
8 Nonferrous Ores, 30-38	0.4242		0.7405	-0.3163	-75%	0.4024	0.0944	0.5456
9 COAL MINING, 39-40	0.0322	0	0.0000	0.0323	100%	0.0000	0.0000	0.0000
10 CRUDE PETROLEUM, 41	0.0429		0.2532	-0.2102	-489%	0.0055	0.0000	0.1287
11 Natural Gas, 42-43	0.5444		0.1265	0.4180	77%	0.0042	0.0000	0.0778
12 Stone, Clay, Mining, 44-58	0.7295		0.3872	0.3423	47%	0.5385	0.5509	0.4575
13 Chemical Minerals, 59-65	0.0019		0.0000	0.0020	100%	0.0000	0.0000	0.0000
14 Construction, 66-76	0.9749	0.87	1.0000	-0.0251	-3%	1.0000	1.0000	1.0000
20 Ordnance, 77-81	0	0.2987	0.9518	-0.9518		0.0374	0.2230	0.6404
21 Meat Products, 82-85	0.6514	0.3913	0.4987	0.1528	23%	0.3859	0.4723	0.4594
22 Dairy Products, 86-90	0.7296	0.4499	0.7354	-0.0058	-1%	0.7978	0.7088	0.7558
23 Canned & Frozen Foods, 91-98	0.1636	0.3696	0.1164	0.0473	29%	0.5830	0.2707	0.2751
24 Grain Mill Products, 99-105	0.3333	0.3577	0.6235	-0.2901	-87%	0.3883	0.3052	0.4708
25 Bakery Products, 106-107	0.7282	0.4503	0.7298	-0.0015	-0%	0.7844	0.5494	0.7064
26 Sugar & Confectionery, 108-111	0.4546	0.2403	0.2690	0.1856	41%	0.2880	0.1705	0.2502
27 Beverages, 112-117	0.4967	0.3558	0.5390	-0.0423	-9%	0.5318	0.7493	0.5761
28 Other Food Products, 118-126	0.4324	0.3198	0.2716	0.1608	37%	0.1883	0.5466	0.3308
29 Tobacco Products, 127-130	0.0007	0.0050	0.0000	0.0008	100%	0.0000	0.0000	0.0000
30 Fabric, Yarn, Thread, 131-134	0.0069	0.0330	0.1038	-0.0969	-1404%	0.1320	0.1218	0.1139
31 Floor Coverings, 135-144	0.1228	0.1145	0.1711	-0.0483	-39%	0.3929	0.0368	0.2014
32 Hosiery & Knit Goods, 145-6,150	0.0205	0.0029	0.0000	0.0205	100%	0.7138	0.5365	0.3360
33 Apparel, 147-8,151	0.0479	0.0656	0.1104	-0.0624	-130%	0.1878	0.1670	0.1414
34 Other Fab. Products, 149,152-9	0.6269	0.4112	0.7384	-0.1114	-18%	0.2025	0.4206	0.6289
35 Logging & Lumber, 160-163	0.4191	0.3548	0.2104	0.2087	50%	0.2573	0.1489	0.2125
36 Wood Products, 164-7,9-173	0.5942	0.4397	0.3800	0.2142	36%	0.4865	0.4259	0.4277
37 Prefab Bldg&Mbl Home,168,413	0.0053	0.2573	0.2536	-0.2482	-4616%	0.9697	0.6393	0.5608
38 Household Furniture, 174-179	0.3936	0.1938	0.2346	0.1591	40%	0.6111	0.3123	0.3440
39 Other Furniture, 180-186	0.8222	0.3969	0.4477	0.3746	46%	0.4809	0.2245	0.4088
** 40 Paper Products, 187-198	0.0009	0.2304	0.2519	-0.2510	-25923%	0.4362	0.3262	0.3430
41 PAPERBOARD CONTAINERS, 199	0.7866	0.2924	0.5612	0.2254	29%	0.7124	0.8707	0.6708
42 Newspaper, Other Printing, 200-214	0.3740	0.5751	0.5940	-0.2199	-59%	0.5439	0.5410	0.5680
43 INDUSTRIAL CHEMICALS, 215	0.5131	0.4192	0.3431	0.1700	33%	0.2248	0.0477	0.2617
44 Agricultural Chemicals, 216-8	0.1131	0.0333	0.3115	-0.1984	-175%	0.1457	0.1224	0.1892
45 Other Chemicals, 219-224	0.7825	0.2722	0.0624	0.7201	92%	0.0490	0.0994	0.0652
46 Plastics & Synthetics, 225-228	0.4865	0.3327	0.4836	0.0029	1%	0.2607	0.3204	0.4045
47 DRUGS, 229	0.1277	0.2632	0.5179	-0.3901	-305%	0.1859	0.1500	0.3788
48 Cosmetics, Cleaning Prdcts,230-233	0.5567	0.1531	0.1691	0.3877	70%	0.4315	0.3287	0.2718
49 PAINTS AND ALLIED PRODUC, 234	0.2682	0.3852	0.7287	-0.4604	-172%	0.5616	0.2447	0.6133
50 Petroleum Refining, 235-239	0.2160	0.1741	0.1189	0.0972	45%	0.0875	0.4385	0.2013
** 51 Rubber & Misc. Plastics, 240-245	0.0046	0.3065	0.2317	-0.2271	-4904%	0.2849	0.2684	0.2498
52 Leather & Leather Prdcts, 246-254	0.3489	0.1849	0.2122	0.1367	39%	0.5604	0.2304	0.3081

Appendix B (cont'd.)

MRIO no. Name, IMPLAN sector numbers	MI IMPLAN	REMI	MRIO	IMP-MRIO	DIFF/IMP%	WI MRIO	MN MRIO	LKST MRIO
53 Glass & Glass Prdcts, 255, 256	0.1997	0.3810	0.2310	-0.0313	-16%	0.1378	0.2497	0.2087
** 54 Stone & Clay Products, 257-279	0.0588	0.4581	0.7156	-0.6568	-1116%	0.7065	0.7488	0.7224
** 55 Iron & Steel Forging,280-1,3,4,6-8	0.1333	0.2656	0.3223	-0.1890	-142%	0.2146	0.1183	0.2867
** 56 IRON AND STEEL FOUNDRIES, 285	0.0045	0.4180	0.4539	-0.4494	-9885%	0.6325	0.6904	0.4976
57 Primary Nonferrous Metal,289-302	0.1811	0.1344	0.2199	-0.0388	-21%	0.2413	0.1658	0.2191
58 Metal Containers,282,303-4,319-29	0.3961	0.3538	0.4758	-0.0797	-20%	0.4201	0.4091	0.4520
59 Structural Metal Prdcts,305-14	0.1943	0.3489	0.5028	-0.3084	-159%	0.6296	0.5565	0.5516
60 Screw Machine Products, 315-318	0.6347	0.5712	0.7820	-0.1472	-23%	0.4853	0.5348	0.7316
61 Engines & Turbines, 330,331	0.7565	0.5671	0.4792	0.2774	37%	0.6166	0.0953	0.4887
62 Farm & Lawn Equipment, 332,333	0.8352	0.4830	0.2315	0.6038	72%	0.4608	0.4816	0.3901
63 Construction, Mining Equip.,334-6	0.0792	0.2623	0.3355	-0.2562	-323%	0.4745	0.5067	0.4183
64 Materials Handling Equip.,337-340	0.6247	0.4880	0.6131	0.0116	2%	0.5917	0.6685	0.6151
65 Metalworking Equipment, 341-346	0.6580	0.5219	0.6626	-0.0045	-1%	0.5688	0.0251	0.6036
66 Special Machinery, 347-352	0.5716	0.3257	0.1447	0.4269	75%	0.5807	0.3452	0.2937
** 67 Other Nonelect. Equipment, 353-361	0.0001	0.5192	0.3172	-0.3170	-285025%	0.3813	0.4180	0.3424
68 Office & Computing Equip., 362-365	0.1962	0.1708	0.1725	0.0237	12%	0.2462	0.3189	0.2419
69 Service Machinery, 366-370	0.6410	0.4978	0.3018	0.3393	53%	0.2500	0.1764	0.2766
70 Electrical Equipment, 371-378	0.3142	0.1546	0.3038	0.0104	3%	0.1279	0.1490	0.2282
71 Household Appliances, 379-385	0.2050	0.1710	0.4946	-0.2896	-141%	0.6315	0.4664	0.5284
72 Electric Lighting, 386-388	0.0109	0.0587	0.1823	-0.1714	-1566%	0.1981	0.0952	0.1717
73 Receiving Sets, Records, 389,390	0.1147	0.1806	0.0453	0.0695	61%	0.1935	0.0647	0.0794
74 Communications Equipment, 391-392	0.3124	0.0455	0.1191	0.1933	62%	0.1967	0.3310	0.2097
75 Electronic Components, 393-395	0.2500	0.0377	0.2636	-0.0136	-5%	0.3865	0.3315	0.3133
76 Other Electrical Equip.,396-400	0.2215	0.2730	0.2250	-0.0034	-2%	0.4592	0.1759	0.2637
77 Motor Vehicles & Parts, 401-404	0.4375	0.4777	0.4631	-0.0255	-6%	0.2531	0.0331	0.4059
78 AIRCRAFT, 405	0	0.01	0.5736	-0.5736		0.0000	0.3604	0.3766
79 Missiles & Parts, 76, 407	0	0.21834	0.0046	-0.0046		0.0000	0.2273	0.0488
80 AIRCRAFT AND MISSILE ENG, 406	0.8083	0.33707	0.0836	0.7247	90%	0.5166	0.0323	0.1106
81 Other Transp. Equip,408-12,414-15	0.1895	0.31751	0.3729	-0.1834	-97%	0.1212	0.4715	0.3356
82 Scient.&Photo Equip,416-18,422,425	0.0664	0.07801	0.2866	-0.2201	-331%	0.7046	0.6522	0.4591
83 Medical Equipment, 419-21,423-4	0.3765	0.07757	0.3507	0.0258	7%	0.0593	0.4971	0.3165
84 Other Manuf. Prdcts, 426-445	0.0640	0.19348	0.1073	-0.0433	-68%	0.0785	0.3576	0.1554
85 RAILROADS AND RELATED SE, 446	0.4440	0.295	0.5621	-0.1181	-27%	0.8452	1.0089	0.7168
86 Local Transit, 447, 519	0.5505	0.2375	0.4673	0.0833	15%	0.7999	0.7999	0.6501
87 MOTOR FREIGHT TRANSPORT, 448	0.3911	0.46	1.0000	-0.6089	-156%	1.0000	0.9043	0.9753
88 WATER TRANSPORTATION, 449	0.4019	0.215	0.7873	-0.3854	-96%	1.2121	1.2760	1.0213
89 AIR TRANSPORTATION, 450	0.4227	0.215	0.2569	0.1659	39%	0.1260	0.4799	0.3105
90 PIPE LINES, EXCEPT NAT GAS, 451	0.4695	0.325	0.2733	0.1963	42%	0.0000	1.0000	0.4207
91 Transportation Services, 452-3	0.4430	0.94063	0.7000	-0.2570	-58%	0.6993	0.7000	0.6999
92 COMMUNICATIONS, EXCEPT RADIO, 454	0.6292	0.395	0.5601	0.0691	11%	0.4797	0.4995	0.5257
93 RADIO AND TV BROADCASTING, 455	0.4926	0.85	0.4132	0.0794	16%	0.4326	0.4383	0.4236
94 Electric Utilities,456,517,520	0.5260	0.9685	0.9653	-0.4392	-83%	0.7339	0.7867	0.8655
95 GAS PRODUCTION & DISTRIBUTION, 457	0.5940	0.9523	0.9465	-0.3525	-59%	0.9539	0.9745	0.9525
96 Water Supply & Sanitary Svcs, 458-90	0.6156	0.7069	1.0000	-0.3843	-62%	1.0000	1.0000	1.0000
97 Wholesale Trade, 460,461	0.0420	0.909	0.6274	-0.5854	-1393%	0.7691	0.9955	0.7321
98 EATING AND DRINKING PLACES, 491	0.6020	0.7575	0.8901	-0.2880	-48%	0.9000	0.9000	0.8950
99-102 Other Retail Trade, 462-463	0.5002	0.8455	0.9469	-0.4467	-89%	0.9288	0.9425	0.9425
103 Banking, Credit Agencies, 464-466	0.5952	0.8573	0.5512	0.0440	7%	0.5701	0.6665	0.5831
104 Insurance, 467-468	0.4909	0.5120	0.5702	-0.0793	-16%	0.7057	0.7116	0.6398
105 Real Estate, 469-470	0.6006	0.646	0.6939	-0.0932	-16%	0.7000	0.7000	0.6969

Appendix B (cont'd.)

MRIO no.	Name, IMPLAN sector numbers	MI IMPLAN	REMI	MRIO	IMP-MRIO	DIFF/IMP%	WI MRIO	MN MRIO	LKST MRIO
106	HOTELS AND LODGING PLACE, 471	0.6251	0.118	0.7232	-0.0980	-16%	0.7754	0.7302	0.7386
107	Personal, Repair Svcs, 472-77	0.6111	0.8524	0.9000	-0.2888	-47%	0.8226	0.8823	0.8761
** 108	Misc. Svcs & Advertising, 478-487	0	0.8833	0.7316	-0.7316		0.6634	0.7998	0.7301
** 109	Misc. Professional Svcs, 488-490	0	0.9616	0.8014	-0.8014		0.6490	0.7670	0.7551
110	Auto Rental, Repair, 492-494	0.2554	0.9401	0.8784	-0.6230	-244%	0.8995	0.9000	0.8877
111	Amusements, 495-502	0.7021	0.6003	0.8366	-0.1345	-19%	0.8364	0.8487	0.8393
112	DOCTORS AND DENTISTS, 503	1.0000	0.9699	0.9500	0.0500	5%	0.9252	0.9500	0.9437
113	Hospitals, 504, 505	0.9840	0.9596	0.9000	0.0841	9%	0.9000	0.8892	0.8977
114	OTHER MEDICAL AND HEALTH, 506	0.9945	0.9747	0.9000	0.0945	10%	0.6530	0.6399	0.7761
115	Educational Services, 507-509	1	0.4001	0.7734	0.2266	23%	0.7941	0.7910	0.7840
116	Nonprofit Organizations, 510-513	0.9560	0.8459	0.7990	0.1571	16%	0.7363	0.7991	0.7818
117	Other Social Services, 514, 515	1.0000	0.9512	1.0000	0.0000	0%	1.0000	1.0000	1.0000
118	Fed Govt. Enterprises,516,518	0.9635		0.5612	0.4023	42%	0.7279	0.7501	0.6475
119	OTHER STATE AND LOCAL GOV, 521	0.9488		1.0000	-0.0511	-5%	1.0000	1.0000	1.0000
120	NONCOMPARABLE IMPORTS, 522	0.0002		1.0000	-0.9998	-418708%	1.0000	1.0000	1.0000
121	SCRAP & SECONDHAND GOODS, 523-4	0.9698		0.3222	0.6477	67%	0.2011	0.3106	0.2954
122	GOVERNMENT INDUSTRY, 525	0.9803		1.0000	-0.0197	-2%	1.0000	1.0000	1.0000
123	HOUSEHOLD INDUSTRY, 527	0.9999		1.0000	-0.0000	-0%	1.0000	1.0000	1.0000
	weighted averages for RPCs:	0.4378	0.5822	0.5772	-0.1394	-32%	0.6422	0.6460	0.5971
	unweighted averages for RPCs:	0.4256	0.4219	0.4930	-0.0674	-16%	0.4964	0.5030	0.5052

* signifies imperfect REMI comparison (REMI RPCs are not available for sectors left blank)

** signifies sectors for which IMPLAN's Michigan RPCs are zero or near zero
despite sizeable SDP ratios

APPENDIX C: ALTERNATIVE LAKE STATE RPCS AND RPCS USED AS GUIDES FOR THE ESTIMATION OF THE LAKE STATE RPCS

IMPLAN SECTOR No.	SECTOR NAME	SDP	FLRLK	ALTFLRLK	BSTLK	UNCHGD IMPLAN	MICHIGAN UNCHGD IMPLAN	RPCS 1983 REMI	UNCHGD MINN RPCs	IMPLAN WISC RPCs	LKST MRIO
1	Dairy Farm Prdcts	1	0.9840	0.9840	0.9994	0.9994	0.9840		0.9966	0.9987	0.9912
2	Poultry & Eggs	0.8132	0.4750	0.4750	0.8132	0.8132	0.4750		0.9245	0.8501	0.7184
3	Ranch Fed Cattle	1	0.4255	0.4255	0.9300	0.9300	0.4255		0.9690	0.9627	0.7184
4	Range Fed Cattle	1	0.4066	0.4066	0.9282	0.9282	0.4066		0.9690	0.9603	0.7184
5	Cattle Feedlots	0.4935	0.2748	0.2748	0.4935	0.4935	0.3898		0.7893	0.2748	0.7184
6	Sheep,Lambs, and Goats	0.5476	0.3003	0.3003	0.5476	0.5476	0.3825		0.8853	0.3003	0.7184
7	Hogs,Pigs,& Swine	1	0.5147	0.5147	0.9569	0.9569	0.5147		0.9856	0.6707	0.7184
8	Other Meat Animals	0.8241	0.5371	0.5371	0.8241	0.8241	0.5371		0.8207	0.8837	0.7184
9	Misc Livestock	0.8255	0.4834	0.4834	0.8255	0.8255	0.4834		0.6011	0.8998	0.7184
10	Cotton	0	0	0	0	0	0		0	0	0.5256
11	Food Grains	0.5161	0.1086	0.1086	0.5161	0.5161	0.2491		0.6646	0.1086	0.5256
12	Feed Grains	1	0.5256	0.5256	0.7220	0.7220	0.5379		0.7170	0.5964	0.5256
13	Hay & Pasture	0.9113	0.5184	0.5184	0.7661	0.7661	0.5184		0.6927	0.7414	0.5256
14	Grass Seeds	0.2804	0.0742	0.0742	0.2804	0.2804	0.0967		0.5013	0.0742	0.5256
15	Tobacco	1	0	0	0.2453	0.2453	0		0	0.3272	0.5256
16	Fruits	0.4158	0.0488	0.0488	0.4158	0.4158	0.5418		0.0488	0.3758	0.7813
17	Tree Nuts	0	0	0	0	0	0		0	0	0.7813
18	Vegetables	0.9391	0.6952	0.6952	0.7253	0.7253	0.6977		0.6952	0.7429	0.7813
19	Sugar Crops	1	0.0285	0.0285	0.9198	0.9198	0.8131		0.9775	0.0285	0.7813
20	Misc Crops	0.5937	0.3218	0.3218	0.5937	0.5937	0.4976		0.8130	0.3218	0.7813
21	Oil Bearing Crops	1	0.3915	0.3915	0.8487	0.8487	0.5252		0.9614	0.3915	0.7813
22	Forest Prdcts	0	0	0	0	0	0		0	0	0.7813
23	Greenhouse & Nursery Pr	0.7626	0.4446	0.4446	0.6807	0.6807	0.7553		0.4446	0.5263	0.7813
24	Forestry Prdcts	0.7552	0.2550	0.2550	0.7552	0.7559	0.7272	0.96	0.2550	0.7772	0.4719
25	Commercial Fishing	0.0322	0.0237	0.0237	0.0322	0.0322	0.0393	0.96	0.0294	0.0237	0.1415
26	Agri, For, & Fish Svcs	0.674	0.2274	0.2274	0.3409	0.3409	0.2274	0.72	0.4262	0.4505	0.7813
27	Lanscape & Hortic Svcs	0.7546	0.2624	0.2624	0.3163	0.3163	0.3413	0.72	0.3396	0.2624	0.7813
28	Iron Ores	1	0.0018	0.5490	0.6000	0.0018	0.0007	0.57	0.0015	0.0001	0.5490
29	Ferroalloy Ores	0.3622	0	0.1800	0.2000	0.00001	0.00002	0.57	0	0	0.5490
30	Copper Ores	1	0.0975	0.0975	0.9617	0.9617	0.9626	0.57	0.9493	0.0975	0.5456
31	Lead & Zinc Ores	0.0263	0	0	0.0263	0.0263	0.1238	0.57	0	0	0.5456
32	Gold Ores	0.0013	0	0	0.0013	0.0013	0.0021	0.57	0	0	0.5456
33	Silver Ores	0.028	0	0	0.0280	0.0280	0.0448	0.57	0	0	0.5456
34	Bauxite & Other Alum	0	0	0	0	0	0	0.57	0	0	0.5456
35	Metal Mining Svcs	1	0.5456	0.5456	0.9960	0.9960	0.9956	0.57	0.9974	0.9956	0.5456
36	Mercury Ores	0	0	0	0	0	0	0.57	0	0	0.5456
37	Uranium,Radium,Vanadium	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.57	0	0.0008	0.5456
38	Metal Ores, nec	0	0	0	0	0	0	0.57	0	0	0.5456
39	Anthracite Mining	0	0	0	0	0	0	0.01	0	0	0
40	Bituminous & Lignite	0.0516	0	0	0.0218	0.0218	0.0327	0.01	0.0006	0.0004	0
41	Crude Petroleum	0.1283	0	0	0.0206	0.0206	0.0430	0.32	0	0	0.0778
42	Natural Gas	0.3331	0	0	0.2500	0.3331	0.5641	0.32	0	0	0.1287
43	Natural Gas Liquids	0.2378	0.0563	0.0563	0.2378	0.2378	0.4004	0.32	0.0563	0.1076	0.0778
44	Dimension Stone	0.4108	0.2688	0.2688	0.4108	0.4108	0.2688	0.65	0.3027	0.7234	0.4575
45	Crushed & Broken Limest	1	0.4239	0.4239	0.9583	0.9583	0.9674	0.65	0.4239	0.8162	0.4575
46	Crushed & Broken Granit	0.3541	0.0100	0.0100	0.3541	0.3541	0.0100	0.65	0.8155	0.2490	0.4575
47	Crushed & Broken Stone,	0.788	0.4575	0.4575	0.7880	0.7880	0.4810	0.65	0.6732	0.8284	0.4575
48	Construction Sand & Gra	1	0.4575	0.4575	0.9369	0.9369	0.9514	0.65	0.4896	0.7659	0.4575

Appendix C (cont'd.)

SEC NO.	SECTOR NAME	RPC: SDP	FLRLK	ALTFLR	BSTLK	UNCHGD	MI: IMP	REMI	MN IMP	WI IMP	LK MRIO
49	Industrial Sand	1	0.1378	0.1378	0.9634	0.9634	0.9728	0.65	0.1378	0.8792	0.4575
50	Bentonite	0.1203	0	0	0.1203	0.1203	0.0000	0.65	0.0289	0.8402	0.4575
51	Fire Clay	1	0	0	0.9361	0.9361	0.9663	0.65	0	0.0026	0.4575
52	Fuller's Earth	0	0	0	0	0	0	0.65	0	0	0.4575
53	Kaolin & Ball Clay	0.0003	0.0003	0.0003	0.0003	0.0003	0.0008	0.65	0	0	0.4575
54	Clay,Ceramic,&Refractor	1	0	0	0.9129	0.9129	0.9454	0.65	0	0	0.4575
55	Nonmetallic Minerals Sv	0.8061	0.2125	0.2125	0.8061	0.8061	0.7050	0.65	0.2125	0.69767	0.4575
56	Gypsum	0.2158	0	0	0.0069	0.0069	0.0070	0.65	0	0	0.4575
57	Talc,Soapstone,&pyrophi	0.0032	0.0032	0.0032	0.0032	0.0032	0.0062	0.65	0	0	0.4575
58	Misc Nonmetallic Minera	0.4429	0.0269	0.0269	0.3000	0.4429	0.6088	0.65	0.0269	0.0587	0.4575
59	Barite	0	0	0	0	0	0	0.65	0	0	0
60	Flourspar	0.0007	0.0001	0.0001	0.0001	0.0001	0.0000	0.65	0	0.00002	0
61	Potash,Soda,& Borate Mi	0	0	0	0	0	0	0.65	0	0	0
62	Phosphate Rock	0	0	0	0	0	0	0.65	0	0	0
63	Rock Salt	1	0	0.0270	0.2000	0.0270	0.0115	0.65	0.00014	0.0001	0
64	Sulfur	0.2147	0	0.0019	0.0019	0.0019	0.0012	0.65	0.00003	0.0001	0
65	Chemical,Fertilizer Min	0	0	0	0	0	0	0.65	0	0	0
66	New Res Structures	1	0.8564	0.8564	1.0000	1.0000	1.0000		1	0.8564	1
67	New Industrial & Comm B	1	0.8719	0.8719	1.0000	1.0000	1.0000		1	0.8719	1
68	New Utility Structures	1	0.7863	0.7863	1.0000	1.0000	1.0000		1	0.7863	1
69	New Highways & Streets	1	0.5971	0.5971	1.0000	1.0000	1.0000		1	0.5971	1
70	New Farm Structures	1	0.7195	0.7195	1.0000	1.0000	1.0000		0.71945	1	1
71	New Mineral Extraction	1	0.3181	0.3181	1.0000	1.0000	1.0000		0.3181	1	1
72	New Military & Nonbldg	1	1.0000	1.0000	1.0000	1.0000	1.0000		1.0000	1	1
73	Maintenance & Repair, R	0.8368	0.7412	0.7412	0.8368	0.8368	0.7412		0.7900	1	1
74	Maintenance & Repair, O	1	0.9271	0.9271	1.0000	1.0000	1.0000		1.0000	0.9271	1.0000
75	Maintenance & Repair, O	1	0	1.0000	1.0000	1.0000	1.0000		0	0	1
76	Complete Guided Missile	0	0	0	0	0	0	0	0	0	0.0488
77	Ammunition,exc small ar	1	0	0	0.5000	0	0	0	0	0	0.6404
78	Tanks & Tank Components	1	0	0	0.5000	0	0	0.64	0	0	0.6404
79	Small Arms	0.0749	0	0	0	0	0	0	0	0	0.6404
80	Small Arm Amunition	1	0	0.5000	0.5000	0	0	0	0	0	0.6404
81	Other Ordnance & Access	0	0	0	0	0	0	0.01	0	0	0.6404
82	Meat Packing Plants	1	0.3600	0.3600	0.9181	0.9181	0.6472	0.36	0.9180	0.9116	0.4594
83	Sausage & Other Preprd	1	0.4100	0.4100	0.9286	0.9286	0.9081	0.41	0.9042	0.9241	0.4594
84	Poultry Dressing Plants	0.7628	0.1807	0.1807	0.7628	0.7628	0.1807	0.33	0.9459	0.4193	0.4594
85	Poultry & Egg Processin	1	0.1300	0.1300	0.9141	0.9141	0.1729	0.13	0.9504	0.5147	0.4594
86	Creamery Butter	1	0.0200	0.0200	0.9624	0.9624	0.8763	0.02	0.9550	0.9584	0.7558
87	Cheese, nat & processed	1	0.1392	0.1392	0.9349	0.9349	0.1392	0.16	0.9143	0.9386	0.7558
88	Condensed & Evaporated	1	0.5400	0.5400	0.9558	0.9558	0.9220	0.54	0.9313	0.9514	0.7558
89	Ice Cream & Frozen Dess	1	0.2300	0.2300	0.9180	0.9180	0.7667	0.23	0.8925	0.8980	0.7558
90	Fluid Milk	1	0.4400	0.4400	0.9438	0.9438	0.8875	0.44	0.9262	0.9329	0.7558
91	Canned & Cured Seafoods	0.0536	0	0	0.0536	0.0536	0.0302	0.00	0.0920	0.0432	0.2751
92	Canned Specialties	1	0.1746	0.1746	0.3572	0.3572	0.2379	0.34	0.2543	0.1746	0.2751
93	Canned Fruits & Vegs	1	0.1476	0.1476	0.3149	0.3149	0.1476	0.33	0.2271	0.2209	0.2751
94	Dehydrated Food Prdcts	0.5585	0	0.2750	0.3357	0.3357	0.2235	0.00	0.1473	0.2293	0.2751
95	Pickles,Sauces,&Salad D	0.9826	0.1820	0.1820	0.3640	0.3640	0.2386	0.40	0.1820	0.2533	0.2751
96	Fresh or Frozen Pckgd F	0.0982	0.0449	0.0449	0.0983	0.0983	0.0449	0.06	0.0659	0.1027	0.2751
97	Froz Fruits,Juices,&Veg	1	0.1738	0.1738	0.2978	0.2978	0.1847	0.27	0.1937	0.1738	0.2751
98	Frozen Specialties	1	0.1915	0.1915	0.4181	0.4181	0.1915	0.29	0.3574	0.2543	0.2751

Appendix C (cont'd.)

SEC NO.	SECTOR NAME	RPC: SDP	FLRLK	ALTFLR	BSTLK	UNCHGD	MI: IMP	REMI	MN IMP	WI IMP	LK MRIO
99	Flour & Other Grain Mil	1	0.4071	0.4071	0.6225	0.6225	0.4491	0.48	0.5310	0.4071	0.4708
100	Cereal Preparations	1	0.0830	0.0830	0.7076	0.7076	0.6221	0.44	0.5365	0.0830	0.4708
101	Blended & Prepared Flou	1	0.1800	0.1800	0.6109	0.6109	0.4956	0.18	0.4602	0.4032	0.4708
102	Dog,Cat,&Other Pet Food	0.8095	0.1500	0.1500	0.5432	0.5432	0.1516	0.15	0.4037	0.4141	0.4708
103	Prepared Feeds,nec	0.506	0.2600	0.2600	0.5060	0.5060	0.2958	0.26	0.4380	0.4072	0.4708
104	Rice Milling	0.2264	0	0	0.2264	0.2264	0.0038	0.00	0.3698	0.0011	0.4708
105	Wet Corn Milling	0.1072	0	0	0.1072	0.1072	0.1840	0.00	0.1136	0.0299	0.4708
106	Bread,Cake,&Related Prd	0.6961	0.3700	0.3700	0.6961	0.6961	0.6485	0.37	0.5975	0.8834	0.7064
107	Cookies & Crackers	0.6861	0.2427	0.2427	0.6861	0.6861	0.9891	0.30	0.2427	0.4743	0.7064
108	Sugar	0.7143	0.0874	0.0874	0.5000	0.7143	0.4650	0.10	0.8139	0.0874	0.2502
109	Confectionery rdcts	0.7664	0.2502	0.2502	0.5000	0.7664	0.4417	0.29	0.9842	0.7978	0.2502
110	Chocolate & Cocoa Prdct	0.5505	0.0000	0.2700	0.4000	0.5505	0.1413	0.00	0.3890	0.7599	0.2502
111	Chewing Gum	1	0.1200	0.1200	0.6000	0.9855	0.9825	0.12	0.1771	0.1860	0.2502
112	Malt Liquor	1	0.5300	0.5300	0.7664	0.7664	0.6406	0.53	0.5319	0.6847	0.5761
113	Malt	1	0.1158	0.1158	0.7500	0.8763	0.1158	0.13	0.7889	0.8364	0.5761
114	Wines,Brandy,& Brandy S	0.1336	0.0225	0.0225	0.1336	0.1389	0.2127	0.09	0.0225	0.1103	0.5761
115	Distilled Liquor,exc Br	0.3077	0.0887	0.0887	0.3077	0.3133	0.4102	0.43	0.0887	0.0929	0.5761
116	Bottled & Canned Soft D	1	0.4300	0.4300	0.6697	0.6697	0.5111	0.43	0.5350	0.5104	0.5761
117	Flavoring Extracts & Sy	0.6241	0.1100	0.1100	0.6241	0.6241	0.5239	0.11	0.5355	0.3473	0.5761
118	Cottonseed Oil Mills	0.1992	0	0	0.1992	0.1992	0.2389	0.00	0.3142	0.0463	0.3308
119	Soybean Oil Mills	0.672	0	0.3700	0.5000	0.6720	0.1867	0.00	0.8564	0.0469	0.3308
120	Vegetable Oil Mills,nec	1	0.0200	0.0200	0.4000	0.5572	0.1473	0.02	0.6079	0.2908	0.3308
121	Animal & Marine Fats &	1	0.3308	0.3308	0.8122	0.8122	0.7973	0.36	0.8364	0.8438	0.3308
122	Roasted Coffee	0.2436	0.0730	0.0730	0.2436	0.2436	0.1743	0.15	0.5822	0.0730	0.3308
123	Shortening & Cooking Oi	0.7016	0.3300	0.3300	0.7016	0.7016	0.3427	0.33	0.8146	0.7085	0.3308
124	Manufactured Ice	0.4789	0.0200	0.0200	0.4789	0.4925	0.6023	0.02	0.4658	0.3007	0.3308
125	Macaroni & Spaghetti	1	0.1500	0.1500	0.7892	0.7892	0.8106	0.15	0.8395	0.4267	0.3308
126	Food Preparations,nec	0.7514	0.3300	0.3300	0.7514	0.7514	0.5797	0.33	0.7361	0.8166	0.3308
127	Cigarettes	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.00	0.0003	0.0002	0
128	Cigars	0.003	0.0030	0.0030	0.0030	0.0030	0.0035	0.00	0.0001	0.0048	0
129	Chewing & Smoking Tobac	0.0382	0.0382	0.0382	0.0382	0.0382	0.0070	0.00	0.0746	0.0649	0
130	Tobacco Stemming & Redr	1	0	0.5000	0.5000	0.9583	0.9583	0.00	0.9583	0.9583	0
131	Broadwoven Fabric Mills	0.2712	0.0054	0.0054	0.0142	0.0142	0.0054	0.03	0.0155	0.0139	0.1139
132	Narrow Fabric Mills	0.0569	0.0100	0.0100	0.0415	0.0415	0.0232	0.01	0.0573	0.0187	0.1139
133	Yarn Mills & Finishing	0.1777	0.0116	0.0116	0.0200	0.0200	0.0116	0.20	0.0195	0.0171	0.1139
134	Thread Mills	0.0077	0.0062	0.0062	0.0062	0.0062	0.0045	0.00	0.0054	0.0044	0.1139
135	Floor Coverings	0.0246	0.0054	0.0054	0.0246	0.0246	0.0382	0.01	0.0054	0.0071	0.2014
136	Felt Goods,nec	0.3026	0.0522	0.0522	0.1581	0.1581	0.1239	0.09	0.0522	0.2252	0.2014
137	Lace Goods	0.2921	0	0	0.0779	0.0779	0.1312	0.00	0.0002	0.0003	0.2014
138	Padding & Upholstery Fi	0.7307	0.0654	0.0654	0.4000	0.2024	0.2873	0.80	0.0654	0.0808	0.2014
139	Processed Textile Waste	0.4678	0.0300	0.0300	0.1545	0.1545	0.1671	0.03	0.1719	0.0321	0.2014
140	Coated Fabrics,not rubb	0.3167	0.0863	0.0863	0.2529	0.2529	0.2800	0.55	0.0863	0.1731	0.2014
141	Tire Cord & Fabric	0.0134	0.0042	0.0042	0.0042	0.0042	0.0009	0.00	0.0026	0.0077	0.2014
142	Cordage & Twine	0.332	0.0559	0.0559	0.1787	0.1787	0.2510	0.42	0.0798	0.0559	0.2014
143	Nonwoven Fabrics	0.3619	0.0737	0.0737	0.2096	0.2096	0.1083	0.18	0.0737	0.3268	0.2014
144	Textile Goods,nec	0.9252	0.0254	0.0254	0.0937	0.0937	0.0254	0.16	0.0369	0.1676	0.2014
145	Womens Hosiery,exc sock	0.0246	0	0	0.0246	0.0246	0.0200	0.00	0.0066	0.0561	0.3360
146	Hosiery,nec	0.2132	0.0053	0.0053	0.1000	0.2132	0.0185	0.01	0.0053	0.7945	0.3360
147	Knit Outerwear Mills	0	0	0	0	0	0	0.04	0	0	0.1414
148	Knit Underwear Mills	0	0	0	0	0	0	0	0	0	0.1414

Appendix C (cont'd.)

SEC NO.	SECTOR NAME	RPC: SDP	FLRLK	ALTFLR	BSTLK	UNCHGD	MI: IMP	REMI	MN IMP	WI IMP	LK MRIO
149	Knitting Mills,nec	0	0	0	0	0	0	0	0	0	0.6289
150	Knit Fabric Mills	0.4292	0	0.2200	0.4292	0.4306	0.0216	0.00	0.2759	0.9231	0.3360
151	Apparel from Purchased	0.6671	0.0200	0.0200	0.0730	0.0730	0.0480	0.02	0.0763	0.1364	0.1414
152	Curtains & Draperies	0.3604	0.0200	0.0200	0.3604	0.3604	0.2768	0.02	0.4498	0.4294	0.6289
153	Housefurnishings,nec	0.1449	0	0	0.1449	0.1449	0.0000	0.01	0.3026	0.2810	0.6289
154	Textile Bags	0.6144	0.0100	0.0100	0.6144	0.6144	0.0637	0.01	0.9577	0.8518	0.6289
155	Canvas Prdcts	1	0.0900	0.0900	0.9169	0.9169	0.9514	0.09	0.5979	0.9364	0.6289
156	Pleating & Stitching	0.1857	0.0677	0.0677	0.1857	0.1857	0.3072	0.09	0.0677	0.0848	0.6289
157	Auto & Apparel Trimming	1	0.0498	0.0498	0.8000	0.9985	0.9995	0.62	0.2044	0.0498	0.6289
158	Schiffi Machine Embroid	0.0276	0.0276	0.0276	0.0276	0.0276	0.0406	0.00	0.0010	0.1143	0.6289
159	Fabricated Textile Prdc	0.0575	0	0	0.0575	0.0579	0	0.23	0.4203	0.7326	0.6289
160	Logging Camps & Contrac	0.4958	0.2125	0.2125	0.4934	0.4934	0.4838	0.56	0.6494	0.3772	0.2125
161	Sawmills & Planing Mill	0.3156	0.2125	0.2125	0.3156	0.3156	0.3702	0.28	0.2152	0.3555	0.2125
162	Hardwd Dimensions & Flo	0.6639	0.2125	0.2125	0.5000	0.4481	0.5439	0.50	0.5021	0.6643	0.2125
163	Special Prdct Sawmills,	0.4042	0.0400	0.0400	0.2692	0.2692	0.1355	0.04	0.0425	0.4748	0.2125
164	Millwork	1	0.4000	0.4000	0.8967	0.8967	0.7746	0.40	0.9182	0.9191	0.4277
165	Wood Kitchen Cabinets	1	0.3900	0.3900	0.8518	0.8518	0.8232	0.39	0.8928	0.8341	0.4277
166	Hard & Softwd Veneer &	0.419	0.0808	0.0808	0.4190	0.4190	0.2848	0.11	0.0808	0.7822	0.4277
167	Structural Wood Members	1	0.3800	0.3800	0.8451	0.8451	0.8205	0.38	0.8840	0.8239	0.4277
168	Prefabricated Wood Buil	1	0.0269	0.0269	0.3000	0.0861	0.0269	0.39	0.3788	0.0910	0.5608
169	Wood Preserving	0.3803	0.1549	0.1549	0.3803	0.3803	0.1549	0.35	0.4776	0.7896	0.4277
170	Wood Pallets and Skids	1	0.4277	0.4277	0.8897	0.8897	0.9087	0.53	0.7733	0.9063	0.4277
171	Particleboard	1	0.4277	0.4277	0.8316	0.8316	0.8405	0.50	0.7778	0.8468	0.4277
172	Wood Products, nec	1	0.4277	0.4277	0.7706	0.7706	0.7663	0.61	0.7606	0.7878	0.4277
173	Nld&Lk Wd Boxes & Conta	0.688	0.2400	0.2400	0.6000	0.7044	0.2947	0.24	0.7091	0.7493	0.4277
174	Non-upholstrd Wd Hshld	0.5413	0.1402	0.1402	0.5177	0.5177	0.4943	0.24	0.1402	0.6580	0.3440
175	Household Furniture,nec	0.3264	0.0200	0.0200	0.2811	0.2811	0.1627	0.02	0.2479	0.3979	0.3440
176	Wd Cabinets:Tv,Sewing M	0.685	0	0.3400	0.4435	0.4435	0.4945	0.00	0.4104	0.6059	0.3440
177	Upholstrd Wd Hshold Fur	0.2297	0.0400	0.0400	0.2297	0.2297	0.1561	0.04	0.0594	0.5445	0.3440
178	Metal Hshld Furniture	0.5963	0.0700	0.0700	0.5692	0.5692	0.6460	0.07	0.4469	0.4738	0.3440
179	Mattresses and Bedsprin	0.6457	0.1400	0.1400	0.5736	0.5736	0.3893	0.14	0.5691	0.7338	0.3440
180	Wood Office Furniture	1	0.3200	0.3200	0.6000	0.8263	0.9247	0.32	0.4110	0.4755	0.4088
181	Metal Office Furniture	1	0.1453	0.1453	0.7000	0.9226	0.9716	0.57	0.1453	0.6172	0.4088
182	Public Building Furnitu	0.9672	0.2900	0.2900	0.6879	0.6879	0.7142	0.29	0.4732	0.7015	0.4088
183	Wood Partitions & Fixtu	1	0.2300	0.2300	0.8076	0.8076	0.8731	0.23	0.8104	0.7452	0.4088
184	Metal Partitions & Fixt	1	0.3200	0.3200	0.6641	0.6641	0.7735	0.32	0.7260	0.5696	0.4088
185	Blinds,Shades,&Drapery	1	0.1579	0.1579	0.6000	0.6957	0.7019	0.18	0.1579	0.8638	0.4088
186	Furniture & Fixtures, n	1	0.1700	0.1700	0.6708	0.6708	0.7269	0.17	0.5884	0.7497	0.4088
187	Pulp Mills	0.2764	0	0.0005	0.1500	0.0005	0.0003	0.00	0.0002	0.0016	0.3430
188	Paper Mills,exc Bldng P	1	0.0007	0.2900	0.6000	0.0027	0.0007	0.29	0.0012	0.0089	0.3430
189	Paperboard Mills	1	0.0014	0.2000	0.4000	0.0028	0.0039	0.19	0.0014	0.0037	0.3430
190	Envelopes	1	0.0004	0.0100	0.4000	0.0011	0.0004	0.01	0.0028	0.0015	0.3430
191	Sanitary Paper Products	1	0.0000	0.0600	0.2500	0.0021	0.0003	0.06	0.00004	0.0085	0.3430
192	Building Paper & Bldg B	1	0.0037	0.0600	0.4500	0.0129	0.0076	0.06	0.0399	0.0037	0.3430
193	Paper Coating and Glazi	1	0.0005	0.1700	0.5500	0.0076	0.0005	0.17	0.0405	0.0030	0.3430
194	Bags,except Textile Bag	0.8655	0.0003	0.0600	0.2500	0.0011	0.0003	0.06	0.0009	0.0042	0.3430
195	Die-cut Paper and Paper	1	0.0009	0.3500	0.5000	0.0015	0.0009	0.35	0.0038	0.0012	0.3430
196	Pressed & Molded Pulp G	0.5861	0	0.0017	0.2500	0.0017	0.0011	0.00	0.0001	0.0054	0.3430
197	Stationery,Tablets & Re	0.779	0.0012	0.0500	0.2500	0.0012	0.0012	0.05	0.0013	0.0019	0.3430
198	Cnvrted Paper & Paperbr	0.6028	0.0008	0.0600	0.3000	0.0036	0.0008	0.06	0.0042	0.0111	0.3430

Appendix C (cont'd.)

SEC NO.	SECTOR NAME	RPC: SDP	FLRLK	ALTFLR	BSTLK	UNCHGD	MI: IMP	REMI	MN IMP	WI IMP	LK MRIO
199	Paperbrd Boxes & Contai	0.8347	0.2100	0.2100	0.6000	0.8527	0.7866	0.21	0.8391	0.9426	0.6708
200	Newspapers	0.82	0.5146	0.5146	0.5672	0.5672	0.5214	0.72	0.5146	0.5285	0.5680
201	Periodicals	0.327	0.1848	0.1848	0.3270	0.3371	0.1848	0.22	0.5358	0.3550	0.5680
202	Book Publishing	0.4491	0.1140	0.1140	0.4491	0.4496	0.1140	0.24	0.5505	0.5250	0.5680
203	Book Printing	1	0.4436	0.4436	0.5899	0.5899	0.5445	0.56	0.4436	0.5776	0.5680
204	Misc Publishing	0.9597	0.4909	0.4909	0.5791	0.5791	0.5688	0.59	0.4909	0.5061	0.5680
205	Commercial Printing	1	0.5061	0.5061	0.5851	0.5851	0.5061	0.62	0.5710	0.5381	0.5680
206	Lithographic Platemakin	0.9748	0.4500	0.4500	0.5747	0.5747	0.5226	0.45	0.5241	0.5389	0.5680
207	Manifold Business forms	0.7596	0.4697	0.4697	0.5581	0.5581	0.5143	0.54	0.4697	0.5384	0.5680
208	Blankbooks & Looseleaf	1	0.4626	0.4626	0.5317	0.5317	0.4837	0.48	0.5124	0.4626	0.5680
209	Greeting Card Publishin	0.0977	0.0600	0.0600	0.0977	0.0977	0.0810	0.06	0.1194	0.1126	0.5680
210	Engraving & Plate Print	0.6349	0.2593	0.2593	0.5819	0.5819	0.2593	0.27	0.6203	0.4408	0.5680
211	Bookbinding & Related W	0.4866	0.3247	0.3247	0.4866	0.4870	0.4714	0.39	0.3247	0.4646	0.5680
212	Typesetting	0.9143	0.4200	0.4200	0.5594	0.5594	0.5272	0.42	0.5246	0.4678	0.5680
213	Photoengraving	0.6172	0.1500	0.1500	0.5561	0.5561	0.4908	0.15	0.4238	0.5632	0.5680
214	Electrotyping & Stereot	0.8291	0	0.4000	0.5482	0.5482	0.4438	0.00	0.5778	0.4303	0.5680
215	Industrial Inorganic,or	0.5178	0.2617	0.2617	0.5179	0.5179	0.5131	0.34	0.4559	0.5490	0.2617
216	Nitrogenous & Phosphati	0.1954	0.0060	0.0060	0.1708	0.1708	0.0881	0.01	0.1491	0.1402	0.1892
217	Fertilizers, Mixing Onl	0	0	0	0	0	0	0.11	0	0	0.1892
218	Agricultural Chemicals,	0.2825	0.0100	0.0100	0.2174	0.2174	0.1579	0.01	0.1036	0.2066	0.1892
219	Gum & Wood Chemicals	0.4354	0	0.2000	0.4354	0.4354	0.2212	0.00	0.4217	0.9015	0.0652
220	Adhesives & Sealants	0.6783	0.0652	0.0652	0.6783	0.6790	0.8548	0.16	0.2510	0.7140	0.0652
221	Explosives	0.4472	0	0.2000	0.3000	0.4472	0.0653	0.00	0.9228	0.1328	0.0652
222	Printing Ink	0.693	0.0500	0.0500	0.6930	0.6930	0.6798	0.05	0.9111	0.5158	0.0652
223	Carbon Black	0.136	0	0	0.1360	0.1360	0.0250	0.00	0	0.3546	0.0652
224	Chemical Preparations,n	1	0.0652	0.0652	0.8846	0.8846	0.8927	0.29	0.8947	0.8857	0.0652
225	Plastics Materials & Re	0.4437	0.2300	0.2300	0.4437	0.4437	0.5023	0.23	0.3575	0.4047	0.4045
226	Synthetic Rubber	0.3501	0.1700	0.1700	0.3501	0.3501	0.3351	0.17	0.2803	0.3901	0.4045
227	Cellulosic Man-Made Fib	0.2562	0	0.1200	0.2562	0.2562	0.1232	0.00	0.2334	0.3028	0.4045
228	Organic Fibers,noncellu	0.2229	0	0.1200	0.2229	0.2229	0.6868	0.00	0.1336	0.0788	0.4045
229	Drugs	0.6611	0.0497	0.0497	0.2000	0.1138	0.1278	0.21	0.0497	0.0925	0.3788
230	Soap & Other Detergents	1	0.2718	0.2718	0.6500	0.9387	0.9341	0.29	0.6185	0.6370	0.2718
231	Polishes & Sanitation G	1	0.0300	0.0300	0.6000	0.8855	0.7091	0.03	0.6339	0.8748	0.2718
232	Surface Active Agents	0.6564	0	0.2700	0.6564	0.6564	0.3969	0.00	0.9160	0.7965	0.2718
233	Toilet Preparations	0.52	0	0.2700	0.5200	0.5200	0.2284	0.00	0.8532	0.2072	0.2718
234	Paints & Allied Prdcts	0.862	0.1395	0.1395	0.3394	0.3394	0.2683	0.25	0.1395	0.2400	0.6133
235	Petroleum Refining	0.2559	0.1744	0.1744	0.2560	0.2631	0.1995	0.19	0.4397	0.1744	0.2013
236	Lubricating Oils & Grea	0.4978	0.2013	0.2013	0.4978	0.5183	0.5523	0.22	0.5556	0.4318	0.2013
237	Petroleum & Coal Prdcts	0.8827	0	0.2000	0.6000	0.8827	0.9623	0.00	0.9627	0.3218	0.2013
238	Paving Mixtures & Block	0.6471	0.1000	0.1000	0.5000	0.6471	0.5422	0.10	0.5891	0.9844	0.2013
239	Asphalt Felts & Coating	0.4699	0.0400	0.0400	0.3000	0.4699	0.1027	0.04	0.9875	0.2018	0.2013
240	Tires & Inner Tubes	0.2359	0.0008	0.0700	0.0017	0.0017	0.0019	0.07	0.0008	0.0028	0.2498
241	Rubber & Plastics Footw	1	0	0.2500	0.2000	0.0087	0.0036	0.00	0.0001	0.0214	0.2498
242	Reclaimed Rubber	0.3232	0	0.0023	0.1000	0.0023	0.0015	0.00	0.0060	0.0023	0.2498
243	Fabricated Rubber Prdct	0.3206	0.0038	0.1300	0.1000	0.0044	0.0059	0.13	0.0038	0.0047	0.2498
244	Misc Plastics Prdcts	0.9079	0.0044	0.2500	0.3500	0.0050	0.0052	0.36	0.0044	0.0080	0.2498
245	Rubber & Plastics Hose	0.2804	0.0033	0.0200	0.0053	0.0053	0.0077	0.02	0.0054	0.0033	0.2498
246	Leather Tanning & Finis	1	0.2186	0.2186	0.7577	0.7577	0.5730	0.52	0.2186	0.7832	0.3081
247	Footwear Cut Stock	0.1822	0	0	0.1822	0.1822	0.0674	0.00	0.0000	0.4036	0.3081
248	Shoes, exc Rubber	0.6528	0.1800	0.1800	0.4267	0.4267	0.4021	0.18	0.4070	0.4428	0.3081

Appendix C (cont'd.)

SEC NO.	SECTOR NAME	RPC: SDP	FLRLK	ALTFLR	BSTLK	UNCHGD	MI: IMP	REMI	MN IMP	WI IMP	LK MRIO
249	House Slippers	0.1358	0	0	0.1358	0.1358	0.0304	0.00	0.0175	0.5008	0.3081
250	Leather Gloves & Mitten	1	0.2700	0.2700	0.5594	0.5594	0.4489	0.27	0.5400	0.5907	0.3081
251	Luggage	0.1418	0.0200	0.0200	0.1418	0.1470	0.0507	0.02	0.1034	0.4134	0.3081
252	Womens Handbags & Purses	0.0297	0.0186	0.0186	0.0297	0.0297	0.0186	0.04	0.0222	0.0628	0.3081
253	Personal Leather Goods	0.8637	0	0.3080	0.4500	0.6299	0.1874	0.00	0.4307	0.6974	0.3081
254	Leather Goods,nec	0.1697	0.0886	0.0886	0.1697	0.1734	0.1294	0.10	0.0886	0.3396	0.3081
255	Glass & Glass Prdcts,ex	0.2535	0.2087	0.2087	0.2535	0.2543	0.2271	0.43	0.3391	0.2941	0.2087
256	Glass Containers	0.1759	0.1007	0.1007	0.1759	0.1779	0.1007	0.14	0.4569	0.1110	0.2087
257	Cement,Hydraulic	0.8475	0.0003	0.4200	0.7000	0.0158	0.0414	0.70	0.0003	0.0008	0.7224
258	Brick & Structural Clay	0.1692	0.0001	0.1600	0.1500	0.0050	0.0088	0.16	0.0034	0.0001	0.7224
259	Ceramic Wall & Floor Ti	0.0543	0.0000	0.0100	0.0014	0.0014	0.0018	0.01	0.0023	0.00001	0.7224
260	Clay Refractories	0.0717	0.0001	0.0400	0.0013	0.0013	0.0012	0.04	0.0001	0.0023	0.7224
261	Structural Clay Prdcts,	0.2064	0.0039	0.0800	0.1000	0.0455	0.0739	0.08	0.0248	0.0039	0.7224
262	Vitreous Plumbing Fixtu	1	0	0.5000	0.1484	0.1484	0.0034	0.00	0.00002	0.4749	0.7224
263	Vitreous China Food Ute	0.0115	0.0004	0.0004	0.0004	0.0004	0.0002	0.00	0.00001	0.0009	0.7224
264	Fine Earthenware Food U	0.0563	0	0.0563	0.0563	0.0563	0.0987	0.00	0.0019	0.0001	0.7224
265	Porcelain Electrical Su	1	0.0008	0.4700	0.4500	0.7214	0.0992	0.47	0.0008	0.8422	0.7224
266	Pottery Prdcts,nec	0.2505	0.0068	0.0268	0.2000	0.0268	0.0167	0.30	0.0068	0.0436	0.7224
267	Concrete Block & Brick	1	0.0359	0.5000	0.4000	0.0732	0.0359	0.50	0.0612	0.0780	0.7224
268	Concrete Prdcts,nec	1	0.0306	0.5000	0.4500	0.0681	0.0306	0.53	0.0859	0.0499	0.7224
269	Ready-Mixed Concrete	0.9456	0.0147	0.4700	0.6000	0.0314	0.0147	0.65	0.0233	0.0373	0.7224
270	Lime	0.4363	0.0009	0.2200	0.3500	0.0233	0.0101	0.38	0.0009	0.0628	0.7224
271	Gypsum Prdcts	0.0915	0.0003	0.0203	0.0203	0.0203	0.0562	0.55	0.0005	0.0003	0.7224
272	Cut Stone & Stone Prdct	1	0.0185	0.2200	0.2000	0.0619	0.0185	0.22	0.1351	0.0605	0.7224
273	Abrasive Prdcts	1	0.0417	0.1639	0.3500	0.1639	0.1136	0.37	0.2535	0.0417	0.7224
274	Asbestos Prdcts	0.1409	0.0041	0.0041	0.0041	0.0041	0.0020	0.00	0.0008	0.0117	0.7224
275	Gaskets,Packing & Seali	0.5456	0.0239	0.1310	0.3000	0.1310	0.1445	0.31	0.0239	0.1095	0.7224
276	Minerals,Ground or Trea	0.9426	0.0065	0.4700	0.5500	0.0324	0.0209	0.58	0.0065	0.0817	0.7224
277	Mineral Wool	0.4341	0.0089	0.2200	0.3500	0.0623	0.0089	0.37	0.1875	0.0462	0.7224
278	Nonclay Refractories	0.5424	0.0030	0.2700	0.4500	0.0597	0.1032	0.48	0.0030	0.0304	0.7224
279	Nonmetallic Mineral Prd	0.3922	0.0790	0.2100	0.2000	0.3886	0.5029	0.21	0.0978	0.0790	0.7224
280	Blast Furnaces & Steel	0.4575	0.0407	0.0826	0.3000	0.0826	0.1174	0.35	0.0407	0.0611	0.2867
281	Electrometallurgical Pr	0.0892	0.0252	0.0346	0.0346	0.0346	0.0465	0.05	0.0296	0.0252	0.2867
282	Steel Wire & Related Pr	1	0.1200	0.1200	0.3000	0.4584	0.5093	0.12	0.3031	0.3819	0.4520
283	Cold Finishing of Steel	0	0	0	0	0	0	0.28	0	0	0.2867
284	Steel Pipe & Tubes	0	0	0	0	0	0	0.13	0	0	0.2867
285	Iron & Steel Foundries	0.9391	0.0017	0.3600	0.4500	0.0026	0.0046	0.36	0.0017	0.0018	0.4976
286	Iron & Steel Forgings	1	0.0751	0.3800	0.3500	0.2395	0.2528	0.38	0.0751	0.3011	0.2867
287	Metal Heat Treating	1	0.1624	0.1624	0.2150	0.2150	0.2521	0.18	0.1624	0.2106	0.2867
288	Primary Metal Prdcts, n	0.4974	0.0600	0.0600	0.1642	0.1642	0.2137	0.06	0.0736	0.1574	0.2867
289	Primary Copper	0.3448	0	0.1021	0.1021	0.1021	0.1464	0.00	0.0658	0.0807	0.2191
290	Primary Lead	0.6091	0	0.1374	0.1374	0.1374	0.1768	0.00	0.1043	0.1441	0.2191
291	Primary Zinc	0.1128	0	0.0639	0.0639	0.0639	0.0934	0.00	0.0378	0.0476	0.2191
292	Primary Aluminum	0.3613	0	0.1037	0.1037	0.1037	0.1236	0.00	0.0549	0.1340	0.2191
293	Primary Nonferrous Meta	0.1404	0.0236	0.0236	0.0297	0.0297	0.0408	0.03	0.0236	0.0262	0.2191
294	Secondary Nonferrous Me	0	0	0	0	0	0	0.09	0	0	0.2191
295	Copper Rolling & Drawin	0.6097	0.0623	0.0623	0.1843	0.1843	0.2373	0.08	0.0623	0.2044	0.2191
296	Aluminum Rolling & Draw	0.3113	0.0903	0.0903	0.1451	0.1451	0.2099	0.11	0.0903	0.0988	0.2191
297	Nonferrous Rolling & Dr	0.2582	0.0200	0.0200	0.1417	0.1417	0.1769	0.02	0.0686	0.1693	0.2191
298	Nonferrous Wire Drawing	0.3661	0.0858	0.0858	0.1188	0.1188	0.1530	0.10	0.0858	0.1369	0.2191

Appendix C (cont'd.)

SEC NO.	SECTOR NAME	RPC:	SDP	FLRLK	ALTFLR	BSTLK	UNCHGD	MI: IMP	REMI	MN IMP	WI IMP	LK MRIO
299	Aluminum Castings		1	0.1700	0.1700	0.2461	0.2461	0.2274	0.17	0.2100	0.3125	0.2191
300	Brass,Bronze,&Copper Ca		1	0.0300	0.0300	0.2733	0.2733	0.2912	0.03	0.1687	0.3383	0.2191
301	Nonferrous Castings,nec		1	0.1300	0.1300	0.2270	0.2270	0.2734	0.13	0.1941	0.2487	0.2191
302	Nonferrous Forgings		0.9728	0.0781	0.0781	0.3000	0.2066	0.2825	0.34	0.0781	0.1900	0.2191
303	Metal cans		0.7186	0.0411	0.0411	0.3792	0.3792	0.0411	0.05	0.3568	0.4794	0.4520
304	Metal Barrels,Drums,& P		0.4498	0.1000	0.1000	0.3119	0.3119	0.3517	0.10	0.2373	0.1437	0.4520
305	Metal Sanitary Ware		1	0.0256	0.0256	0.5000	0.7704	0.2221	0.24	0.0256	0.8640	0.5516
306	Plumbing Fixture Fittin		1	0.0876	0.0876	0.3569	0.3569	0.2791	0.18	0.0876	0.3511	0.5516
307	Heating Equipmnt,exc El		0.9971	0.1419	0.1419	0.2278	0.2278	0.1419	0.23	0.1439	0.2118	0.5516
308	Fabricated Metal		1	0.1825	0.1825	0.2688	0.2688	0.1825	0.24	0.1933	0.2055	0.5516
309	Metal Doors,Sash,& Trim		1	0.1892	0.1892	0.3257	0.3257	0.2887	0.29	0.1892	0.1981	0.5516
310	Fabricated Plate Work (		0.7866	0.1408	0.1408	0.3456	0.3456	0.1537	0.23	0.1408	0.4190	0.5516
311	Sheet Metal Work		1	0.2129	0.2129	0.3407	0.3407	0.2349	0.32	0.2129	0.2908	0.5516
312	Architectural Metal Wor		1	0.1747	0.1747	0.3396	0.3396	0.2881	0.36	0.1747	0.2529	0.5516
313	Prefabricated Metal Bld		0.4396	0.0700	0.0700	0.1782	0.1782	0.1057	0.07	0.0747	0.1939	0.5516
314	Misc Metal Work		0.4092	0.1300	0.1300	0.2510	0.2510	0.1867	0.13	0.1422	0.1951	0.5516
315	Screw Machine Prdcts &		1	0.2032	0.2032	0.3273	0.3273	0.4191	0.37	0.2032	0.2738	0.7316
316	Automotive Stampings		1	0	0.5000	0.5813	0.5813	0.7239	0.56	0	0.1101	0.7316
317	Crowns & Closures		0.4092	0.0650	0.0650	0.1662	0.1662	0.2214	0.25	0.0650	0.1931	0.7316
318	Metal Stampings,nec		1	0.2800	0.2800	0.3802	0.3802	0.3441	0.28	0.3845	0.4602	0.7316
319	Cutlery		0.1929	0.0100	0.0100	0.1000	0.1946	0.1234	0.01	0.0607	0.2674	0.4520
320	Hand & Edge Tools,nec		1	0.2000	0.2000	0.4102	0.4102	0.3417	0.20	0.4394	0.3893	0.4520
321	Hand Saws & Saw Blades		0.3382	0	0.1700	0.3023	0.3023	0.1301	0.00	0.2927	0.2931	0.4520
322	Hardware,nec		1	0.3247	0.3247	0.5270	0.5270	0.5324	0.46	0.3247	0.5373	0.4520
323	Plating & Polishing		1	0.4100	0.4100	0.5149	0.5149	0.5453	0.41	0.4258	0.4322	0.4520
324	Metal Coating & Allied		0.7628	0.3500	0.3500	0.5248	0.5248	0.5117	0.35	0.4713	0.4999	0.4520
325	Misc Fabricated Wire Pr		0.8777	0.2883	0.2883	0.4135	0.4135	0.4439	0.29	0.2883	0.3759	0.4520
326	Steel Springs,exc Wire		0.3291	0.0600	0.0600	0.3291	0.3292	0.3136	0.06	0.2448	0.3158	0.4520
327	Pipe,Valves,& Pipe Fitt		0.7096	0	0.3500	0.4174	0.4174	0.4373	0.32	0	0.3955	0.4520
328	Metal Foil & Leaf		0.5288	0	0.2600	0.4140	0.4140	0.2970	0.00	0.4907	0.3628	0.4520
329	Fabricated Metal Prdcts		0.7872	0	0.3900	0.4053	0.4053	0.3991	0.38	0	0.3715	0.4520
330	Steam Engines & Turbine		0.2859	0.0600	0.0600	0.2859	0.2859	0.2063	0.06	0.2479	0.5960	0.4887
331	Internal Combustion Eng		1	0.2942	0.2942	0.7000	0.8393	0.8393	0.58	0.2942	0.8393	0.4887
332	Farm Machinery & Equip		1	0.3900	0.3900	0.6000	0.8863	0.8003	0.39	0.3909	0.8864	0.3901
333	Lawn & Garden Equip		1	0.3901	0.3901	0.7000	0.9829	0.9644	0.40	0.8022	0.9830	0.3901
334	Construction Machinery		1	0.1010	0.1010	0.3500	0.2853	0.1010	0.39	0.1784	0.3690	0.4183
335	Mining Machinery,exc oi		0.9984	0.0924	0.0924	0.4500	0.3069	0.0924	0.52	0.1224	0.4313	0.4183
336	Oil Field Machinery		0.1047	0	0.0373	0.0373	0.0373	0.0223	0.00	0.0533	0	0.4183
337	Elevators & Moving Stai		0.6892	0.2400	0.2400	0.4140	0.4140	0.2700	0.24	0.5000	0.4266	0.6151
338	Conveyors & Conveyor Eq		1	0.4216	0.4216	0.6457	0.6457	0.6950	0.52	0.4216	0.4963	0.6151
339	Hoists,Cranes,& Monorai		1	0.2400	0.2400	0.6301	0.6301	0.5026	0.24	0.7206	0.5183	0.6151
340	Industrial Trucks & Tra		1	0.3768	0.3768	0.6166	0.6166	0.6598	0.42	0.5172	0.3768	0.6151
341	Machine Tools,Metal Cut		1	0.4189	0.4189	0.5541	0.5541	0.5705	0.42	0.4189	0.5271	0.6036
342	Machine Tools,Metal For		0.5584	0.2500	0.2500	0.4000	0.5584	0.6165	0.25	0.4134	0.3319	0.6036
343	Special Dyes & Tools &		1	0.5285	0.5285	0.6000	0.7777	0.8197	0.53	0.5285	0.6457	0.6036
344	Power Driven Hand Tools		0.3514	0.0500	0.0500	0.3514	0.3514	0.1485	0.05	0.2498	0.5298	0.6036
345	Rolling Mill Machinery		0.1848	0.0300	0.0300	0.1848	0.1848	0.1681	0.03	0.1771	0.2492	0.6036
346	Metalworking Machinery,		1	0.3900	0.3900	0.7178	0.7178	0.7233	0.39	0.5619	0.7343	0.6036
347	Food Prdcts Machinery		1	0.2937	0.2937	0.6000	0.7572	0.4471	0.33	0.7568	0.7576	0.2937
348	Textile Machinery		0.0752	0.0100	0.0100	0.0752	0.0752	0.0705	0.01	0.0779	0.0829	0.2937

Appendix C (cont'd.)

SEC NO.	SECTOR NAME	RPC:	SDP	FLRLK	ALTFLR	BSTLK	UNCHGD	MI: IMP	REMI	MN IMP	WI IMP	LK MRIO
349	Woodworking Machinery	1	0.1500	0.1500	0.7500	0.9377	0.4954	0.15	0.9421	0.9294	0.2937	
350	Paper Industries Machin	1	0.1400	0.1400	0.6500	0.8061	0.4613	0.14	0.1648	0.8061	0.2937	
351	Printing Trades Machine	0.442	0.1300	0.1300	0.4400	0.4420	0.2306	0.13	0.4636	0.7760	0.2937	
352	Special Industry Machin	0.9864	0.2937	0.2937	0.7500	0.9203	0.9199	0.37	0.9200	0.9204	0.2937	
353	Pumps & Compressors	0.7971	0.00003	0.3400	0.4000	0.0001	0.0000	0.35	0.0001	0.0005	0.3424	
354	Ball & Roller Bearings	0.2427	0.00003	0.2000	0.2000	0.0001	0.0002	0.20	0.00003	0.0001	0.3424	
355	Blowers & Fans	0.8878	0.0001	0.2500	0.3000	0.0001	0.0002	0.25	0.0001	0.0001	0.3424	
356	Industrial Patterns	1	0.00002	0.3400	0.4000	0.0001	0.0001	0.39	0.00002	0.0002	0.3424	
357	Power Transmission Equi	1	0.0002	0.2600	0.3000	0.0002	0.0003	0.26	0.0004	0.0002	0.3424	
358	Industrial Furnaces & O	1	0.0001	0.2700	0.3000	0.0002	0.0003	0.27	0.0001	0.0002	0.3424	
359	General Industrial Mach	0.2545	0.00001	0.1200	0.2000	0.0002	0.0002	0.39	0	0.0001	0.3424	
360	Carburetors,Pistons,Rin	0.8028	0.00001	0.3400	0.5500	0.00003	0.0001	0.52	0.00001	0.0001	0.3424	
361	Machinery,exc Electrica	0.9582	0.0001	0.3400	0.7500	0.0001	0.0001	0.74	0.0001	0.0002	0.3424	
362	Electronic Computing Eq	1	0.1600	0.1600	0.3000	0.9518	0.1736	0.16	0.9518	0.1928	0.2419	
363	Calculating & Accountin	0.5548	0.00001	0.2400	0.4000	0.5548	0.6445	0.00	0.4677	0.4280	0.2419	
364	Scales & Balances	0.5477	0.00001	0.2400	0.4000	0.5485	0.2602	0.00	0.9076	0.2508	0.2419	
365	Typewriters & Office Ma	0.1435	0.0300	0.0300	0.1435	0.1436	0.0763	0.03	0.3083	0.1508	0.2419	
366	Automatic Merchandising	0.9048	0.0200	0.0200	0.6000	0.9114	0.0840	0.02	0.9795	0.9794	0.2766	
367	Commercial Laundry Equi	0.4767	0.0500	0.0500	0.3000	0.4767	0.3117	0.05	0.7230	0.6326	0.2766	
368	Refrigeration & Heating	0.8546	0.2766	0.2766	0.5500	0.8688	0.6056	0.44	0.9723	0.9724	0.2766	
369	Measuring & Dispensing	0.5946	0.1900	0.1900	0.4000	0.5956	0.6435	0.19	0.9237	0.2121	0.2766	
370	Service Industry Machin	1	0.2766	0.2766	0.7000	0.9999	0.9999	0.38	0.9998	0.9999	0.2766	
371	Instruments to Measure	0.4899	0.0600	0.0600	0.3460	0.3460	0.2993	0.06	0.4340	0.2921	0.2282	
372	Transformers	1	0.0600	0.0600	0.3909	0.3909	0.1653	0.06	0.2172	0.5557	0.2282	
373	Switchgear & Switchboar	0.6027	0.0400	0.0400	0.3250	0.3250	0.2473	0.04	0.2572	0.4324	0.2282	
374	Motors & Generators	1	0.1200	0.1200	0.4730	0.4730	0.3621	0.12	0.4567	0.5517	0.2282	
375	Industrial Controls	1	0.0900	0.0900	0.5512	0.5512	0.3585	0.09	0.2923	0.7056	0.2282	
376	Welding Apparatus, Elec	1	0.2000	0.2000	0.5328	0.5328	0.5664	0.20	0.3104	0.5354	0.2282	
377	Carbon & Graphite Prdct	0.9618	0.1300	0.1300	0.3977	0.3977	0.3721	0.13	0.4637	0.3234	0.2282	
378	Electrical Industrial A	0.4836	0.0300	0.0300	0.2110	0.2110	0.1739	0.03	0.2641	0.2023	0.2282	
379	Household Cooking Equip	1	0.0685	0.0685	0.1864	0.1864	0.1620	0.14	0.0844	0.0685	0.5284	
380	Household Refrigerators	1	0.0155	0.0155	0.4000	0.6551	0.6880	0.10	0.1996	0.0155	0.5284	
381	Household Laundry Equip	1	0.0254	0.0254	0.2681	0.2681	0.2528	0.09	0.0254	0.1428	0.5284	
382	Electric Housewares & F	1	0.0078	0.0078	0.0943	0.0943	0.0078	0.01	0.0113	0.1748	0.5284	
383	Household Vacuum Cleane	1	0.0116	0.0116	0.2339	0.2339	0.1344	0.13	0.3141	0.0116	0.5284	
384	Sewing Machines	0.2174	0.0000	0.0175	0.0175	0.0175	0.0016	0.00	0.0447	0.0015	0.5284	
385	Household Appliances,ne	1	0.0618	0.0618	0.3000	0.1897	0.1108	0.25	0.0618	0.1708	0.5284	
386	Electric Lamps	0.1687	0.0000	0.0107	0.0107	0.0107	0.0032	0.00	0.0100	0.0163	0.1717	
387	Lighting Fixtures and E	0.407	0.0052	0.0052	0.1000	0.0075	0.0153	0.02	0.0052	0.0068	0.1717	
388	Wiring Devices	0.8908	0.0066	0.0066	0.1500	0.0108	0.0066	0.07	0.0085	0.0263	0.1717	
389	Radio & Tv Receiving Se	0.0857	0.0084	0.0084	0.0857	0.0859	0.0957	0.11	0.0084	0.1223	0.0794	
390	Phonograph Records & Ta	0.2756	0.0794	0.0794	0.2756	0.2756	0.3119	0.12	0.1973	0.2637	0.0794	
391	Telephone & Telegraph A	0.0952	0.0000	0.0952	0.0952	0.0952	0.0267	0.00	0.2910	0.0607	0.2097	
392	Radio Tv Communication	0.4785	0.0400	0.0400	0.3000	0.4785	0.5516	0.04	0.3939	0.5209	0.2097	
393	Electron Tubes	0.0771	0.00001	0.0771	0.0771	0.0771	0.0610	0.00	0.0825	0.0809	0.3133	
394	Semiconductors & Relate	0.1329	0.00001	0.1329	0.1329	0.1329	0.1652	0.00	0.1345	0.0687	0.3133	
395	Electronic Components,n	0.6155	0.0250	0.0250	0.3500	0.5016	0.3399	0.03	0.6414	0.2643	0.3133	
396	Storage Batteries	0.6726	0.1200	0.1200	0.6726	0.6792	0.2090	0.12	0.9528	0.8985	0.2637	
397	Primary Batteries, Dry	0.7322	0.0275	0.0275	0.7322	0.7322	0.0840	0.04	0.0275	0.8935	0.2637	
398	X-ray Apparatus & Tubes	1	0.0700	0.0700	0.8569	0.8569	0.0924	0.07	0.8617	0.8605	0.2637	

Appendix C (cont'd.)

SEC NO.	SECTOR NAME	RPC: SDP	FLRLK	ALTFLR	BSTLK	UNCHGD	MI: IMP	REMI	MN IMP	WI IMP	LK MRIO
399	Engine Electrical Equip	0.2818	0.2200	0.2200	0.2818	0.2823	0.2541	0.22	0.4290	0.3915	0.2637
400	Electrical Equip,nec	0.7665	0.0100	0.0100	0.2500	0.3731	0.3762	0.01	0.3804	0.3011	0.2637
401	Truck & Bus Bodies	0.5823	0.1449	0.1449	0.3000	0.1449	0.1694	0.41	0.1591	0.2413	0.4059
402	Truck Trailers	0.9022	0.1861	0.1861	0.1861	0.1861	0.2228	0.23	0.2136	0.2854	0.4059
403	Motor Vehicles	1	0.0891	0.0891	0.5000	0.3316	0.4508	0.93	0.0891	0.2306	0.4059
404	Motor Vehicle Parts & A	1	0.1145	0.1145	0.4500	0.3000	0.4372	0.90	0.1145	0.2768	0.4059
405	Aircraft	0	0	0	0	0	0	0	0.02219	0	0.3766
406	Aircraft & Missile Engi	0.9449	0.00001	0.2550	0.3000	0.6245	0.8083	0.26	0.1186	0	0.1106
407	Aircraft & Missile Equi	0	0	0	0	0	0	0.31	0	0	0.0488
408	Ship Building & Repairi	1	0.0540	0.0540	0.2043	0.2043	0.1061	0.25	0.0540	0.2115	0.3356
409	Boat Building & Repairi	1	0.1991	0.1991	0.3305	0.3305	0.2451	0.58	0.2510	0.1991	0.3356
410	Railroad Equip	0.3253	0.0614	0.0614	0.2168	0.2168	0.0614	0.11	0.1636	0.1302	0.3356
411	Motorcycles,Bicycles,&	0.6902	0.0400	0.0400	0.1812	0.1812	0.0483	0.04	0.0490	0.2034	0.3356
412	Travel Trailers & Campe	0.5364	0.1356	0.1356	0.3809	0.3809	0.3559	0.41	0.2428	0.1356	0.3356
413	Mobile Homes	0.4402	0.0003	0.0003	0.1000	0.0018	0.0006	0.11	0.0003	0.0133	0.5608
414	Motor Homes	0.5729	0.0082	0.0082	0.3243	0.3243	0.3461	0.26	0.0246	0.0082	0.3356
415	Transportation Equip,ne	1	0.2200	0.2200	0.4006	0.4006	0.2381	0.22	0.3534	0.2813	0.3356
416	Engineering & Scientifi	1	0.1003	0.1003	0.2046	0.2046	0.1003	0.17	0.2149	0.3543	0.4591
417	Mechanical Measuring De	0.8048	0.0200	0.0200	0.2222	0.2222	0.1281	0.02	0.3486	0.2203	0.4591
418	Automatic Temperature C	0.9406	0.00001	0.4600	0.5000	0.6070	0.0799	0.00	0.7681	0.6705	0.4591
419	Surgical & Medical Inst	0.7394	0.0600	0.0600	0.5500	0.7365	0.3584	0.06	0.8159	0.8120	0.3165
420	Surgical Appliances & S	0.7649	0.0700	0.0700	0.6000	0.7677	0.3564	0.07	0.9113	0.8517	0.3165
421	Dental Equip & Supplies	0.4993	0.0800	0.0800	0.4000	0.4993	0.4451	0.08	0.3665	0.7824	0.3165
422	Watches,Clocks,& Parts	0.4507	0.0160	0.0160	0.1263	0.1263	0.1128	0.02	0.0160	0.2021	0.4591
423	Optical Instruments & L	0.6271	0.0300	0.0300	0.4000	0.6271	0.4677	0.03	0.7357	0.5008	0.3165
424	Ophthalmic Goods	0.5711	0	0	0.3500	0.5711	0.2727	0.00	0.6635	0.5524	0.3165
425	Photographic Equip & Su	0.3397	0.0100	0.0100	0.1120	0.1120	0.0287	0.01	0.3003	0.0814	0.4591
426	Jewelry,Precious Metal	0.2377	0.0200	0.0200	0.1057	0.1057	0.0315	0.02	0.2241	0.0223	0.1554
427	Jewelers Materials & La	0.0792	0.00001	0.0243	0.0243	0.0243	0.0188	0.00	0.0350	0.0080	0.1554
428	Silverware & Plated War	0.0565	0.00001	0.0144	0.0144	0.0144	0.0144	0.00	0.0040	0.0140	0.1554
429	Costume Jewelry	0.3445	0.00001	0.0818	0.0818	0.0818	0.0288	0.00	0.1021	0.0895	0.1554
430	Musical Instruments	0.7069	0.0176	0.0176	0.1209	0.1209	0.1391	0.23	0.0176	0.0961	0.1554
431	Games,Toys,& Childrens	0.5651	0.0546	0.0546	0.2051	0.2051	0.0546	0.25	0.3495	0.0878	0.1554
432	Dolls	0.3951	0	0.1476	0.1476	0.1476	0.0201	0.00	0.3004	0.0333	0.1554
433	Sprting & Athletic Good	0.9497	0.1010	0.1010	0.1715	0.1715	0.1586	0.33	0.1010	0.1313	0.1554
434	Pens & Mechanical Penci	0.6245	0	0.1430	0.1430	0.1430	0.0039	0.00	0.0278	0.3050	0.1554
435	Lead Pencils & Art Good	0.2683	0.0209	0.0209	0.0393	0.0393	0.0281	0.03	0.0209	0.0471	0.1554
436	Marking Devices	1	0.0900	0.0900	0.2036	0.2036	0.1045	0.09	0.1984	0.2148	0.1554
437	Carbon Paper & Inked Ri	0.3583	0.0591	0.0591	0.0768	0.0768	0.0599	0.07	0.0591	0.0660	0.1554
438	Artificial Trees & Flow	0.4128	0	0.0612	0.0612	0.0612	0.0352	0.00	0.0542	0.0890	0.1554
439	Buttons	0.1663	0	0.0152	0.0152	0.0152	0.0042	0.00	0.0196	0.0189	0.1554
440	Needles,Pins, & Fastene	0.2599	0	0.0546	0.0546	0.0546	0.0147	0.00	0.0079	0.1219	0.1554
441	Brooms & Brushes	1	0.0921	0.0921	0.2045	0.2045	0.0983	0.25	0.0921	0.2973	0.1554
442	Hard Surface Floor Cove	0.0709	0	0.0138	0.0138	0.0138	0.0122	0.00	0.0030	0.0164	0.1554
443	Burial Caskets & Vaults	0.4502	0.0232	0.0232	0.0563	0.0563	0.0375	0.05	0.0232	0.0761	0.1554
444	Signs & Advertising Dis	1	0.1015	0.1015	0.1939	0.1939	0.1015	0.29	0.1672	0.2164	0.1554
445	Manufacturing Industrie	0.7801	0.0763	0.0763	0.1283	0.1283	0.0763	0.20	0.1604	0.1127	0.1554
446	Railroads & Related Svc	0.9921	0.3000	0.3000	0.8000	0.9978	0.4440	0.30	0.8962	0.9034	0.7168
447	Local,Interurban Passen	0.8639	0.2900	0.2900	0.7000	0.8993	0.5506	0.29	0.8911	1.0000	0.6501
448	Motor Freight Transport	1	0.3911	0.3911	0.9000	1.0000	0.3911	0.44	0.7792	1.0000	0.9753

Appendix C (cont'd.)

SEC NO.	SECTOR NAME	RPC: SDP	FLRLK	ALTFLR	BSTLK	UNCHGD	MI: IMP	REMI	MN IMP	WI IMP	LK MRIO
449	Water Transportation	0.6292	0.1600	0.1600	0.6292	0.6335	0.4019	0.16	0.5927	0.7617	1.0000
450	Air Transportation	0.7232	0.1900	0.1900	0.6000	0.7641	0.4228	0.19	0.9755	0.3339	0.3105
451	Pipe Lines,exc Natural	0.6522	0.3200	0.3200	0.5500	0.6658	0.4696	0.32	0.7413	0.9223	0.4207
452	Freight Forwarders & Ot	0.7392	0.4430	0.4430	0.7390	0.9135	0.4430	0.91	0.7634	0.4514	0.6999
453	Arrangement of Passenge	1	0.4430	0.4430	0.9000	1.0000	0.4430	0.94	0.8030	1.0000	0.6999
454	Communications,exc Radi	0.7485	0.4400	0.4400	0.6500	0.7908	0.6292	0.44	0.7514	0.6662	0.5257
455	Radio & Tv Broadcasting	0.8791	0.4236	0.4236	0.7500	0.8792	0.4926	0.87	0.9980	0.9027	0.4236
456	Electric Svcs	0.8711	0.5261	0.5261	0.8711	0.8969	0.5261	0.97	0.8152	0.8575	0.8655
457	Gas Production & Distri	1	0.5941	0.5941	1.0000	1.0000	0.5941	0.95	0.9681	0.8139	0.8525
458	Water Supply & Sewerage	0.912	0.0300	0.0300	0.9120	0.9150	0.6157	0.03	0.9592	1.0000	1.0000
459	Sanitary Svcs, Steam &	0.9866	0.6157	0.6157	0.9866	1.0000	0.6157	0.97	0.8655	1.0000	1.0000
460	Recreational Related Wh	0.7343	0.4955	0.4955	0.7343	0.7421	0.4955	0.78	0.9983	0.8597	0.7321
461	Other Wholesale Trade	0.9007	0.4955	0.4955	0.7300	0.0085	0.0083	0.78	0.0109	0.0069	0.7321
462	Recreational Related Re	0.9472	0.5597	0.5597	0.7500	0.2099	0.2019	0.75	0.2212	0.2167	0.9425
463	Other Retail Trade	0.9566	0.5597	0.5597	0.9566	0.9584	0.5597	0.75	0.9539	0.9778	0.9425
464	Banking	0.8307	0.5831	0.5831	0.8307	0.8562	0.6045	0.83	0.9931	0.7231	0.5831
465	Credit Agencies	0.872	0.5831	0.5831	0.8720	0.8757	0.6045	0.86	0.9931	0.7165	0.5831
466	Security & Commodity Br	0.6862	0.4980	0.4980	0.6862	0.6966	0.5368	0.76	0.9931	0.4980	0.5831
467	Insurance Carriers	0.8474	0.3900	0.3900	0.8475	0.8681	0.4909	0.39	0.9665	1.0000	0.6398
468	Insurance Agents & Brok	0.9289	0.4909	0.4909	0.9289	0.9289	0.4909	0.96	0.9950	0.6265	0.6398
469	Owner-Occupied Dwelling	1	0.6006	0.6006	1.0000	1.0000	0.6006	0.62	0.9159	0.9164	0.6969
470	Real Estate	0.8989	0.6006	0.6006	0.8989	0.9323	0.6006	0.62	0.9159	0.7620	0.6969
471	Hotels & Lodging Places	0.6813	0.1100	0.1100	0.6813	0.7138	0.6252	0.11	0.7123	0.8808	0.7386
472	Laundry,Cleaning & Shoe	0.9856	0.6112	0.6112	0.9856	0.9984	0.6112	0.81	0.9857	0.9282	0.8761
473	Funeral Svc & Crematori	1	0.6112	0.6112	1.0000	1.0000	0.6112	0.92	0.9857	1.0000	0.8761
474	Photo Studios & Misc Pe	1	0.6112	0.6112	1.0000	1.0000	0.6112	0.93	0.9857	1.0000	0.8761
475	Electrical Repair Shops	0.8537	0.6112	0.6112	0.8537	0.8661	0.6112	0.83	0.7963	0.8600	0.8761
476	Watch,Clock,Jewelry,Fur	1	0.5100	0.5100	1.0000	1.0000	0.6112	0.51	0.9857	1.0000	0.8761
477	Beauty & Barber Shops	1	0.6100	0.6100	1.0000	1.0000	0.6112	0.61	0.9857	1.0000	0.8761
478	Misc Repair Shops	0.6773	0	0.6773	0.6773	0.7227	0	0.92	0.5883	0.7296	0.7301
479	Svcs to Buildings	0.6593	0	0.6593	0.6593	0.6922	0	0.67	0.7778	0.6605	0.7301
480	Personal Supply Svcs	0.8377	0	0.8377	0.8377	0.9263	0	0.93	0.9650	1.0000	0.7301
481	Computer & Data Process	0.7233	0	0.7233	0.7233	0.7522	0	0.96	0.7125	0.8401	0.7301
482	Management & Consulting	1	0	0.7300	0.8000	1.0000	0	0.80	0.9956	0.5278	0.7301
483	Detective & Protective	0.7104	0	0.7104	0.7104	0.7681	0	0.88	0.5541	0.7361	0.7301
484	Equip Rental & Leasing	0.6359	0	0.6359	0.6359	0.6779	0	0.87	0.6205	0.5137	0.7301
485	Photofinishing,Commerci	0.9582	0	0.7300	0.9582	1.0000	0	0.96	0.9956	0.8184	0.7301
486	Other Business Svcs	0.9985	0	0.7300	0.9985	1.0000	0	0.96	0.8929	0.7566	0.7301
487	Advertising	0.8786	0	0.7300	0.8786	0.9689	0	0.96	0.9956	1.0000	0.7301
488	Legal Svcs	0.8676	0	0.7300	0.8676	0.9081	0	0.96	0.8905	0.8670	0.7551
489	Engineering,Architectur	0.9272	0	0.7300	0.8500	0.9363	0	0.97	0.5270	0.5328	0.7551
490	Accounting,Auditing,& B	0.8409	0	0.7300	0.8400	1.0000	0	0.95	0.9379	1.0000	0.7551
491	Eating & Drinking Place	1	0.6021	0.6021	0.9000	1.0000	0.6021	0.71	0.9953	1.0000	0.8950
492	Auto Rental & Leasing	1	0.2554	0.2554	0.9000	1.0000	0.2554	0.82	0.9912	0.9583	0.8877
493	Auto Repair & Svcs	0.8965	0.2554	0.2554	0.8965	0.9652	0.2554	0.90	0.9912	0.9616	0.8877
494	Auto Parking & Car Wash	0.9374	0.2554	0.2554	0.9000	1.0000	0.2554	0.67	0.9850	1.0000	0.8877
495	Motion Pictures	0.6128	0.4400	0.4400	0.6128	0.6469	0.7238	0.44	0.6180	0.4951	0.8383
496	Dance Halls,Studios & S	0.7987	0.6100	0.6100	0.7987	0.7987	0.7506	0.61	0.7675	0.8630	0.8383
497	Theatrical Producers,Ba	0.6018	0.4500	0.4500	0.6018	0.6417	0.5241	0.45	0.9015	0.5295	0.8383
498	Bowling Alleys & Pool H	0.837	0.7997	0.7997	0.8370	0.8370	0.7997	0.97	0.8177	0.9194	0.8383

Appendix C (cont'd.)

SEC NO.	SECTOR NAME	RPC: SDP	FLRLK	ALTFLR	BSTLK	UNCHGD	MI: IMP	REMI	MN IMP	WI IMP	LK MRIO
499	Commercial Sports,exc R	0.8766	0.8383	0.8383	0.8766	0.8956	0.8524	0.96	0.8741	0.9666	0.8383
500	Racing & Track Operatio	0.8002	0.4600	0.4600	0.8002	0.8051	0.8495	0.46	0.4679	0.6535	0.8383
501	Membership Sports & Rec	0.8295	0.8290	0.8290	0.8295	0.8879	0.8625	0.95	0.8751	0.9702	0.8383
502	Amusement & Rec Svcs,ne	0.6306	0.5300	0.5300	0.6306	0.6309	0.6015	0.53	0.6167	0.6969	0.8383
503	Doctors & Dentists	1	0.9437	0.9437	1.0000	1.0000	1.0000	0.97	0.9889	1.0000	0.9437
504	Hospitals	0.9963	0.8436	0.8436	0.9963	0.9963	1.0000	0.96	0.8436	1.0000	0.8977
505	Nursing & Personal Care	1	0.8977	0.8977	1.0000	1.0000	0.9007	0.95	0.9902	1.0000	0.8977
506	Other Medical & Health	1	0.7761	0.7761	1.0000	1.0000	0.9946	0.96	0.9535	0.9743	0.7761
507	Elementary & Secondary	1	0.7400	0.7400	1.0000	1.0000	1.0000	0.74	0.9624	1.0000	0.7840
508	Colleges,Universities,&	1	0.3100	0.3100	0.8000	1.0000	1.0000	0.31	0.9624	1.0000	0.7840
509	Other Educational Svcs	1	0.4600	0.4600	1.0000	1.0000	1.0000	0.46	0.9624	1.0000	0.7840
510	Business Associations	0.8221	0.7395	0.7395	0.8221	0.8730	0.9610	0.74	0.8138	0.7395	0.7818
511	Labor & Civic Organizat	0.9916	0.7818	0.7818	0.9916	0.9916	0.9687	0.94	0.9294	0.9599	0.7818
512	Religious Organizations	1	0.7818	0.7818	1.0000	1.0000	0.9687	0.95	0.9294	1.0000	0.7818
513	Other Membership Organi	0.8595	0.5100	0.5100	0.8595	0.8624	0.8572	0.51	0.8703	0.8618	0.7818
514	Residential Care	1	0.5729	0.5729	1.0000	1.0000	1.0000	0.91	0.5729	1.0000	1.0000
515	Social Svcs,nec	1	0.5729	0.5729	1.0000	1.0000	1.0000	0.91	0.5729	0.9914	1.0000
516	U.S. Postal Service	1	0.6475	0.6475	1.0000	1.0000	1.0000		0.9678	0.9209	0.6475
517	Federal Electric Utilit	0	0	0	0	0	0		0	0	0.8655
518	Other Federal Gov Enter	0.5921	0.5182	0.5182	0.5921	0.5921	0.6283		0.5182	0.6099	0.6475
519	Local Gov Passenger Tra	0	0	0	0	0	0		0	0	0.6501
520	State & Local Electric	0	0	0	0	0	0		0	0	0.8655
521	Other State & Local Gov	0.8599	0.7704	0.7704	0.8599	0.8766	0.9489		0.8519	0.7704	1.0000
522	Noncomparable Imports	0.0004	0.0004	0.0004	0.0004	0.0004	0.0002		0.0005	0.0005	1.0000
523	Scrap	0.954	0.2954	0.2954	0.9540	0.9540	0.9049		0.9065	0.7850	0.2954
524	Used & Secondhand Goods	1	0.2954	0.2954	1.0000	1.0000	1.0000		0.9065	1.0000	0.2954
525	Government Industry	1	0.5730	0.5730	1.0000	1.0000	0.9803		0.9806	0.5730	1.0000
526	Rest of the World Indus	0	0	0	0	0	0		0.9414	0	1.0000
527	Household Industry	1	1.0000	1.0000	1.0000	1.0000	1.0000		0.9975	0	1.0000
528	Inventory Valuation Adj	1	0	0	0	0	0		0	0	1.0000
AVERAGE RPC FOR 528 SECTORS:		0.6467	0.1699	0.2266	0.4435	0.4362	0.3301	0.28	0.3832	0.3966	0.4688
STANDARD DEVIATION:		0.3572	0.2240	0.2332	0.3150	0.3557	0.3219	0.28	0.3621	0.3523	0.2496

APPENDIX D: IMPLAN AGGREGATION AND SECTORIZATION SCHEMES

The four aggregation and sectorization schemes used for Lake State models are listed below. Their names and the number of sectors they contain (in parentheses) are as follows: UNAGMN (308), AGMN (158), AG30 (31), AG16 (16). The aggregation schemes are presented first. They appear in the exact format by which they were used as aggregation templates with IMPLAN; therefore, only aggregated sectors are shown. The format involves two lines for each aggregated sector. On the first line, the first number is the lowest IMPLAN sector number of all the IMPLAN sectors that are to be aggregated together to form a new aggregated sector. The next number on the same line indicates how many other sectors are to be aggregated to form the new sector. The name for the new aggregated aggregated sector completes the data on the first line. The next line below these data lists the remaining IMPLAN sector numbers for the other sectors which comprise the new aggregated sector. As an example, the first two lines for the UNAGMN models aggregation scheme indicate sector 3 is being aggregated with six other sectors (4 through 9) to form a new sector called "Meat Animals & Misc. Livestock." The first line for the AGMN aggregation scheme indicates 326 sectors are being aggregated with sector 1 to form a sector called "All Other."

The sectorization schemes list all model sectors which result from the aggregation schemes. Aggregated sectors are indicated by the abbreviation "AGG;" unaggregated sectors are indicated by all capital letters. Appendix A lists all 528 IMPLAN sectors.

Aggregation Scheme for UNAGMN models

```
  3  6Meat Animals & Misc. Livestock
  4   5   6   7   8   9
 11  3Food,Feed Grains & Grass Seed
 12  13  14
 16  1Fruits & Tree Nuts
 17
 18  2Vegs, Sugar & Misc. Crops
 19  20
 22  1Forest, Grnhs & Nursery Prdcts
 23
 24  1Agri, Forstry, & Fish Prdcts
 25
 26  1Agri, For, & Fish Svcs
 27
 28  1Iron & Ferroalloy Ore Mining
 29
 31  7Nonferrous Ore Mining,exc copper
 32  33  34  35  36  37  38
 39  1Coal Mining
 40
 44  5Dim,Crshd,Constr Stone & Ind Sand
 45  46  47  48  49
 50 15Misc. Nonmetallic Minerals, nec
 51  52  53  54  55  56  57  58  59  60
 61  62  63  64  65
 66  6New Construction
 67  68  69  70  71  72
 73  2Maintenance & Repair Construction
 74  75
 76  4Militay Ordnance
 77  78 406 407
 97  1Frozen Fruits, Juices,& Vegs
 98
127  3Tobacco
128 129 130
160 13Wood Prdcts,exc furniture&paper
161 162 163 164 165 166 167 168 169 170
171 172 173
180  4Office Furniture
181 182 183 184
225  3Plastics & Synthetic Materials
226 227 228
235  2Petro Refining & Misc. Petro Prdct
236 237
257 22Stone & Clay Prdcts
258 259 260 261 262 263 264 265 266 267
268 269 270 271 272 273 274 275 276 277
278 279
280  8Primary Iron & Steel Manufacturing
281 282 283 284 285 286 287 288
289 13Primary Nonferrous Metals Manuf
290 291 292 293 294 295 296 297 298 299
300 301 302
303  1Metal Cans
304
305  9Heating,Plumbing,&Fab.Metal Prdcts
306 307 308 309 310 311 312 313 314
322  7Other Fabricated Metal Prdcts
323 324 325 326 327 328 329
330  1Engines & Turbines
```

Appendix D (cont'd.)

Aggregation Scheme for UNAGMN models (cont'd.)

```
 331
334  2Construction & Mining Machinery
 335 336
337  3Material Handling Mach & Equip
 338 339 340
353  8Gen Indstries Machinery & Equip
 354 355 356 357 358 359 360 361
362  3Office Computing&Acctng Machines
 363 364 365
366  4Service Industry Machinery
 367 368 369 370
389  3Radio,Tv & Communications Equip
 390 391 392
434  3Marking Devices
 435 436 437
452  1Freight Forwrdrs & Other Transp
 453
458  1Water Supply & Sanitary Svcs
 459
460  1Other Wholesale Trade
 461
462  1Other Retail Trade
 463
464  2Banking & Other Finance Institut
 465 466
469  1Real Estate
 470
472  4Other Personal & Repair Svcs
 473 474 475 476
478  8Other Business Svcs
 479 480 481 482 483 484 485 486
488  2Misc. Professional Svcs
 489 490
492  2Auto Repair & Svcs
 493 494
496  6Amusement & Rec Svcs, nec
 497 498 499 500 501 502
505  1Other Medical & Health Svcs
 506
507  2Educational Svcs
 508 509
510  3Nonprofit Organizations
 511 512 513
523  1Scrap, Used & Secondhand Goods
 524
```

Aggregation Scheme for AGMN models

```
 1326ALL OTHER
  3   4   5   6   7   8   9  10  15  28
 29  30  31  32  33  34  35  36  37  38
 39  40  41  42  43  44  45  46  47  48
 49  50  51  52  53  54  55  56  57  58
 60  61  62  63  64  65  66  67  68  69
 70  71  72  73  74  75  76  77  78  79
 81 113 118 120 121 127 128 129 130 135
136 138 139 140 141 143 144 147 148 149
154 155 160 161 162 163 164 165 166 167
168 169 170 171 172 173 176 180 181 182
183 184 185 187 188 189 190 192 193 194
195 196 197 199 203 206 207 208 209 210
211 212 213 214 216 217 218 219 220 221
222 223 225 226 227 228 231 232 234 238
239 240 241 242 246 247 248 249 256 257
258 259 260 261 262 263 264 265 266 267
268 269 270 271 272 273 274 275 276 277
278 279 280 281 283 284 285 286 287 289
290 291 292 293 294 295 296 297 298 299
300 301 302 303 304 305 306 307 308 309
310 311 312 313 314 316 317 318 322 323
324 325 326 327 328 329 330 331 334 335
336 337 338 339 340 342 343 345 347 348
350 351 352 353 354 355 356 357 358 359
360 361 362 363 364 365 366 367 368 369
370 371 373 375 376 377 379 380 381 383
384 385 388 389 390 391 392 393 394 395
397 398 399 401 402 403 404 405 406 407
408 409 410 411 412 413 416 418 421 424
428 430 434 435 436 437 442 443 444 452
453 455 456 457 458 459 464 465 466 467
469 470 487 488 489 490 503 504 505 506
516 517 518 519 520 522
 11  3Food,Feed Grains&Grass Seeds
  12  13  14
 16  1Fruits & Tree Nuts
  17
 18  2Veggies,Sugar & Misc. Crops
  19  20
 22  1Forest,Grnhs & Nursery Prdcts
  23
 24  1Forestry & Fishery Prdcts
  25
 26  1Agri, Forestry & Fish Svcs
  27
 97  1Froz Fruits, Juices & Vegs
  98
```

Appendix D (cont'd.)

Aggregation Scheme for AGMN models (cont'd.)

```
235  2Petro Refining & Misc Petro Prdcts
236 237
460  1Other Wholesale Trade
 461
462  1Other Retail Trade
 463
472  4Pers & Repair Svcs,exc auto&beauty
 473 474 475 476
478  8Other Business Services
 479 480 481 482 483 484 485 486
492  2Auto Repair & Services
 493 494
496  6Amusement & Rec Svcs, nec
 497 498 499 500 501 502
507  2Educational Svcs
 508 509
510  3Nonprofit Organizations
 511 512 513
523  1Scap, Used & Secondhand Goods
 524
```

Aggregation Scheme for AG30 models

```
  1 22Farm Products
    2   3   4   5   6   7   8   9  10  11
   12  13  14  15  16  17  18  19  20  21
   22  23
 24  3Agri, For & Fish Prdcts
  25  26  27
 28 37Mining
  29  30  31  32  33  34  35  36  37  38
  39  40  41  42  43  44  45  46  47  48
  49  50  51  52  53  54  55  56  57  58
  59  60  61  62  63  64  65
 66  9Construction
  67  68  69  70  71  72  73  74  75
 76 11Other Transport Vehicles
  78 405 406 407 408 409 410 411 412 414
 415
 77 31Fabricated Metals Manufacturing
  79  80  81 302 303 304 305 306 307 308
 309 310 311 312 313 314 315 316 317 318
 319 320 321 322 323 324 325 326 327 328
 329
 82 48Food & Kindred Prdcts
  83  84  85  86  87  88  89  90  91  92
  93  94  95  96  97  98  99 100 101 102
 103 104 105 106 107 108 109 110 111 112
 113 114 115 116 117 118 119 120 121 122
 123 124 125 126 127 128 129 130
131 28Textiles & Apparel
 132 133 134 135 136 137 138 139 140 141
 142 143 144 145 146 147 148 149 150 151
 152 153 154 155 156 157 158 159
160 40Forest Products
 161 162 163 164 165 166 167 168 169 170
 171 172 173 174 175 176 177 178 179 180
 181 182 183 184 185 186 187 188 189 190
 191 192 193 194 195 196 197 198 199 413
200 14Printing & Publishing
 201 202 203 204 205 206 207 208 209 210
 211 212 213 214
215 19Chemicals
 216 217 218 219 220 221 222 223 224 225
 226 227 228 229 230 231 232 233 234
235  4Petroleum Production
 236 237 238 239
240 14Rubber,Leather&Misc Plastics
 241 242 243 244 245 246 247 248 249 250
 251 252 253 254
255 24Stone,Clay&Glass Prdcts
 256 257 258 259 260 261 262 263 264 265
 266 267 268 269 270 271 272 273 274 275
 276 277 278 279
280 21Primary Metals Manufacturing
 281 282 283 284 285 286 287 288 289 290
 291 292 293 294 295 296 297 298 299 300
 301
330 40Machinery & Equipment
 331 332 333 334 335 336 337 338 339 340
 341 342 343 344 345 346 347 348 349 350
 351 352 353 354 355 356 357 358 359 360
 361 362 363 364 365 366 367 368 369 370
371 30Instruments&Misc Manufacturing
 416 417 418 419 420 421 422 423 424 425
 426 427 428 429 430 431 432 433 434 435
 436 437 438 439 440 441 442 443 444 445
372 28Electric&Electronic Equipment
 373 374 375 376 377 378 379 380 381 382
 383 384 385 386 387 388 389 390 391 392
 393 394 395 396 397 398 399 400
401  3Motor Vehicles
 402 403 404
446  7Transportation Services
 447 448 449 450 451 452 453
```

Appendix D (cont'd.)

Aggregation Scheme for AG30 models (cont'd.)

```
454  1Communications
 455
456  3Public Utilities
 457 458 459
460  1Wholesale Trade
 461
462  1Retail Trade
 463
464  6Finance,Insur,Real Estate
 465 466 467 468 469 470
472 35Misc. Services, nec
 473 474 475 476 477 478 479 480 481 482
 483 484 485 486 487 488 489 490 492 493
 494 495 503 504 505 506 507 508 509 510
 511 512 513 514 515
496  6Amusement & Rec Services
 497 498 499 500 501 502
516  5Federal & State Gov.
 517 518 519 520 521
522  6Other Gov,Hshld, World Industry
 523 524 525 526 527 528
```

Aggregation Scheme for AG16 models

```
  1 26Farm Products
   2   3   4   5   6   7   8   9  10  11
  12  13  14  15  16  17  18  19  20  21
  22  23  24  25  26  27
 28 37Mining
  29  30  31  32  33  34  35  36  37  38
  39  40  41  42  43  44  45  46  47  48
  49  50  51  52  53  54  55  56  57  58
  59  60  61  62  63  64  65
 66  9Construction
  67  68  69  70  71  72  73  74  75
 762860ther Manufacturing
  77  78  79  80  81 160 161 162 163 164
 165 166 167 168 169 170 171 172 173 174
 175 176 177 178 179 180 181 182 183 184
 185 186 187 188 189 190 191 192 193 194
 195 196 197 198 199 200 201 202 203 204
 205 206 207 208 209 210 211 212 213 214
 215 216 217 218 219 220 221 222 223 224
 225 226 227 228 229 230 231 232 233 234
 240 241 242 243 244 245 246 247 248 249
 250 251 252 253 254 255 256 257 258 259
 260 261 262 263 264 265 266 267 268 269
 270 271 272 273 274 275 276 277 278 279
 280 281 282 283 284 285 286 287 288 289
 290 291 292 293 294 295 296 297 298 299
 300 301 302 303 304 305 306 307 308 309
 310 311 312 313 314 315 316 317 318 319
 320 321 322 323 324 325 326 327 328 329
 330 331 332 333 334 335 336 337 338 339
 340 341 342 343 344 345 346 347 348 349
 350 351 352 353 354 355 356 357 358 359
 360 361 362 363 364 365 366 367 368 369
 370 371 372 373 374 375 376 377 378 379
 380 381 382 383 384 385 386 387 388 389
 390 391 392 393 394 395 396 397 398 399
 400 401 402 403 404 405 406 407 408 409
 410 411 412 413 414 415 416 417 418 419
 420 421 422 423 424 425 426 427 428 429
 430 431 432 433 434 435 436 437 438 439
 440 441 442 443 444 445
 82 48Food & Kindred Prdcts
  83  84  85  86  87  88  89  90  91  92
  93  94  95  96  97  98  99 100 101 102
 103 104 105 106 107 108 109 110 111 112
 113 114 115 116 117 118 119 120 121 122
 123 124 125 126 127 128 129 130
131 28Textiles & Apparel
 132 133 134 135 136 137 138 139 140 141
 142 143 144 145 146 147 148 149 150 151
 152 153 154 155 156 157 158 159
235  4Petroleum Production
 236 237 238 239
446  7Transportation Services
 447 448 449 450 451 452 453
454 48Other Services
 455 456 457 458 459 464 465 466 467 468
 469 470 472 473 474 475 476 477 478 479
 480 481 482 483 484 485 486 487 488 489
 490 492 493 494 495 503 504 505 506 507
 508 509 510 511 512 513 514 515
460  1Wholesale Trade
 461
462  1Retail Trade
 463
496  6Amusement & Rec Services
 497 498 499 500 501 502
516  5Federal & State Gov.
 517 518 519 520 521
522  6Other Gov,Hshld, World Industry
 523 524 525 526 527 528
```

Appendix D (cont'd.)

UNAGMN 308 Sectorization Scheme

1	DAIRY FARM PRODUCTS
2	POULTRY AND EGGS
3	AGG Meat Animals & Misc. Livestock
11	AGG Food,Feed Grains & Grass Seed
15	TOBACCO
16	FRUITS
18	AGG Vegs, Sugar & Misc. Crops
21	OIL BEARING CROPS
22	AGG Forest, Grnhs & Nursery Prdcts
24	AGG Agri, Forstry, & Fish Prdcts
26	AGG Agri, For, & Fish Svcs
28	IRON ORES
30	AGG Nonferrous Ore Mining,exc copper
40	BITUMINOUS AND LIGNITE MINING, SERVI
41	NATURAL GAS
42	CRUDE PETROLEUM
43	NATURAL GAS LIQUIDS
44	AGG Dim,Crshd,Constr Stone & Ind Sand
50	AGG Misc. Nonmetallic Minerals, nec
66	AGG New Construction
73	AGG Maintenance & Repair Construction
76	AGG Militay Ordnance
79	SMALL ARMS
80	SMALL ARMS AMMUNITION
81	OTHER ORDNANCE AND ACCESSORIES
82	MEAT PACKING PLANTS
83	SAUSAGES AND OTHER PREPARED MEATS
84	POULTRY DRESSING PLANTS
85	POULTRY AND EGG PROCESSING
86	CREAMERY BUTTER
87	CHEESE, NATURAL AND PROCESSED
88	CONDENSED AND EVAPORATED MILK
89	ICE CREAM AND FROZEN DESSERTS
90	FLUID MILK
91	CANNED AND CURED SEA FOODS
92	CANNED SPECIALTIES
93	CANNED FRUITS AND VEGETABLES
94	DEHYDRATED FOOD PRODUCTS
95	PICKLES, SAUCES, AND SALAD DRESSINGS
96	FRESH OR FROZEN PACKAGED FISH
97	AGG Frozen Fruits, Juices,& Vegs
99	FLOUR AND OTHER GRAIN MILL PRODUCTS
100	CEREAL PREPARATIONS
101	BLENDED AND PREPARED FLOUR
102	DOG, CAT, AND OTHER PET FOOD
103	PREPARED FEEDS, N.E.C
104	RICE MILLING
105	WET CORN MILLING
106	BREAD, CAKE, AND RELATED PRODUCTS
107	COOKIES AND CRACKERS
108	SUGAR
109	CONFECTIONERY PRODUCTS
110	CHOCOLATE AND COCOA PRODUCTS
111	CHEWING GUM
112	MALT LIQUORS
113	MALT
114	WINES, BRANDY, AND BRANDY SPIRITS
115	DISTILLED LIQUOR, EXCEPT BRANDY
116	BOTTLED AND CANNED SOFT DRINKS
117	FLAVORING EXTRACTS AND SYRUPS, N.E.C.
119	SOYBEAN OIL MILLS
120	AGG Other Fats, Oils, & Oil Mills
122	ROASTED COFFEE
123	SHORTENING AND COOKING OILS
124	MANUFACTURED ICE
125	MACARONI AND SPAGHETTI
126	FOOD PREPARATIONS, N.E.C
128	AGG Tobacco
131	BROADWOVEN FABRIC MILLS AND FINISHING
132	NARROW FABRIC MILLS
133	YARN MILLS AND FINISHING OF TEXTILES
135	AGG Other Misc. Textl Gds&Flr Cvrngs
142	CORDAGE AND TWINE
145	WOMENS HOSIERY, EXCEPT SOCKS
146	HOSIERY, N.E.C
147	KNIT OUTERWEAR MILLS
148	KNIT UNDERWEAR MILLS
149	KNITTING MILLS, N.E.C
150	KNIT FABRIC MILLS
151	APPAREL MADE FROM PURCHASED MATERIAL
152	CURTAINS AND DRAPERIES
153	HOUSEFURNISHINGS, N.E.C
154	TEXTILE BAGS
155	CANVAS PRODUCTS
156	PLEATING AND STITCHING
157	AUTOMOTIVE AND APPAREL TRIMMINGS
158	SCHIFFI MACHINE EMBROIDERIES
159	FABRICATED TEXTILE PRODUCTS, N.E.C
160	AGG Wood Prdcts,exc furniture&paper
174	WOOD HOUSEHOLD FURNITURE
175	HOUSEHOLD FURNITURE, N.E.C
176	WOOD TV AND RADIO CABINETS
177	UPHOLSTERED HOUSEHOLD FURNITURE
178	METAL HOUSEHOLD FURNITURE
179	MATTRESSES AND BEDSPRINGS
180	AGG Office Furniture
185	BLINDS, SHADES, AND DRAPERY HARDWARE
186	FURNITURE AND FIXTURES, N.E.C
187	PULP MILLS
188	PAPER MILLS, EXCEPT BUILDING PAPER

Appendix D (cont'd.)

UNAGMN 308 Sectorization Scheme (cont'd.)

189	PAPERBOARD MILLS
190	ENVELOPES
191	SANITARY PAPER PRODUCTS
192	BUILDING PAPER AND BOARD MILLS
193	PAPER COATING AND GLAZING
194	BAGS, EXCEPT TEXTILE
195	DIE-CUT PAPER AND BOARD
196	PRESSED AND MOLDED PULP GOODS
197	STATIONERY PRODUCTS
198	CONVERTED PAPER PRODUCTS, N.E.C
199	PAPERBOARD CONTAINERS AND BOXES
200	NEWSPAPERS
201	PERIODICALS
202	BOOK PUBLISHING
203	BOOK PRINTING
204	MISCELLANEOUS PUBLISHING
205	COMMERCIAL PRINTING
206	LITHOGRAPHIC PLATEMAKING AND SERVICE
207	MANIFOLD BUSINESS FORMS
208	BLANKBOOKS AND LOOSELEAF BINDERS
209	GREETING CARD PUBLISHING
210	ENGRAVING AND PLATE PRINTING
211	BOOKBINDING AND RELATED WORK
212	TYPESETTING
213	PHOTOENGRAVING
214	ELECTROTYPING AND STEREOTYPING
215	INDUSTRIAL INORGANIC, ORGANIC CHEMIC
216	NITROGENOUS AND PHOSPHATIC FERTILIZE
217	FERTILIZERS, MIXING ONLY
218	AGRICULTURAL CHEMICALS, N.E.C
219	GUM AND WOOD CHEMICALS
220	ADHESIVES AND SEALANTS
221	EXPLOSIVES
222	PRINTING INK
223	CARBON BLACK
224	CHEMICAL PREPARATIONS, N.E.C
225	AGG Plastics & Synthetic Materials
229	DRUGS
230	SOAP AND OTHER DETERGENTS
231	POLISHES AND SANITATION GOODS
232	SURFACE ACTIVE AGENTS
233	TOILET PREPARATIONS
234	PAINTS AND ALLIED PRODUCTS
235	AGG Petro Refining & Misc. Petro Prd
238	PAVING MIXTURES AND BLOCKS
239	ASPHALT FELTS AND COATINGS
240	TIRES AND INNER TUBES
241	RUBBER AND PLASTICS FOOTWEAR
242	RECLAIMED RUBBER
243	FABRICATED RUBBER PRODUCTS, N.E.C
244	MISCELLANEOUS PLASTICS PRODUCTS
245	RUBBER AND PLASTICS HOSE AND BELTING
246	LEATHER TANNING AND FINISHING
247	FOOTWEAR CUT STOCK
248	SHOES, EXCEPT RUBBER
249	HOUSE SLIPPERS
250	LEATHER GLOVES AND MITTENS
251	LUGGAGE
252	WOMENS HANDBAGS AND PURSES
253	PERSONAL LEATHER GOODS
254	LEATHER GOODS, N.E.C
255	GLASS AND GLASS PRODUCTS, EXC CONTAI
256	GLASS CONTAINERS
257	AGG Stone & Clay Prdcts
280	AGG Primary Iron & Steel Manufacturng
289	AGG Primary Nonferrous Metals Manuf
303	AGG Metal Cans
305	AGG Heating,Plumbing,&Fab.Metal Prdc
315	SCREW MACHINE PRODUCTS AND BOLTS, ET
316	AUTOMOTIVE STAMPINGS
317	CROWNS AND CLOSURES
318	METAL STAMPINGS, N.E.C.
319	CUTLERY
320	HAND AND EDGE TOOLS, N.E.C.
321	HAND SAWS AND SAW BLADES
322	AGG Other Fabricated Metal Prdcts
330	AGG Engines & Turbines
332	FARM MACHINERY AND EQUIPMENT
333	LAWN AND GARDEN EQUIPMENT
334	AGG Construction & Mining Machinery
337	AGG Material Handling Mach & Equip
341	MACHINE TOOLS, METAL CUTTING TYPES
342	MACHINE TOOLS, METAL FORMING TYPES
343	SPECIAL DIES AND TOOLS AND ACCESSORI
344	POWER DRIVEN HAND TOOLS
345	ROLLING MILL MACHINERY
346	METALWORKING MACHINERY, N.E.C.
347	FOOD PRODUCTS MACHINERY
348	TEXTILE MACHINERY
349	WOODWORKING MACHINERY
350	PAPER INDUSTRIES MACHINERY
351	PRINTING TRADES MACHINERY
352	SPECIAL INDUSTRY MACHINERY, N.E.C.
353	AGG Gen Indstries Machinery & Equip
362	AGG Office Computing&Acctng Machines
366	AGG Service Industry Machinery
371	INSTRUMENTS TO MEASURE ELECTRICITY
372	TRANSFORMERS
373	SWITCHGEAR AND SWITCHBOARD APPARATUS
374	MOTORS AND GENERATORS

Appendix D (cont'd.)

UNAGMN 308 Sectorization Scheme (cont.'d)

375	INDUSTRIAL CONTROLS
376	WELDING APPARATUS, ELECTRIC
377	CARBON AND GRAPHITE PRODUCTS
378	ELECTRICAL INDUSTRIAL APPARATUS, N.E.C.
379	HOUSEHOLD COOKING EQUIPMENT
380	HOUSEHOLD REFRIGERATORS AND FREEZERS
381	HOUSEHOLD LAUNDRY EQUIPMENT
382	ELECTRIC HOUSEWARES AND FANS
383	HOUSEHOLD VACUUM CLEANERS
384	SEWING MACHINES
385	HOUSEHOLD APPLIANCES, N.E.C.
386	ELECTRIC LAMPS
387	LIGHTING FIXTURES AND EQUIPMENT
388	WIRING DEVICES
389	AGG Radio,Tv & Communications Equip
393	ELECTRON TUBES
394	SEMICONDUCTORS AND RELATED DEVICES
395	ELECTRONIC COMPONENTS, N.E.C.
396	STORAGE BATTERIES
397	PRIMARY BATTERIES, DRY AND WET
398	X-RAY APPARATUS AND TUBES
399	ENGINE ELECTRICAL EQUIPMENT
400	ELECTRICAL EQUIPMENT, N.E.C.
401	TRUCK AND BUS BODIES
402	TRUCK TRAILERS
403	MOTOR VEHICLES
404	MOTOR VEHICLE PARTS AND ACCESSORIES
405	AIRCRAFT
408	SHIP BUILDING AND REPAIRING
409	BOAT BUILDING AND REPAIRING
410	RAILROAD EQUIPMENT
411	MOTORCYCLES, BICYCLES, AND PARTS
412	TRAVEL TRAILERS AND CAMPERS
413	MOBILE HOMES
414	MOTOR HOMES
415	TRANSPORTATION EQUIPMENT, N.E.C.
416	ENGINEERING AND SCIENTIFIC INSTRUMEN
417	MECHANICAL MEASURING DEVICES
418	AUTOMATIC TEMPERATURE CONTROLS
419	SURGICAL AND MEDICAL INSTRUMENTS
420	SURGICAL APPLIANCES AND SUPPLIES
421	DENTAL EQUIPMENT AND SUPPLIES
422	WATCHES, CLOCKS, AND PARTS
423	OPTICAL INSTRUMENTS AND LENSES
424	OPHTHALMIC GOODS
425	PHOTOGRAPHIC EQUIPMENT AND SUPPLIES
426	JEWELRY, PRECIOUS METAL
427	JEWELERS MATERIALS AND LAPIDARY WORK
428	SILVERWARE AND PLATED WARE
429	COSTUME JEWELERY
430	MUSICAL INSTRUMENTS
431	GAMES, TOYS, AND CHILDRENS VEHICLES
432	DOLLS
433	SPORTING AND ATHLETIC GOODS, N.E.C.
434	AGG Marking Devices
438	ARTIFICIAL TREES AND FLOWERS
439	BUTTONS
440	NEEDLES, PINS, AND FASTENERS
441	BROOMS AND BRUSHES
442	HARD SURFACE FLOOR COVERINGS
443	BURIAL CASKETS AND VAULTS
444	SIGNS AND ADVERTISING DISPLAYS
445	MANUFACTURING INDUSTRIES, N.E.C.
446	RAILROADS AND RELATED SERVICES
447	LOCAL, INTERURBAN PASSENGER TRANSIT
448	MOTOR FREIGHT TRANSPORT AND WAREHOUS
449	WATER TRANSPORTATION
450	AIR TRANSPORTATION
451	PIPE LINES, EXCEPT NATURAL GAS
452	AGG Freight Forwrdrs & Other Transp
454	COMMUNICATIONS, EXCEPT RADIO AND TV
455	RADIO AND TV BROADCASTING
456	ELECTRIC SERVICES
457	GAS PRODUCTION AND DISTRIBUTION
458	AGG Water Supply & Sanitary Svcs
460	AGG Other Wholesale Trade
462	AGG Other Retail Trade
464	AGG Banking & Other Finance Institut
467	INSURANCE CARRIERS
468	INSURANCE AGENTS AND BROKERS
469	AGG Real Estate
471	HOTELS AND LODGING PLACES
472	AGG Other Personal & Repair Svcs
477	BEAUTY AND BARBER SHOPS
478	AGG Other Business Svcs
487	ADVERTISING
488	AGG Misc. Professional Svcs
491	EATING AND DRINKING PLACES
492	AGG Auto Repair & Svcs
495	MOTION PICTURES
496	AGG Amusement & Rec Svcs, nec
503	DOCTORS AND DENTISTS
504	HOSPITALS
505	AGG Other Medical & Health Svcs
507	AGG Educational Svcs
510	AGG Nonprofit Organizations
514	RESIDENTIAL CARE
515	SOCIAL SERVICES, N.E.C.
516	U.S. POSTAL SERVICE
517	FEDERAL ELECTRIC UTILITIES

Appendix D (cont'd.)

UNAGMN 308 Sectorization Scheme (cont.'d)

518	OTHER FEDERAL GOVERNMENT ENTERPRISES	525	GOVERNMENT INDUSTRY
519	LOCAL GOVERNMENT PASSENGER TRANSIT	526	REST OF THE WORLD INDUSTRY
520	STATE AND LOCAL ELECTRIC UTILITIES	527	HOUSEHOLD INDUSTRY
521	OTHER STATE AND LOCAL GOVT ENTERPRIS	528	INVENTORY VALUATION ADJUSTMENT

AGMN 158 Sectorization Scheme

1	AGG ALL OTHER	116	BOTTLED AND CANNED SOFT DRINKS
2	POULTRY AND EGGS	117	FLAVORING EXTRACTS AND SYRUPS, N.E.C
11	AGG Food,Feed Grains&Grass Seeds	119	SOYBEAN OIL MILLS
16	FRUITS	122	ROASTED COFFEE
18	AGG Veggies,Sugar & Misc. Crops	123	SHORTENING AND COOKING OILS
21	OIL BEARING CROPS	124	MANUFACTURED ICE
22	AGG Forest,Grnhs & Nursery Prdcts	125	MACARONI AND SPAGHETTI
24	AGG Forestry & Fishery Prdcts	126	FOOD PREPARATIONS, N.E.C
26	AGG Agri, Forestry & Fish Svcs	131	BROADWOVEN FABRIC MILLS AND FINISHIN
80	SMALL ARMS AMMUNITION	132	NARROW FABRIC MILLS
82	MEAT PACKING PLANTS	133	YARN MILLS AND FINISHING OF TEXTILES
83	SAUSAGES AND OTHER PREPARED MEATS	137	LACE GOODS
84	POULTRY DRESSING PLANTS	142	CORDAGE AND TWINE
85	POULTRY AND EGG PROCESSING	145	WOMENS HOSIERY, EXCEPT SOCKS
86	CREAMERY BUTTER	146	HOSIERY, N.E.C
87	CHEESE, NATURAL AND PROCESSED	150	KNIT FABRIC MILLS
88	CONDENSED AND EVAPORATED MILK	151	APPAREL MADE FROM PURCHASED MATERIAL
89	ICE CREAM AND FROZEN DESSERTS	152	CURTAINS AND DRAPERIES
90	FLUID MILK	153	HOUSEFURNISHINGS, N.E.C
91	CANNED AND CURED SEA FOODS	156	PLEATING AND STITCHING
92	CANNED SPECIALTIES	157	AUTOMOTIVE AND APPAREL TRIMMINGS
93	CANNED FRUITS AND VEGETABLES	158	SCHIFFI MACHINE EMBROIDERIES
94	DEHYDRATED FOOD PRODUCTS	159	FABRICATED TEXTILE PRODUCTS, N.E.C
95	PICKLES, SAUCES, AND SALAD DRESSINGS	174	WOOD HOUSEHOLD FURNITURE
96	FRESH OR FROZEN PACKAGED FISH	175	HOUSEHOLD FURNITURE, N.E.C
97	AGG Froz Fruits, Juices & Vegs	177	UPHOLSTERED HOUSEHOLD FURNITURE
99	FLOUR AND OTHER GRAIN MILL PRODUCTS	178	METAL HOUSEHOLD FURNITURE
100	CEREAL PREPARATIONS	179	MATTRESSES AND BEDSPRINGS
101	BLENDED AND PREPARED FLOUR	186	FURNITURE AND FIXTURES, N.E.C
102	DOG, CAT, AND OTHER PET FOOD	191	SANITARY PAPER PRODUCTS
103	PREPARED FEEDS, N.E.C	198	CONVERTED PAPER PRODUCTS, N.E.C
104	RICE MILLING	200	NEWSPAPERS
105	WET CORN MILLING	201	PERIODICALS
106	BREAD, CAKE, AND RELATED PRODUCTS	202	BOOK PUBLISHING
107	COOKIES AND CRACKERS	204	MISCELLANEOUS PUBLISHING
108	SUGAR	205	COMMERCIAL PRINTING
109	CONFECTIONERY PRODUCTS	215	INDUSTRIAL INORGANIC, ORGANIC CHEMIC
110	CHOCOLATE AND COCOA PRODUCTS	224	CHEMICAL PREPARATIONS, N.E.C
111	CHEWING GUM	229	DRUGS
112	MALT LIQUORS	230	SOAP AND OTHER DETERGENTS
114	WINES, BRANDY, AND BRANDY SPIRITS	233	TOILET PREPARATIONS
115	DISTILLED LIQUOR, EXCEPT BRANDY	235	AGG Petro Refining & Misc Petro Prdc

Appendix D (cont'd.)

AGMN 158 Sectorization Scheme (cont.'d)

243	FABRICATED RUBBER PRODUCTS, N.E.C
244	MISCELLANEOUS PLASTICS PRODUCTS
245	RUBBER AND PLASTICS HOSE AND BELTING
250	LEATHER GLOVES AND MITTENS
251	LUGGAGE
252	WOMENS HANDBAGS AND PURSES
253	PERSONAL LEATHER GOODS
254	LEATHER GOODS, N.E.C
255	GLASS AND GLASS PRODUCTS, EXC CONTAI
282	STEEL WIRE AND RELATED PRODUCTS
288	PRIMARY METAL PRODUCTS, N.E.C
315	SCREW MACHINE PRODUCTS AND BOLTS, ET
319	CUTLERY
320	HAND AND EDGE TOOLS, N.E.C.
321	HAND SAWS AND SAW BLADES
332	FARM MACHINERY AND EQUIPMENT
333	LAWN AND GARDEN EQUIPMENT
341	MACHINE TOOLS, METAL CUTTING TYPES
344	POWER DRIVEN HAND TOOLS
346	METALWORKING MACHINERY, N.E.C.
349	WOODWORKING MACHINERY
372	TRANSFORMERS
374	MOTORS AND GENERATORS
378	ELECTRICAL INDUSTRIAL APPARATUS, N.E
382	ELECTRIC HOUSEWARES AND FANS
386	ELECTRIC LAMPS
387	LIGHTING FIXTURES AND EQUIPMENT
396	STORAGE BATTERIES
400	ELECTRICAL EQUIPMENT, N.E.C.
414	MOTOR HOMES
415	TRANSPORTATION EQUIPMENT, N.E.C.
417	MECHANICAL MEASURING DEVICES
419	SURGICAL AND MEDICAL INSTRUMENTS
420	SURGICAL APPLIANCES AND SUPPLIES
422	WATCHES, CLOCKS, AND PARTS
423	OPTICAL INSTRUMENTS AND LENSES
425	PHOTOGRAPHIC EQUIPMENT AND SUPPLIES
426	JEWELRY, PRECIOUS METAL
427	JEWELERS MATERIALS AND LAPIDARY WORK
429	COSTUME JEWELERY
431	GAMES, TOYS, AND CHILDRENS VEHICLES
432	DOLLS
433	SPORTING AND ATHLETIC GOODS, N.E.C.
438	ARTIFICIAL TREES AND FLOWERS
439	BUTTONS
440	NEEDLES, PINS, AND FASTENERS
441	BROOMS AND BRUSHES
445	MANUFACTURING INDUSTRIES, N.E.C.
446	RAILROADS AND RELATED SERVICES
447	LOCAL, INTERURBAN PASSENGER TRANSIT
448	MOTOR FREIGHT TRANSPORT AND WAREHOUS
449	WATER TRANSPORTATION
450	AIR TRANSPORTATION
451	PIPE LINES, EXCEPT NATURAL GAS
454	COMMUNICATIONS, EXCEPT RADIO AND TV
460	AGG Other Wholesale Trade
462	AGG Other Retail Trade
468	INSURANCE AGENTS AND BROKERS
471	HOTELS AND LODGING PLACES
472	AGG Pers & Repair Svcs,exc auto&beau
477	BEAUTY AND BARBER SHOPS
478	AGG Other Business Services
491	EATING AND DRINKING PLACES
492	AGG Auto Repair & Services
495	MOTION PICTURES
496	AGG Amusement & Rec Svcs, nec
507	AGG Educational Svcs
510	AGG Nonprofit Organizations
514	RESIDENTIAL CARE
515	SOCIAL SERVICES, N.E.C.
521	OTHER STATE AND LOCAL GOVT ENTERPRIS
525	GOVERNMENT INDUSTRY
526	REST OF THE WORLD INDUSTRY
527	HOUSEHOLD INDUSTRY
528	INVENTORY VALUATION ADJUSTMENT

Appendix D (cont'd.)

AG30 Sectorization Scheme

1	AGG Farm Products
24	AGG Agri, For & Fish Prdcts
28	AGG Mining
66	AGG Construction
76	AGG Other Transport Vehicles
77	AGG Fabricated Metals Manufacturing
82	AGG Food & Kindred Prdcts
131	AGG Textiles & Apparel
160	AGG Forest Products
200	AGG Printing & Publishing
215	AGG Chemicals
235	AGG Petroleum Production
240	AGG Rubber,Leather&Misc Plastics
255	AGG Stone,Clay&Glass Prdcts
280	AGG Primary Metals Manufacturing
330	AGG Machinery & Equipment
371	AGG Instruments&Misc Manufacturing
372	AGG Electric&Electronic Equipment
401	AGG Motor Vehicles
446	AGG Transportation Services
454	AGG Communications
456	AGG Public Utilities
460	AGG Wholesale Trade
462	AGG Retail Trade
464	AGG Finance,Insur,Real Estate
471	HOTELS AND LODGING PLACES
472	AGG Misc. Services, nec
491	EATING AND DRINKING PLACES
496	AGG Amusement & Rec Services
516	AGG Federal & State Gov.
525	AGG Other Gov,Hshld, World Industry

AG 16 Sectorization Scheme

1	AGG Farm Products
28	AGG Mining
66	AGG Construction
77	AGG Other Manufacturing
82	AGG Food & Kindred Prdcts
131	AGG Textiles & Apparel
235	AGG Petroleum Production
446	AGG Transportation Services
454	AGG Other Services
460	AGG Wholesale Trade
462	AGG Retail Trade
471	HOTELS AND LODGING PLACES
491	EATING AND DRINKING PLACES
496	AGG Amusement & Rec Services
516	AGG Federal & State Gov.
525	AGG Other Gov,Hshld, World In

APPENDIX E: LAKE STATE OUTDOOR RECREATION IMPACTS

The following tables present estimated outdoor recreation economic impacts for the Lake States FHW study area. The estimates are stated in terms of millions of 1982 dollars for output and personal income, and numbers of jobs for employment. They are presented according to type of recreation spending, aggregation scheme, trade estimate, and multiplier type (I or III) they are associated with

The five sets of trade estimates used in deriving impacts and which appear as column headings include:

SDP - trade estimates based on the supply-demand pooling trade estimation technique; these represent ceiling values for IMPLAN RPCs and generate the largest multipliers

FLRLK - RPCs are based on the minimum RPC values for the three Lake states, including questionable low RPCs

ALTFLK - RPCs are the same as for FLRLK except for those FLRLK RPCs which appeared highly contradictory to a combination of SDP, MRIO, REMI, and Census estimates; ALTFLK RPCs represent a more accurate, or reasonable set of minimum RPC values.

BSTLK - RPCs based on other RPCs, secondary data, and this author's judgment

UNCHLK - unchanged IMPLAN (version 2.0) RPC estimates

Model aggregation and type of recreation spending are indicated in row headings. The aggregations are identified by the following prefix abbreviations:

disaggregated (502 sector) model - "DIS"
minimally aggregated (308 sector) model - "UNAG"
all nonrecreation aggregation (159 sector) model - "AGLK"
highly aggregated (31 sector) model - "LK30"
most aggregated (16 sector) model - "LK16"

Four types of recreation spending categories are indicated by abbreviations used as suffixes in row headings as follows:

nonresident spending only - "NONRES"
trip spending only - "TRIP"
total spending less special equipment - "-SPEC"
total spending - "TOTAL"

Two sets of low and high estimated impacts are presented. One set includes recreation spending encompassing transfers from one set of Lake State residents to another set of Lake State residents. The other set does not include such intraregional transfers, but does include payments from nonresidents to resident households. An exception to this is that "NONRES" rows are different. Nonresident outdoor recreation economic impacts stemming from the 1987 Governors' Conference on Forestry study are presented with the "LOW w/res pces" impacts; total impacts stemming from the 1987 study are presented with the "LOW nonres pces." FHW low nonresident impacts are presented with the "HIGH w/res pces" impacts and FHW high nonresident impacts are listed with the "HIGH nonres pces." No impacts based on the 1987 study are listed with the disaggregated model because 1987 spending categories could not be objectively disaggregated.

Appendix E (cont'd.)

LAKE STATE OUTDOOR RECREATION ECONOMIC IMPACTS: LOW, w/res pces (1982 million $)

OUTPUT	SDPLK TYPE I	SDPLK TYPE III	FLRLK TYPE I	FLRLK TYPE III	ALTFLK TYPE I	ALTFLK TYPE III	BSTLK TYPE I	BSTLK TYPE III	UNCHLK TYPE I	UNCHLK TYPE III
DISNONRES										
DISTRIP	1,246.0	1,915.8	881.8	1,116.5	922.0	1,185.0	1,137.7	1,670.3	1,108.9	1,827.7
DIS-SPEC	1,850.7	2,789.6	1,334.1	1,658.2	1,405.3	1,771.5	1,687.6	2,429.4	1,645.0	2,656.5
DISTOTAL	2,401.2	3,515.0	1,677.8	2,043.5	1,771.1	2,187.2	2,127.3	2,983.3	2,057.2	3,216.6
UNAGNONRES	1,036.3	1,605.0	738.2	927.4	777.9	991.0	948.1	1,393.1	938.0	1,484.8
UNAGTRIP	1,237.3	1,896.7	865.3	1,082.5	905.0	1,148.3	1,123.2	1,635.8	1,104.2	1,719.1
UNAG-SPEC	1,839.6	2,822.8	1,311.4	1,635.2	1,381.0	1,745.6	1,667.7	2,430.4	1,638.1	2,594.5
UNAGTOTAL	2,388.8	3,598.3	1,647.7	2,030.7	1,739.3	2,172.1	2,102.3	3,017.6	2,049.5	3,195.8
AGLKNONRES	1,048.8	1,665.9	735.0	922.9	776.6	990.1	944.5	1,402.3	928.5	1,475.8
AGLKTRIP	1,241.8	1,954.6	861.1	1,077.0	902.7	1,146.6	1,114.4	1,641.3	1,089.7	1,705.1
AGLK-SPEC	1,864.4	2,910.5	1,309.3	1,624.9	1,382.0	1,740.7	1,667.2	2,437.4	1,627.7	2,570.9
AGLKTOTAL	2,353.5	3,616.5	1,639.7	2,014.3	1,732.7	2,159.6	2,080.8	3,000.9	2,022.8	3,150.9
LK30NONRES	1,049.2	1,624.3	743.8	931.0	784.4	996.7	958.0	1,404.0	947.4	1,494.2
LK30TRIP	1,253.4	1,934.2	875.5	1,096.0	916.9	1,165.7	1,138.1	1,664.4	1,119.7	1,744.8
LK30-SPEC	1,870.3	2,865.1	1,327.9	1,649.1	1,397.0	1,761.0	1,694.3	2,460.6	1,659.3	2,613.3
LK30TOTAL	2,397.9	3,610.9	1,655.6	2,035.0	1,749.5	2,181.9	2,116.9	3,033.0	2,055.4	3,196.5
LK16NONRES	1,061.5	1,635.9	743.5	929.4	784.0	991.3	957.4	1,398.2	945.5	1,486.9
LK16TRIP	1,275.3	1,936.0	882.1	1,092.9	922.8	1,157.2	1,149.0	1,653.9	1,130.9	1,735.2
LK16-SPEC	1,937.4	2,900.0	1,337.4	1,640.5	1,407.6	1,746.2	1,719.6	2,446.7	1,678.4	2,593.2
LK16TOTAL	2,433.8	3,602.7	1,658.3	2,020.1	1,752.5	2,158.1	2,127.5	2,999.6	2,060.2	3,156.2

PERSONAL INCOME	SDPLK TYPE I	SDPLK TYPE III	FLRLK TYPE I	FLRLK TYPE III	ALTFLK TYPE I	ALTFLK TYPE III	BSTLK TYPE I	BSTLK TYPE III	UNCHLK TYPE I	UNCHLK TYPE III
DISNONRES										
DISTRIP	304.0	489.9	222.9	294.6	237.4	318.7	279.0	429.1	264.5	461.5
DIS-SPEC	504.2	764.8	380.1	479.1	405.6	518.8	464.1	673.1	444.3	721.4
DISTOTAL	681.2	990.4	495.5	607.1	529.2	657.8	608.2	849.4	578.1	895.7
UNAGNONRES	258.5	417.1	186.9	243.8	201.5	266.7	236.7	362.0	230.3	381.0
UNAGTRIP	305.0	488.8	218.7	284.0	233.3	307.7	277.1	421.4	266.6	435.9
UNAG-SPEC	506.3	780.3	374.9	472.3	400.3	511.8	462.1	676.7	447.5	710.9
UNAGTOTAL	683.5	1,020.6	488.0	603.2	521.4	653.8	604.8	862.4	581.7	897.4
AGLKNONRES	272.8	450.8	189.1	246.1	202.7	267.3	245.0	379.3	238.0	395.3
AGLKTRIP	319.0	524.5	220.1	285.5	233.5	307.4	285.6	440.1	274.9	451.7
AGLK-SPEC	517.5	819.2	369.7	465.3	392.8	501.3	465.0	690.9	449.1	720.1
AGLKTOTAL	661.9	1,026.1	469.7	583.2	499.1	628.2	588.8	858.7	567.0	891.1
LK30NONRES	268.5	427.6	191.2	246.4	206.2	270.0	244.8	369.5	239.5	389.1
LK30TRIP	312.5	500.8	220.6	285.6	236.0	310.7	283.5	430.7	274.8	445.8
LK30-SPEC	514.4	789.5	375.4	470.1	400.7	510.1	467.8	682.1	453.2	714.2
LK30TOTAL	693.9	1,029.4	492.9	604.7	527.1	657.1	614.9	871.2	591.2	903.5
LK16NONRES	268.9	429.6	190.0	244.7	200.8	261.4	242.4	367.6	236.4	386.5
LK16TRIP	297.7	482.5	205.4	267.4	216.2	284.7	267.2	410.6	258.2	425.8
LK16-SPEC	498.3	767.7	350.2	439.4	369.0	467.9	442.7	649.3	425.9	679.5
LK16TOTAL	651.9	979.0	454.5	560.9	479.7	598.2	571.6	819.3	546.3	850.1

Appendix E (cont'd.)

LAKE STATE OUTDOOR RECREATION ECONOMIC IMPACTS: LOW, w/res pces (cont'd.) (jobs)

EMPLOYMENT	SDPLK TYPE I	SDPLK TYPE III	FLRLK TYPE I	FLRLK TYPE III	ALTFLK TYPE I	ALTFLK TYPE III	BSTLK TYPE I	BSTLK TYPE III	UNCHLK TYPE I	UNCHLK TYPE III
DISNONRES										
DISTRIP	22,627	33,194	18,615	22,954	19,347	24,172	21,495	30,393	20,782	29,154
DIS-SPEC	31,704	46,511	25,688	31,676	26,940	33,659	29,927	42,317	28,737	40,315
DISTOTAL	37,615	55,183	28,990	35,748	30,604	38,237	34,536	48,833	32,766	45,967
UNAGNONRES	19,227	28,191	15,765	19,256	16,470	20,382	18,254	25,654	17,975	25,397
UNAGTRIP	22,292	32,684	18,094	22,102	18,798	23,262	21,030	29,556	20,727	29,286
UNAG-SPEC	33,237	48,732	26,969	32,943	28,174	34,865	31,284	43,968	30,733	43,424
UNAGTOTAL	40,889	59,951	31,894	38,958	33,446	41,389	37,547	52,770	36,706	51,862
AGLKNONRES	19,575	29,044	15,734	19,049	16,409	20,114	18,357	25,794	18,065	25,380
AGLKTRIP	22,613	33,551	18,074	21,883	18,746	22,978	21,124	29,683	20,826	29,260
AGLK-SPEC	33,189	49,244	26,432	32,001	27,566	33,790	30,881	43,393	30,294	42,561
AGLKTOTAL	40,069	59,452	31,369	37,979	32,799	40,205	36,890	51,837	36,076	50,684
LK30NONRES	19,393	28,262	15,614	18,921	16,373	20,152	18,310	25,544	17,984	25,217
LK30TRIP	22,958	33,457	18,398	22,296	19,176	23,601	21,606	30,142	21,172	29,688
LK30-SPEC	33,547	48,888	26,800	32,478	28,068	34,546	31,455	43,883	30,646	42,974
LK30TOTAL	40,907	59,613	31,658	38,365	33,339	41,034	37,609	52,468	36,499	51,180
LK16NONRES	19,250	28,129	15,497	18,757	16,008	19,573	18,101	25,305	17,775	24,970
LK16TRIP	22,152	32,369	17,584	21,283	18,099	22,129	20,743	29,000	20,317	28,540
LK16-SPEC	32,263	47,143	25,270	30,586	26,139	31,960	29,861	41,747	29,014	40,758
LK16TOTAL	39,180	57,250	30,163	36,508	31,313	38,286	35,818	50,074	34,623	48,638

Appendix E (cont'd.)

LAKE STATE OUTDOOR RECREATION ECONOMIC IMPACTS: LOW, nonres pces (1982 million $)

OUTPUT	SDPLK TYPE I	SDPLK TYPE III	FLRLK TYPE I	FLRLK TYPE III	ALTFLK TYPE I	ALTFLK TYPE III	BSTLK TYPE I	BSTLK TYPE III	UNCHLK TYPE I	UNCHLK TYPE III
DISNONRES										
DISTRIP	1,241.0	1,908.6	878.1	1,112.1	918.1	1,180.2	1,133.2	1,664.0	1,104.5	1,820.9
DIS-SPEC	1,797.0	2,711.4	1,293.9	1,609.7	1,363.1	1,719.9	1,638.2	2,360.7	1,596.7	2,582.2
DISTOTAL	2,347.4	3,436.8	1,637.6	1,995.0	1,728.9	2,135.5	2,077.9	2,914.5	2,008.9	3,142.3
UNAGNONRES	3,475.1	5,426.2	2,496.8	3,152.1	2,633.9	3,371.8	3,180.4	4,709.8	3,150.5	5,005.6
UNAGTRIP	1,232.4	1,889.6	861.6	1,078.2	901.2	1,143.7	1,118.7	1,629.6	1,099.7	1,712.6
UNAG-SPEC	1,785.9	2,744.8	1,271.7	1,587.7	1,339.3	1,695.0	1,618.7	2,362.5	1,589.8	2,523.5
UNAGTOTAL	2,335.1	3,520.3	1,608.0	1,983.2	1,697.6	2,121.6	2,053.2	2,949.8	2,001.3	3,124.9
AGLKNONRES	3,532.2	5,654.0	2,488.7	3,139.3	2,631.6	3,370.8	3,179.4	4,756.2	3,129.7	4,989.6
AGLKTRIP	1,238.9	1,950.0	859.1	1,074.4	900.5	1,143.9	1,111.8	1,637.4	1,087.2	1,701.0
AGLK-SPEC	1,833.1	2,861.4	1,287.0	1,597.2	1,358.5	1,711.0	1,639.1	2,396.0	1,600.2	2,526.4
AGLKTOTAL	2,322.3	3,567.4	1,617.5	1,986.6	1,709.2	2,129.8	2,052.7	2,959.5	1,995.3	3,106.3
LK30NONRES	3,493.0	5,479.4	2,504.8	3,160.0	2,644.5	3,387.8	3,195.2	4,741.5	3,166.6	5,030.6
LK30TRIP	1,249.3	1,928.1	872.4	1,092.3	913.7	1,161.7	1,134.3	1,659.2	1,116.0	1,739.2
LK30-SPEC	1,825.7	2,799.5	1,294.2	1,608.6	1,361.4	1,717.7	1,653.2	2,403.3	1,618.7	2,552.5
LK30TOTAL	2,353.3	3,545.4	1,621.8	1,994.4	1,713.9	2,138.6	2,075.8	2,975.8	2,014.8	3,135.6
LK16NONRES	3,533.7	5,502.7	2,503.5	3,148.8	2,642.1	3,361.8	3,191.4	4,707.0	3,157.1	4,989.9
LK16TRIP	1,271.1	1,929.9	879.0	1,089.2	919.6	1,153.3	1,145.2	1,648.7	1,127.2	1,729.6
LK16-SPEC	1,891.8	2,833.1	1,303.3	1,599.5	1,371.8	1,702.6	1,678.1	2,388.9	1,637.6	2,531.9
LK16TOTAL	2,394.7	3,544.8	1,628.8	1,984.4	1,721.3	2,119.9	2,091.8	2,949.5	2,025.0	3,102.3

PERSONAL INCOME	SDPLK TYPE I	SDPLK TYPE III	FLRLK TYPE I	FLRLK TYPE III	ALTFLK TYPE I	ALTFLK TYPE III	BSTLK TYPE I	BSTLK TYPE III	UNCHLK TYPE I	UNCHLK TYPE III
DISNONRES										
DISTRIP	302.7	488.0	221.9	293.4	236.3	317.3	277.8	427.4	263.4	459.7
DIS-SPEC	489.9	743.8	369.2	465.6	394.0	504.3	450.9	654.6	431.6	701.6
DISTOTAL	666.9	969.4	484.5	593.7	517.6	643.3	595.0	830.8	565.3	875.9
UNAGNONRES	888.8	1,432.6	647.0	844.1	697.4	923.2	814.2	1,244.6	794.1	1,305.0
UNAGTRIP	303.6	486.8	217.7	282.8	232.2	306.4	275.9	419.7	265.4	434.1
UNAG-SPEC	491.6	758.9	364.0	459.0	388.6	497.4	448.7	658.0	434.4	691.5
UNAGTOTAL	668.8	999.2	477.1	589.9	509.7	639.4	591.4	843.7	568.6	878.0
AGLKNONRES	932.9	1,544.8	651.1	848.3	697.8	921.5	838.4	1,300.9	816.4	1,350.9
AGLKTRIP	318.1	523.2	219.4	284.7	232.9	306.5	284.8	439.0	274.1	450.5
AGLK-SPEC	508.2	804.7	362.8	456.8	385.5	492.1	456.5	678.6	440.9	707.0
AGLKTOTAL	652.6	1,011.6	462.8	574.7	491.7	619.0	580.4	846.4	558.7	878.0
LK30NONRES	931.4	1,480.9	673.7	866.8	725.6	948.9	852.3	1,284.7	837.2	1,347.2
LK30TRIP	311.3	499.1	219.7	284.5	235.0	309.5	282.5	429.2	273.7	444.3
LK30-SPEC	501.6	771.0	365.7	458.4	390.4	497.4	456.1	665.9	441.7	697.2
LK30TOTAL	681.1	1,010.9	483.2	593.0	516.8	644.4	603.2	854.9	579.7	886.4
LK16NONRES	924.8	1,475.8	662.2	852.1	699.4	909.6	836.1	1,266.7	818.2	1,326.3
LK16TRIP	296.5	480.8	204.5	266.3	215.3	283.5	266.1	409.1	257.2	424.2
LK16-SPEC	485.2	748.6	340.3	427.4	358.5	455.2	430.8	632.7	414.2	662.1
LK16TOTAL	639.7	961.5	445.0	549.6	469.7	586.2	560.3	804.0	535.2	833.9

Appendix E (cont'd.)

LAKE STATE OUTDOOR RECREATION ECONOMIC IMPACTS: LOW, nonres pces (cont'd.) (jobs)

EMPLOYMENT	SDPLK TYPE I	SDPLK TYPE III	FLRLK TYPE I	FLRLK TYPE III	ALTFLK TYPE I	ALTFLK TYPE III	BSTLK TYPE I	BSTLK TYPE III	UNCHLK TYPE I	UNCHLK TYPE III
DISNONRES										
DISTRIP	22,552	33,085	18,555	22,880	19,283	24,093	21,424	30,294	20,713	29,058
DIS-SPEC	30,891	45,318	25,031	30,866	26,249	32,796	29,160	41,231	27,994	39,272
DISTOTAL	36,802	53,991	28,333	34,938	29,913	37,374	33,768	47,748	32,023	44,924
UNAGNONRES	65,957	96,706	54,577	66,665	57,020	70,561	62,738	88,172	62,163	87,831
UNAGTRIP	22,217	32,574	18,034	22,029	18,735	23,185	20,959	29,456	20,658	29,188
UNAG-SPEC	32,416	47,527	26,319	32,148	27,489	34,017	30,515	42,887	29,976	42,354
UNAGTOTAL	40,067	58,746	31,243	38,163	32,761	40,542	36,777	51,688	35,949	50,792
AGLKNONRES	67,315	99,875	54,487	65,967	56,812	69,639	63,220	88,835	62,606	87,957
AGLKTRIP	22,561	33,473	18,032	21,831	18,701	22,924	21,075	29,614	20,778	29,192
AGLK-SPEC	32,621	48,400	25,972	31,445	27,088	33,203	30,348	42,644	29,774	41,830
AGLKTOTAL	39,501	58,609	30,910	37,423	32,321	39,618	36,357	51,088	35,556	49,954
LK30NONRES	66,988	97,620	54,672	66,255	57,303	70,529	63,476	88,554	62,570	87,738
LK30TRIP	22,894	33,363	18,346	22,233	19,121	23,534	21,545	30,057	21,112	29,604
LK30-SPEC	32,842	47,861	26,235	31,794	27,469	33,809	30,792	42,958	29,992	42,056
LK30TOTAL	40,202	58,585	31,093	37,680	32,741	40,297	36,946	51,543	35,844	50,262
LK16NONRES	65,996	96,433	53,808	65,127	55,562	67,935	62,246	87,020	61,311	86,127
LK16TRIP	22,078	32,261	17,527	21,214	18,040	22,057	20,675	28,904	20,250	28,446
LK16-SPEC	31,547	46,097	24,696	29,891	25,542	31,230	29,191	40,809	28,353	39,829
LK16TOTAL	38,549	56,328	29,649	35,885	30,777	37,630	35,224	49,244	34,037	47,814

Appendix E (cont'd.)

LAKE STATE OUTDOOR RECREATION ECONOMIC IMPACTS: HIGH, w/res pces (1982 million $)

OUTPUT	SDPLK TYPE I	SDPLK TYPE III	FLRLK TYPE I	FLRLK TYPE III	ALTFLK TYPE I	ALTFLK TYPE III	BSTLK TYPE I	BSTLK TYPE III	UNCHLK TYPE I	UNCHLK TYPE III
DISNONRES	264.7	407.1	187.8	237.9	196.5	252.5	242.0	355.4	236.0	389.5
DISTRIP	2,802.7	4,264.1	1,987.4	2,497.3	2,078.7	2,650.6	2,557.4	3,717.5	2,497.7	4,101.0
DIS-SPEC	4,574.8	6,833.3	3,304.0	4,078.7	3,487.5	4,365.5	4,168.1	5,949.0	4,067.3	6,547.7
DISTOTAL	6,910.7	9,902.7	4,761.9	5,712.0	5,037.6	6,125.2	6,028.0	8,287.1	5,809.8	8,918.7
UNAGNONRES	263.3	404.1	184.6	231.0	193.2	245.3	239.4	349.0	235.5	367.2
UNAGTRIP	2,785.5	4,230.6	1,952.5	2,426.5	2,043.1	2,574.7	2,528.2	3,650.1	2,490.0	3,858.4
UNAG-SPEC	4,548.3	6,909.1	3,250.1	4,022.5	3,428.9	4,301.1	4,121.5	5,949.3	4,051.7	6,375.4
UNAGTOTAL	6,879.8	10,201.3	4,677.8	5,703.8	4,948.3	6,112.6	5,960.4	8,437.6	5,791.1	8,951.3
AGLKNONRES	266.7	421.0	185.0	231.8	194.1	247.0	239.3	353.4	234.2	367.3
AGLKTRIP	2,764.3	4,316.2	1,919.9	2,387.3	2,013.1	2,542.1	2,481.5	3,627.1	2,431.9	3,794.8
AGLK-SPEC	4,392.8	6,825.7	3,096.3	3,828.6	3,274.2	4,108.4	3,935.8	5,727.7	3,852.1	6,095.3
AGLKTOTAL	5,880.1	9,032.5	4,080.3	5,012.1	4,318.3	5,381.4	5,169.7	7,458.8	5,032.5	7,963.0
LK30NONRES	266.8	412.5	186.8	234.1	195.7	249.1	242.7	355.6	239.2	373.2
LK30TRIP	2,582.7	4,027.5	1,828.0	2,301.8	1,917.1	2,451.9	2,353.2	3,474.8	2,324.8	3,686.5
LK30-SPEC	4,124.2	6,411.2	2,971.8	3,721.1	3,134.0	3,983.9	3,751.1	5,521.2	3,683.0	5,940.2
LK30TOTAL	6,376.1	9,595.0	4,369.6	5,368.1	4,638.1	5,780.5	5,554.0	7,964.8	5,373.5	8,456.2
LK16NONRES	270.5	412.6	187.8	233.4	196.6	247.3	244.3	353.1	240.8	370.9
LK16TRIP	2,555.1	3,927.0	1,795.4	2,240.7	1,881.6	2,376.8	2,313.5	3,368.0	2,287.2	3,584.1
LK16-SPEC	4,203.1	6,374.0	2,938.8	3,633.6	3,102.4	3,879.1	3,738.1	5,385.3	3,655.5	5,790.4
LK16TOTAL	6,341.7	9,408.5	4,327.4	5,278.2	4,593.7	5,662.5	5,501.4	7,780.3	5,308.9	8,255.2

PERSONAL INCOME	SDPLK TYPE I	SDPLK TYPE III	FLRLK TYPE I	FLRLK TYPE III	ALTFLK TYPE I	ALTFLK TYPE III	BSTLK TYPE I	BSTLK TYPE III	UNCHLK TYPE I	UNCHLK TYPE III
DISNONRES	64.4	104.0	47.3	62.6	50.4	67.7	59.2	91.2	56.2	98.2
DISTRIP	681.2	1,087.0	497.6	653.3	530.5	707.4	623.8	950.7	592.7	1,031.9
DIS-SPEC	1,252.9	1,879.7	943.2	1,179.7	1,008.5	1,279.8	1,152.1	1,653.8	1,105.1	1,784.5
DISTOTAL	1,987.7	2,818.2	1,416.5	1,706.6	1,516.0	1,852.2	1,746.1	2,382.6	1,656.0	2,507.6
UNAGNONRES	64.4	103.7	46.2	60.2	49.3	65.3	58.6	89.5	56.5	92.7
UNAGTRIP	681.3	1,084.1	486.3	628.8	519.5	682.2	617.8	933.5	595.3	972.2
UNAG-SPEC	1,257.3	1,915.4	930.5	1,162.7	995.2	1,262.0	1,146.9	1,661.3	1,112.3	1,752.2
UNAGTOTAL	1,993.5	2,919.3	1,394.6	1,703.1	1,492.8	1,849.0	1,735.7	2,432.8	1,665.1	2,535.5
AGLKNONRES	68.2	112.7	47.0	61.2	49.9	65.9	61.1	94.5	58.8	97.1
AGLKTRIP	702.7	1,150.2	482.2	623.8	512.4	672.5	628.3	964.4	606.2	997.9
AGLK-SPEC	1,225.6	1,927.2	879.2	1,101.2	935.6	1,188.0	1,104.0	1,629.6	1,069.4	1,714.0
AGLKTOTAL	1,685.3	2,594.4	1,198.3	1,480.7	1,273.3	1,594.9	1,494.9	2,166.4	1,443.0	2,285.1
LK30NONRES	66.2	106.6	46.8	60.8	50.1	66.2	60.3	91.8	58.5	95.2
LK30TRIP	669.8	1,069.4	480.1	619.8	513.3	674.0	610.9	924.5	596.2	968.8
LK30-SPEC	1,197.2	1,829.8	890.8	1,111.6	950.5	1,205.9	1,096.2	1,591.2	1,067.8	1,685.5
LK30TOTAL	1,961.3	2,851.7	1,390.6	1,684.8	1,488.5	1,831.8	1,722.4	2,396.6	1,655.9	2,499.3
LK16NONRES	63.7	103.5	44.2	57.6	46.6	61.4	57.4	88.3	55.6	91.7
LK16TRIP	626.3	1,010.2	441.9	572.9	464.9	609.6	566.6	866.2	552.2	911.8
LK16-SPEC	1,146.4	1,753.9	823.2	1,027.6	867.0	1,093.9	1,025.0	1,492.9	991.5	1,583.5
LK16TOTAL	1,806.0	2,664.2	1,272.6	1,552.4	1,344.2	1,656.4	1,579.8	2,227.3	1,510.8	2,327.7

Appendix E (cont'd.)

LAKE STATE OUTDOOR RECREATION ECONOMIC IMPACTS: HIGH, w/res pces (cont'd.) (jobs)

EMPLOYMENT	SDPLK TYPE I	SDPLK TYPE III	FLRLK TYPE I	FLRLK TYPE III	ALTFLK TYPE I	ALTFLK TYPE III	BSTLK TYPE I	BSTLK TYPE III	UNCHLK TYPE I	UNCHLK TYPE III
DISNONRES	4,813	7,061	3,968	4,893	4,126	5,155	4,578	6,473	4,430	6,215
DISTRIP	49,369	72,427	40,425	49,848	42,080	52,576	46,818	66,200	45,266	63,502
DIS-SPEC	76,261	111,880	61,401	75,714	64,584	80,692	71,848	101,591	68,988	96,781
DISTOTAL	101,044	148,238	75,317	92,873	80,009	99,963	91,151	128,886	85,843	120,428
UNAGNONRES	4,759	6,978	3,872	4,730	4,025	4,981	4,497	6,320	4,442	6,276
UNAGTRIP	48,854	71,629	39,478	48,222	41,081	50,837	46,019	64,676	45,515	64,309
UNAG-SPEC	79,811	117,018	64,326	78,573	67,399	83,406	74,980	105,379	73,749	104,201
UNAGTOTAL	112,288	164,635	85,448	104,374	89,969	111,335	101,621	142,822	99,213	140,179
AGLKNONRES	4,895	7,263	3,918	4,744	4,064	4,982	4,575	6,429	4,520	6,351
AGLKTRIP	49,237	73,053	39,144	47,392	40,652	49,831	45,930	64,540	45,461	63,870
AGLK-SPEC	77,185	114,520	61,333	74,255	64,104	78,578	71,843	100,952	70,617	99,211
AGLKTOTAL	100,010	148,388	78,031	94,472	81,691	100,135	91,777	128,963	89,819	126,189
LK30NONRES	4,914	7,162	3,947	4,783	4,116	5,066	4,632	6,463	4,545	6,373
LK30TRIP	48,725	71,006	39,538	47,915	41,227	50,742	46,040	64,230	45,257	63,460
LK30-SPEC	77,127	112,396	62,524	75,770	65,522	80,644	72,662	101,369	70,951	99,490
LK30TOTAL	108,554	158,194	83,311	100,960	88,076	108,404	98,966	138,066	95,943	134,536
LK16NONRES	4,764	6,962	3,802	4,601	3,913	4,785	4,472	6,252	4,386	6,162
LK16TRIP	48,910	71,468	38,827	46,994	39,999	48,906	45,825	64,065	44,950	63,145
LK16-SPEC	72,763	106,322	57,930	70,115	59,961	73,314	67,648	94,574	65,831	92,477
LK16TOTAL	102,788	150,195	79,284	95,961	82,520	100,897	93,597	130,851	90,267	126,804

Appendix E (cont'd.)

LAKE STATE OUTDOOR RECREATION ECONOMIC IMPACTS: HIGH, nonres pces (1982 million $)

OUTPUT	SDPLK TYPE I	SDPLK TYPE III	FLRLK TYPE I	FLRLK TYPE III	ALTFLK TYPE I	ALTFLK TYPE III	BSTLK TYPE I	BSTLK TYPE III	UNCHLK TYPE I	UNCHLK TYPE III
DISNONRES	717.7	1,087.9	510.9	640.2	534.5	679.6	655.8	949.9	641.4	1,053.8
DISTRIP	2,791.0	4,247.2	1,978.7	2,486.8	2,069.6	2,639.5	2,546.8	3,702.6	2,487.3	4,084.9
DIS-SPEC	4,442.1	6,640.1	3,204.8	3,958.8	3,383.2	4,237.8	4,046.1	5,779.2	3,948.1	6,364.2
DISTOTAL	6,778.0	9,709.5	4,662.7	5,592.1	4,933.4	5,997.5	5,906.0	8,117.3	5,690.5	8,735.2
UNAGNONRES	714.5	1,081.9	502.7	623.3	526.2	661.7	649.8	935.3	640.9	992.8
UNAGTRIP	2,773.9	4,213.8	1,943.9	2,416.2	2,034.1	2,563.8	2,517.6	3,635.4	2,479.6	3,843.1
UNAG-SPEC	4,415.6	6,716.5	3,152.0	3,905.1	3,325.9	4,176.2	4,000.3	5,781.8	3,932.5	6,200.1
UNAGTOTAL	6,747.1	10,008.7	4,579.7	5,586.4	4,845.3	5,987.7	5,839.1	8,270.0	5,671.8	8,775.9
AGLKNONRES	718.1	1,117.3	498.9	618.7	523.4	659.2	644.3	938.7	632.1	985.1
AGLKTRIP	2,757.5	4,305.5	1,915.0	2,381.2	2,008.0	2,535.7	2,475.4	3,618.1	2,425.9	3,785.1
AGLK-SPEC	4,315.1	6,703.5	3,040.9	3,759.7	3,215.6	4,034.4	3,865.8	5,624.8	3,783.7	5,984.6
AGLKTOTAL	5,802.3	8,910.3	4,024.9	4,943.1	4,259.7	5,307.4	5,099.7	7,355.8	4,964.1	7,852.2
LK30NONRES	720.5	1,105.6	507.6	632.3	532.2	673.2	656.9	955.0	649.3	1,010.5
LK30TRIP	2,573.0	4,013.3	1,820.6	2,293.0	1,909.4	2,442.5	2,344.3	3,462.3	2,315.9	3,673.3
LK30-SPEC	4,013.1	6,248.3	2,887.9	3,620.4	3,045.6	3,876.2	3,648.9	5,378.9	3,582.2	5,789.2
LK30TOTAL	6,265.0	9,432.1	4,285.7	5,267.3	4,549.7	5,672.9	5,451.8	7,822.6	5,272.7	8,305.1
LK16NONRES	727.3	1,101.7	509.4	629.4	533.4	667.0	658.7	945.7	651.4	1,001.7
LK16TRIP	2,545.3	3,912.6	1,788.0	2,231.8	1,873.9	2,367.4	2,304.6	3,355.6	2,278.5	3,570.9
LK16-SPEC	4,090.4	6,208.6	2,854.6	3,532.4	3,013.8	3,771.4	3,635.6	5,242.4	3,554.6	5,639.0
LK16TOTAL	6,229.5	9,243.6	4,243.5	5,177.3	4,505.4	5,555.1	5,399.2	7,638.0	5,208.3	8,104.3

PERSONAL INCOME	SDPLK TYPE I	SDPLK TYPE III	FLRLK TYPE I	FLRLK TYPE III	ALTFLK TYPE I	ALTFLK TYPE III	BSTLK TYPE I	BSTLK TYPE III	UNCHLK TYPE I	UNCHLK TYPE III
DISNONRES	173.1	275.9	126.5	166.0	135.0	179.9	158.7	241.6	151.0	263.9
DISTRIP	678.2	1,082.5	495.2	650.4	528.0	704.2	620.9	946.7	589.9	1,027.7
DIS-SPEC	1,217.6	1,827.9	916.2	1,146.4	979.8	1,244.0	1,119.5	1,608.0	1,073.6	1,735.6
DISTOTAL	1,952.4	2,766.4	1,389.5	1,673.3	1,487.3	1,816.3	1,713.5	2,336.8	1,624.5	2,458.7
UNAGNONRES	172.5	274.9	122.9	159.2	131.6	173.0	156.6	236.9	151.1	248.0
UNAGTRIP	678.1	1,079.4	483.9	625.9	517.0	679.1	614.9	929.5	592.5	968.0
UNAG-SPEC	1,221.1	1,862.4	903.4	1,129.8	966.3	1,226.5	1,113.7	1,615.1	1,079.9	1,704.4
UNAGTOTAL	1,957.2	2,866.3	1,367.5	1,670.2	1,464.0	1,813.4	1,702.5	2,386.6	1,632.8	2,487.7
AGLKNONRES	181.1	296.2	123.6	159.9	131.6	172.6	161.6	248.0	156.1	257.6
AGLKTRIP	700.7	1,147.1	480.7	622.0	510.9	670.5	626.5	961.7	604.4	995.0
AGLK-SPEC	1,202.5	1,891.2	862.1	1,079.9	917.5	1,165.2	1,082.9	1,598.9	1,049.0	1,681.4
AGLKTOTAL	1,662.2	2,558.4	1,181.1	1,459.4	1,255.1	1,572.1	1,473.8	2,135.6	1,422.5	2,252.5
LK30NONRES	179.7	286.2	127.1	163.9	136.3	178.6	163.6	247.0	159.6	258.5
LK30TRIP	667.0	1,065.4	478.0	617.2	511.1	671.3	608.3	921.0	593.8	965.2
LK30-SPEC	1,165.7	1,784.0	866.8	1,082.7	924.9	1,176.5	1,067.2	1,551.0	1,039.3	1,643.2
LK30TOTAL	1,929.8	2,805.8	1,366.6	1,655.9	1,462.9	1,800.4	1,693.4	2,356.4	1,627.3	2,457.1
LK16NONRES	172.4	277.2	120.2	155.5	126.5	165.6	155.6	237.1	151.5	248.7
LK16TRIP	623.5	1,006.1	439.8	570.3	462.7	606.8	564.0	862.6	549.7	908.1
LK16-SPEC	1,114.1	1,706.8	798.6	998.0	841.3	1,062.6	995.4	1,451.9	962.6	1,540.5
LK16TOTAL	1,773.8	2,617.3	1,248.1	1,522.8	1,318.4	1,625.1	1,550.3	2,186.4	1,481.9	2,284.9

Appendix E (cont'd.)

LAKE STATE OUTDOOR RECREATION ECONOMIC IMPACTS: HIGH, nonres pces (cont'd.) (jobs)

EMPLOYMENT	SDPLK TYPE I	SDPLK TYPE III	FLRLK TYPE I	FLRLK TYPE III	ALTFLK TYPE I	ALTFLK TYPE III	BSTLK TYPE I	BSTLK TYPE III	UNCHLK TYPE I	UNCHLK TYPE III
DISNONRES	12,504	18,344	10,251	12,641	10,677	13,341	11,869	16,783	11,486	16,113
DISTRIP	49,194	72,170	40,283	49,673	41,930	52,389	46,652	65,966	45,105	63,277
DIS-SPEC	74,253	108,934	59,778	73,713	62,878	78,560	69,952	98,911	67,151	94,205
DISTOTAL	99,036	145,292	73,694	90,872	78,302	97,832	89,256	126,206	84,007	117,852
UNAGNONRES	12,420	18,210	10,048	12,274	10,465	12,951	11,714	16,464	11,628	16,430
UNAGTRIP	48,677	71,369	39,338	48,051	40,933	50,654	45,853	64,443	45,352	64,078
UNAG-SPEC	77,783	114,044	62,719	76,610	65,707	81,312	73,079	102,708	71,879	101,559
UNAGTOTAL	110,259	161,661	83,841	102,411	88,277	109,241	99,721	140,151	97,344	137,538
AGLKNONRES	12,667	18,794	10,038	12,153	10,434	12,790	11,803	16,585	11,723	16,469
AGLKTRIP	49,113	72,870	39,045	47,271	40,548	49,703	45,814	64,377	45,348	63,711
AGLK-SPEC	75,774	112,428	60,194	72,877	62,918	77,123	70,522	99,096	69,327	97,399
AGLKTOTAL	98,599	146,294	76,892	93,093	80,504	98,680	90,455	127,106	88,529	124,376
LK30NONRES	12,986	18,925	10,401	12,604	10,866	13,373	12,240	17,075	12,032	16,871
LK30TRIP	48,572	70,783	39,416	47,766	41,098	50,583	45,896	64,029	45,115	63,261
LK30-SPEC	75,378	109,848	61,126	74,075	64,039	78,820	71,018	99,075	69,329	97,216
LK30TOTAL	106,805	155,646	81,912	99,266	86,594	106,580	97,322	135,772	94,321	132,262
LK16NONRES	12,551	18,340	10,006	12,111	10,312	12,608	11,788	16,480	11,584	16,272
LK16TRIP	48,737	71,215	38,692	46,831	39,859	48,735	45,665	63,841	44,793	62,923
LK16-SPEC	70,994	103,738	56,511	68,398	58,486	71,510	65,992	92,258	64,198	90,183
LK16TOTAL	101,024	147,617	77,867	94,246	81,047	99,096	91,944	128,541	88,637	124,514

APPENDIX F: BRIDGE OF NATIONAL SURVEY OF FISHING, HUNTING, AND WILDLIFE-ASSOCIATE RECREATION (FHW) SPENDING TO IMPLAN

***** See notes at end of table. *****

FHW Spending Category (New Items Only)	Further Allocation; PCE Item, I-O Category, SIC Code, +/or IMPLAN Sector	Basis of Allocation *	Allocation USED
TRIP-RELATED			
food&lodging			
food	Groceries (I-O 1110, Food Purch.for Off-Premise Consump; also I-O 1500, tobacco)	Regional Rec	0.4
	Restaurants (I-O 1120, Purchased Meals & Beverages)	studies	0.6
lodging	all spending to IMPLAN # 471		
transportation	Public transportation	85 FHW	0.08
	Air travel (IMPLAN #450)	Gouldner's	0.05
	Railroads (IMPLAN #446)	Travel	0.01
	Buses (IMPLAN #447)	Trends	0.02
	Private transportation (Automobiles)	Ntl PCEs	0.92
	Gas & oil (I-O 8140)		0.62
	Auto repair (I-O 8130; more narrowly, PCE 1358 & 1359, IMPLAN #493)		0.3
1 other Hunt & Noncons	Equipment rental (PCE 1722-1724, IMPLAN 502(?))	85 FHW	0.14
trp-rltd costs	Guide fees (IMPLAN 502)		0.132
	Pack trips (IMPLAN 502)		0.359
	Public land use (Fed, St, & Loc Gov, no multiplier)		0.164
	Private land use		0.205
	commercial (SIC 0971, marginal IMPLAN #24; or 502)	ad hoc, local	0.02
	household (distribute through PCE vector; see note on PCE vector)	studies/opinion	0.185
other Fishing	Equipment rental (PCE 1722-1724, IMPLAN 502(?))	85 FHW	0.238
trp-rltd costs	Boat launching (IMPLAN 502)		0.174
	Guide fees (IMPLAN 502)		0.078
	Pack trips (IMPLAN 502)		0.221
	Public land use (Fed, St, & Loc Gov, no multiplier)		0.131
	Private land use		0.158
	commercial (SIC 0971; PCE 51, 1706-7; marginal IMPLAN #24)	ad hoc, local	0.05
	household (distribute through PCE vector; see note on PCE vector)	studies/opinion	0.138
boat fuel	gas & oil (I-O 8140)		
boat moor/stor/maint	boat mooring & storing (PCE 1682, IMP #449)	ad hoc, local	0.24
	boat maintenance (PCE 1507 & 1520, IMP #5732 as marginal)	studies/opinion	0.76
bait	(SIC 0279, IMPLAN #26)		
ice	(SIC 2097, PCE 153, IMPLAN #124 as marginal)		
EQUIPMENT & OTHER			
HUNTING			
guns & rifles	(PCE 1481, IMPLAN #79 as marginal)		
ammunition	(PCE 1441-1444, IMPLAN #80 as marginal)		

Appendix F (cont'd.)

FHW SPENDING CATEGORY	FURTHER ALLOCATION; PCE ITEM, I-O CATEGORY, SIC CODE, +/OR IMPLAN SECTOR	ALLOCATION BASIS	ALLOCATION
2 other hunt equip	Archery equipment (SIC 3949, I-O 9300, PCE 1472, IMPLAN #433 as marginal)	85 FHW	0.2
	Telescopic sights (SIC 3832, I-O 9400, PCE 1534-36, IMPLAN 423 as marginal)		0.12
	Decoys & game calls (SIC 3949, I-O 9300, PCE 1466 & 1471, IMPLAN #433 as marginal)		0.04
	Equip or game cases&carriers (SIC 3949, I-O 9400, PCE 1548, IMPLAN 433 as marginal)		0.06
	Hand loading equip (SIC 3949, I-O 9300, PCE 1466 & 1471, IMPLAN 433 as marginal)		0.11
	Hunting dogs & assoc.costs		0.33
	dog purchase (SIC 0279 & 0752, PCE 1704-5 & 1709-10, IMPLAN #26 as PCEs are marginal)		0.05
	food (SIC 2047, PCE 94-5, IMPLAN 102 as marginal)		0.2
	veterinary (SIC 0742, PCE 1734, IMPLAN #506 as marginal)		0.07
	equipment (SIC 3199, PCE 1495, IMPLAN #254 as marginal)		0.01
	Hunting knives (SIC 3421, PCE 1498, IMPLAN #319 as marginal)		0.06
	Unspecified other (** SIC 3949, I-O 9300 & 9400, IMPLAN #433 as marginal)		0.08
NONCONSUMPTIVE			
field glasses	SIC 3832, I-O 9400, PCE 1534-36, IMPLAN 423 as marginal		
binoculars	SIC 3832, I-O 9400, PCE 1534-36, IMPLAN 423 as marginal		
film & dev.	film (SIC 3861, PCE 1462, IMPLAN #425 as marginal)	ad hoc	0.4
	developing (SIC 7395, PCE 1726-27, IMPLAN #485 as marginal)		0.6
other photo equip	SIC 3861 (but also pt. 3832 & 3641), IMPLAN #425 as marginal)		
carrying cases&clothing	luggage (SIC 3161, PCE 471-77 & 1589, IMPLAN #251)	ad hoc	0.5
	clothing (SIC 232, IMPLAN 151 as marginal)		0.5
bird seed	SIC 2047, PCE 97, IMPLAN #102 as marginal		
3 other bird items	Wood bird boxes,feeders,houses (SIC 2499, PCE 762, IMPLAN #172 as marginal)	ad hoc	0.9
	Ceramic bird baths (SIC 325-7, PCE 776-7, IMPLAN #266 (or 261) as marginal)		0.1
4 other noncons equip	SIC 3949, PCE 1467, IMPLAN #433 as marginal		
FISHING			
rods	SIC 3949, PCE 1467, IMPLAN #433 as marginal		
reels	SIC 3949, PCE 1467, IMPLAN #433 as marginal		
lines, hooks,etc.	lines (SIC 2298, PCE 1445(alternatively, PCE 889-90, IMPLAN #142 as marginal))		0.7
	hooks,etc. (SIC 3949, PCE 1467, IMPLAN #433 as marginal)		0.3
lures & flies	SIC 3949, PCE 1467, IMPLAN #433 as marginal		
tackle boxes	SIC 3949, PCE 1467, IMPLAN #433 as marginal		
creels, nets	creels (SIC 3949, PCE 1467, IMPLAN #433 as marginal)	ad hoc	0.2
	nets (SIC 2298 (& 2399), PCE 888-9(383,468,909,1486); IMPLAN #142 (159) as marginal)		0.8
bait containers	SIC 3949, PCE 1467, IMPLAN #433 as marginal		
scales & knives	scales (SIC 3576, PCE 795-6, IMPLAN #364 as marginal)		0.1
	knives (SIC 3421, PCE 1498-9, IMPLAN #319 as marginal)		0.9
5 other fish equip	depth & fish finders & other elec. fish devices (SIC 3662, IMPLAN #392)	85 FHW	0.52
	other fishing equip (** SIC 3949, I-O 9300 & 9400, IMPLAN #433 as marginal)		0.48

Appendix F (cont'd.)

F&W SPENDING CATEGORY	FURTHER ALLOCATION; PCE ITEM, I-O CATEGORY, SIC CODE, +/OR IMPLAN SECTOR	ALLOCATION BASIS	ALLOCATION
AUXILIARY EQUIPMENT			
Fish & Hunt Aux Equip			
6 Camping Equip	camping & outdoor cooking equip (SIC 3469, PCE 694, IMPLAN #518 as margined)	ad hoc	0.15
	tents & tarps (SIC 2394, PCE 1483-5, IMPLAN #155 as margined)		0.35
	sleeping bags (SIC 2399, PCE 1487, IMPLAN #159)		0.25
	lanterns & other lighting equip(SIC 3648, PCE 806-810, IMPLAN #387 as margined)		0.15
	back packs, duffle bags, etc.(textile bags - SIC 2393, PCE 1482, IMPLAN #154)		0.1
Foul Weather Gear	SIC 2385,PCE 455-6 & 469, IMPLAN #151 as margined		
Spec Clothing	SIC 2320, IMPLAN #151 as margined		
Rubber Boots/Waders	SIC 3021, PCE 299, IMPLAN #241 as margined		
Equip Maintenance	SIC 7699 (3732 too?, PCE 1569, 1572-4, 1720, IMPLAN #478 as margined		
Fish or Hunt Boots	SIC 3143, PCE 499, IMPLAN #248		
7 Other F&H Aux Equip	binoculars, field glasses (SIC 3832, I-O 9400, PCE 1534-36, IMPLAN 423 as margined	85 FHW	0.36
	snow shoes & skis (SIC 3949, PCE 1559, IMPLAN #433 as margined)		0.02
	processing,taxidermy costs (SIC 7699, PCE 1573, IMPLAN # 478 as margined)		0.58
	unspecified other (** SIC 3949, I-O 9300 & 9400, IMPLAN #433 as margined)		0.04
SPECIAL EQUIPMENT			
Fish & Hunt Spec Equip			
Boats & Canoes	SIC 3732, PCE 1507-21 (& 14917), IMPLAN #409 as margined		
Boat Accessories	outboard motors (SIC 3519, PCE 1502, IMPLAN 331)	85 FHW	0.74
	elec. trolling motors (SIC 3621, PCE 873 (8874) IMPLAN #574)		0.09
	other boat accessories (** boat cushions=SIC 2392, IMP #153;life preservers=SIC 3069 & 3842, IMP #243 & 420; tarps=SIC 2394; ETC.- default to IMP #433 as margined)		0.17
Boat Trailer&Hitch	SIC 3799, PCE 1531, IMPLAN #415 as margined		
Travel or Tent Trailer	travel or tent trailer (SIC 3792, PCE 1297-1301, IMPLAN #412 as margined)	85 FHW	0.12
Pickup,Van,Motor Home	pickup, camper or van		0.58
or Cabin	pickup (SIC 3711, PCE 1291-2, IMPLAN #403 as margined)	ad hoc	0.29
	campers (SIC 3792, PCE 1289-1290, IMPLAN #412 as margined)		0.05
	vans (SIC 3716, PCE 1303-5, IMPLAN #414 as margined)		0.24
	motor home (SIC 3792, PCE 1302, IMPLAN #412 as margined)		0.13
	cabin (new res construction -pt.SIC 1521, 17; IMPLAN #66)		0.17
Off-Road Vehicles	off road vehicles (SIC 3799, PCE 1525 & 1532, IMPLAN #415)	85 FHW	0.97
	snowmobiles (SIC 3799, PCE 1529, IMPLAN #415 as margined)		0.03
Ice Chests	SIC 3079, PCE 673, IMPLAN #244 as margined		
8 Nonconsum Spec Equip	travel or tent trailer (SIC 3792, PCE 1297-1301, IMPLAN #412 as margined)	85 FHW	0.05
	off road vehicles (SIC 3799, PCE 1525 & 1532, IMPLAN #415)		0.51
	pickup, camper, or van		0.37
	pickup (SIC 3711, PCE 1291-2, IMPLAN #403 as margined)	ad hoc	0.18
	campers (SIC 3792, PCE 1289-1290, IMPLAN #412 as margined)		0.03
	vans (SIC 3716, PCE 1303-5, IMPLAN #414 as margined)		0.16
	unspecified other (** SIC 3949, I-O 9300 & 9400, IMPLAN #433 as margined)		0.07

Appendix F (cont'd.)

FHW SPENDING CATEGORY	FURTHER ALLOCATION; PCE ITEM, I-O CATEGORY, SIC CODE, +/OR IMPLAN SECTOR	ALLOCATION BASIS	ALLOCATION
9 Nonconsum Aux Equip	tents & tarps (SIC 2394, PCE 1483-5, IMPLAN #155 as margined)	85 FHW	0.35
	frame packs & backpacking equip (SIC 2393, PCE 1482, IMPLAN #154)		0.18
	other camping equip	ad hoc	0.28
	sleeping bags (SIC 2399, PCE 1487, IMPLAN #159)		0.14
	camping & outdoor cooking equip (SIC 3469, PCE 694, IMPLAN #518 as margined)		0.07
	lanterns & other lighting equip(SIC 3648, PCE 806-810, IMPLAN #587 as margined)		0.07
	snow shoes & skis (SIC 3949, PCE 1559, IMPLAN #433 as margined)		0.19
OTHER EXPENDITURES			
10 F&H Mags,Dues,Leases	magazines (SIC 272, PCE 1421-1430, IMPLAN #272 as margined)	85 FHW	0.04
	member dues & contributions (SIC 7997, PCE 1678-9, allocate all to IMPLAN #501)		0.04
	land leasing & ownership		0.92
	ownership (property taxes, land improvements)		0.46
	land leasing (public or private)		0.46
	public land use (Fed, St, & Loc Gov, no multiplier)		0.2
	private land use		0.26
	commercial (SIC 0971; PCE 51, 1706-7; margined IMPLAN #24)		0.03
	household (distribute through PCE vector, see note on PCE vector)		0.23
F&H Licenses,	ONLY DIRECT RECEIPT (no gov multiplier)		
Stamps,Tags&Permits	ONLY DIRECT RECEIPT (no gov multiplier)		
Other Nonconsumptive			
Magazines	SIC 272, PCE 1421-1430, IMPLAN #272 as margined		
Membership fees	SIC 7997, PCE 1678-9, allocate all to IMPLAN #501		

NOTES: (extended quotations are from 1985 FHW Survey Reports)

I-O and PCE numbers listed under the "Further Allocation" column correspond to numbers and descriptions from detailed BEA PCE worksheets. If PCE numbers are listed, their margins from the detailed worksheets were used and the IMPLAN sector listed identifies the producer's sector. The exception to this is that IMPLAN sector margins were adopted if the PCE and IMPLAN sector margins were quite similar (within 2% of each other).

A vector of PCE coefficients may be derived from IMPLAN (see the Invert report, for example) and be used to represent household spending, but adjustments should be made for the difference between personal income and personal consumption expenditures. 1982 personal consumption expenditures were about 77.25% of total personal income (Survey of Current Business, p. S-1, table 2.4, May, 1984). Therefore, only 77.25% of the "household" spending allocation from nonresidents is bridged through a PCE vector. Resident payments to households are considered transfers and not counted.

Appendix F (cont'd.)

* The "Basis of Allocation" column indicates the basis of FHW spending allocation used in the study of upper Lake State outdoor recreation. The basis for the allocation between spending categories is the sum of MI, MN, and WI State FHW reports, unless otherwise indicated. "85 FHW" indicates the allocation is based on national spending profiles from the 1985 U.S. FHW report; "Ntl PCEs" indicates the ratio of spending is based on national averages; "ad hoc" indicates the allocation is based on discussions with MSU recreation authorities and the author's subjective opinion.

** Due to lack of specificity in FHW survey responses, some spending is reported as "other." These items are identified by two asterisks within the parentheses indicating how an item was allocated. The bridging of these items may warrant further attention; however, they comprised less than 2.5% of total and 4% of equipment spending for the Lake States.

1) includes nonconsumptive and hunting expenditures for "equipment rental (boats, camping equipment, etc.) and fees for guides, pack trips, public land use and private land use."
2) "Includes bows, arrows, archery equipment, telescopic sights, decoys and game calls, equipment or game cases or carriers, handloading equipment, hunting dogs, hunting knives, and other unspecified hunting equipment."
3) includes "nest boxes, bird houses, bird feeders, and bird baths"
4) undefined in FHW national and state survey reports
5) "Includes electronic fishing devices (depth finders, fish finders, etc.) rod holders and belts, spear fishing equipment, ice fishing equipment and other unspecified fishing equipment."
6) "Camping Equipment" is not defined in the FHW survey. Items listed come from discussions with recreation professionals.
7) "Includes binoculars, field glasses, snow shoes and skis, processing and taxidermy costs and other unspecified equipment."
8) "Includes travel or tent trailers, off-the-road vehicles, pickups, campers or vans, motor homes and other unspecified equipment."
9) "Includes tents, tarps, frame packs and other backpacking equipment, other camping equipment, snowshoes and skis."
10) "Includes magazine subscriptions, membership dues and contributions, and land leasing and ownership" fishing and hunting expenditures.

APPENDIX G: FHW USED EQUIPMENT ALLOCATION TABLE

The 1985 Fishing, Hunting, and Wildlife-Associated Recreation Survey (FHW) reports the percent of equipment expenditures on new items. The percent spent on used items is equal to 1.00 minus the percent spent on new items. The distinction between used and new items is important in I-O analysis; generally, they affect different sectors and generate different multiplier effects. This table contains information on bridging FHW (or other) used recreation equipment spending to IMPLAN sectors. The identification of spending categories is similar to what is contained in Appendix E. However, the spending allocation for used items is made on the basis of used PCE items in the BEA detailed PCE worksheets, after allowing for used equipment purchases by residents from other residents (households) (these are generally treated as transfers and not counted. Used goods may be purchased from retail outlets or other households, but few surveys have differentiated spending between the two. Thus, the amount of spending on used items from retail outlets is unknown and estimated retail proportions involve guesswork. In contrast, margining used retail recreation equipment is relatively straightforward, as most only have margins. Also, except for cabins, all such equipment is bridged to a recreation-related retail sector (#462) and used & secondhand goods (#524); "used" cabin purchases are bridged to real estate (#470).

Approximate Rec-Retail Margin

5 MAJOR USED RECREATION EQUIPMENT SPENDING CATEGORIES (for used items thru' retail outlets).
(except for cabin/real estate, the remainder goes to IMP 524, used & secondhand goods)

- 0.25 off road vehicles & snowmobiles (either PCE 1580 or 1309) & tent trailers (PCE 1309)
- 0.14 used trucks & motor veh, excl cars (PCE 1312)
- 0.214 boats (PCE 1586)
- 0 cabin (REAL ESTATE, for used cabins thru' commercial outlets)
- 0.35 all other used equipment (PCE 1479-80, 1575-1585)

USED RECREATION EQUIPMENT ITEMS (bridging codes for new equipment in parentheses)		USED PCE CODE Item #	ESTIMATED RETAIL % OF USED SPENDING
HUNTING			
guns & rifles	(PCE 1481, IMPLAN #79 as margined)	1577	50%
ammunition	(PCE 1441-1444, IMPLAN #80 as margined)	not applicable	0%
other hunt equip	Archery equipment (SIC 3949, I-O 9300, PCE 1472, IMPLAN #433 as margined)	1480	50%
	Telescopic sights (SIC 3832, I-O 9400, PCE 1534-36, IMPLAN 423 as margined)	1575	50%
	Decoys & game calls (SIC 3949, I-O 9300, PCE 1466 & 1471, IMPLAN #433 as margined)	1480	50%
	Equip or game cases&carriers (SIC 3949, I-O 9400, PCE 1548, IMPLAN 433 as margined)	1577	50%
	Hand loading equip (SIC 3949, I-O 9300, PCE 1466 & 1471, IMPLAN 433 as margined)	1480	50%
	Hunting dogs & assoc.costs		
	dog purchase (SIC 0279 & 0752, PCE 1704-5 & 1709-10, IMPLAN #26)	not applicable	0%
	food (SIC 2047, PCE 94-5, IMPLAN 102 as margined)	not applicable	0%
	veterinary (SIC 0742, PCE 1734, IMPLAN #506 as margined)	not applicable	0%
	equipment (SIC 3199, PCE 1495, IMPLAN #254 as margined)	not applicable	0%
	Hunting knives (SIC 3421, PCE 1498, IMPLAN #319 as margined)	1577	50%
	Unspecified other (** SIC 3949, I-O 9300 & 9400, IMPLAN #433 as margined)	1480	50%
NONCONSUMPTIVE			
field glasses	SIC 3832, I-O 9400, PCE 1534-36, IMPLAN 423 as margined	1575	50%
binoculars	SIC 3832, I-O 9400, PCE 1534-36, IMPLAN 423 as margined	1575	50%
film & dev.	film (SIC 3861, PCE 1462, IMPLAN #425 as margined)	not applicable	0%
	developing (SIC 7395, PCE 1726-27, IMPLAN #485 as margined)	not applicable	0%
other photo equip	SIC 3861 (but also pt. 3832 & 3641), IMPLAN #425 as margined)	1585	50%
carrying cases	luggage (SIC 3161, PCE 471-77 & 1589, IMPLAN #251)	1585	50%
& clothing	clothing (SIC 232, IMPLAN 151 as margined)	1585	50%

Appendix G (cont'd.)

USED RECREATION EQUIPMENT ITEMS (bridging codes for new equipment in parentheses)		USED PCE CODE Item #	ESTIMATED RETAIL % OF USED SPENDING
bird seed	SIC 2047, PCE 97, IMPLAN #102 as margined	not applicable	0%
other bird items	Wood bird boxes,feeders,houses (SIC 2499, PCE 762, IMPLAN #172 as margined)	1585	50%
	Ceramic bird baths (SIC 325-7, PCE 776-7, IMPLAN #266 (or 261) as margined)	1585	50%
other nonconsumptive equip	SIC 3949, PCE 1467, IMPLAN #433 as margined	1480	50%
FISHING			
rods	SIC 3949, PCE 1467, IMPLAN #433 as margined	1480	50%
reels	SIC 3949, PCE 1467, IMPLAN #433 as margined	1480	50%
lines, hooks,etc.	lines (SIC 2298, PCE 1445(alternatively, PCE 889-90, IMPLAN #142 as margined))	1480	50%
	hooks,etc. (SIC 3949, PCE 1467, IMPLAN #433 as margined)	1480	50%
lures & flies	SIC 3949, PCE 1467, IMPLAN #433 as margined	1480	50%
tackle boxes	SIC 3949, PCE 1467, IMPLAN #433 as margined	1480	50%
creels, nets	creels (SIC 3949, PCE 1467, IMPLAN #433 as margined)	1480	50%
	nets (SIC 2298 (& 2399), PCE 888-9(383,468,909,1486); IMPLAN #142 (159) as mrgnd)	1480	50%
bait containers	SIC 3949, PCE 1467, IMPLAN #433 as margined	1480	50%
scales & knives	scales (SIC 3576, PCE 795-6, IMPLAN #364 as margined)	1480	50%
	knives (SIC 3421, PCE 1498-9, IMPLAN #319 as margined)	1585	50%
other fish equip	depth & fish finders & other elec. fish devices (SIC 3662, IMPLAN #392)	1480	50%
	other fishing equip (** SIC 3949, I-O 9300 & 9400, IMPLAN #433 as margined)	1480	50%
AUXILIARY EQUIPMENT			
Fish & Hunt Aux Equip			
Camping Equip	camping & outdoor cooking equip (SIC 3469, PCE 694, IMPLAN #318 as margined)	1577	50%
	tents & tarps (SIC 2394, PCE 1483-5, IMPLAN #155 as margined)	1577	50%
	sleeping bags (SIC 2399, PCE 1487, IMPLAN #159)	1577	50%
	lanterns & other lighting equip(SIC 3648, PCE 806-810, IMPLAN #387 as margined)	1577	50%
	back packs, duffle bags, etc.(textile bags - SIC 2393, PCE 1482, IMPLAN #154)	1577	50%
Foul Weather Gear	SIC 2385,PCE 455-6 & 469, IMPLAN #151 as margined	1577	50%
Spec Clothing	SIC 2320, IMPLAN #151 as margined	1577	50%
Rubber Boots/Waders	SIC 3021, PCE 299, IMPLAN #241 as margined	1577	50%
Equip Maintenance	SIC 7699 (3732 too?, PCE 1569, 1572-4, 1720, IMPLAN #478 as margined	not applicable	0%
Fish or Hunt Boots	SIC 3143, PCE 499, IMPLAN #248	1577	50%
Other F&H Aux Equip	binoculars, field glasses (SIC 3832, I-O 9400, PCE 1534-36, IMPLAN 423 as margined)	1575	50%
	snow shoes & skis (SIC 3949, PCE 1559, IMPLAN #433 as margined)	1577	50%
	processing,taxidermy costs (SIC 7699, PCE 1573, IMPLAN # 478 as margined)	not applicable	0%
	unspecified other (** SIC 3949, I-O 9300 & 9400, IMPLAN #433 as margined)	1577	50%
SPECIAL EQUIPMENT			
Fish & Hunt Spec Equip			
Boats & Canoes	SIC 3732, PCE 1507-21 (& 1491?), IMPLAN #409 as margined	1586	50%
Boat Accessories	outboard motors (SIC 3519, PCE 1502, IMPLAN 331)	1586	50%
	elec. trolling motors (SIC 3621, PCE 873 (&874) IMPLAN #374)	1586	50%
	other boat accessories (** boat cushions=SIC 2392, IMP #153;life preservers= IMP #243 & 420; tarps=SIC 2394; ETC.- default to IMP #433 as margined)	1585	50%

Appendix G (cont'd.)

USED RECREATION EQUIPMENT ITEMS (bridging codes for new equipment in parentheses)		USED PCE CODE Item #	ESTIMATED RETAIL % OF USED SPENDING
Boat Trailer&Hitch	SIC 3799, PCE 1531, IMPLAN #415 as margined	1586	50%
Travel or Tent Trailer	travel or tent trailer (SIC 3792, PCE 1297-1301, IMPLAN #412 as margined)	1309	50%
Pickup,Van,Motor Home or Cabin	pickup, camper or van		
	pickup (SIC 3711, PCE 1291-2, IMPLAN #403 as margined)	1312	60%
	campers (SIC 3792, PCE 1289-1290, IMPLAN #412 as margined)	1309	50%
	vans (SIC 3716, PCE 1303-5, IMPLAN #414 as margined)	1312	60%
	motor home (SIC 3792, PCE 1302, IMPLAN #412 as margined)	1312	60%
	cabin (new res construction -pt.SIC 1521, 17; IMPLAN #66)	IMP 470	50%
Off-Road Vehicles	off road vehicles (SIC 3799, PCE 1525 & 1532, IMPLAN #415)	1580	50%
	snowmobiles (SIC 3799, PCE 1529, IMPLAN #415 as margined)	1580	50%
Ice Chests	SIC 3079, PCE 673, IMPLAN #244 as margined	1585	50%
Nonconsum Spec Equip	travel or tent trailer (SIC 3792, PCE 1297-1301, IMPLAN #412 as margined)	1309	50%
	off road vehicles (SIC 3799, PCE 1525 & 1532, IMPLAN #415)	1580	50%
	pickup, camper, or van		
	pickup (SIC 3711, PCE 1291-2, IMPLAN #403 as margined)	1312	60%
	campers (SIC 3792, PCE 1289-1290, IMPLAN #412 as margined)	1309	50%
	vans (SIC 3716, PCE 1303-5, IMPLAN #414 as margined)	1312	60%
	unspecified other (** SIC 3949, I-O 9300 & 9400, IMPLAN #433 as margined)	1312	50%
Nonconsum Aux Equip	tents & tarps (SIC 2394, PCE 1483-5, IMPLAN #155 as margined)	1577	50%
	frame packs & bckpcking equip (SIC 2393, PCE 1482, IMPLAN #154)	1577	50%
	other camping equip	1577	50%
	sleeping bags (SIC 2399, PCE 1487, IMPLAN #159)	1577	50%
	camping & outdoor cooking equip (SIC 3469, PCE 694, IMPLAN #318 as margined)	1577	50%
	lanterns & other lighting equip(SIC 3648, PCE 806-810, IMPLAN #387 as margined)	1577	50%
	snow shoes & skis (SIC 3949, PCE 1559, IMPLAN #433 as margined)	1577	50%

Appendix H: Lake State Multiplier Analysis

DISAGLK OUTPUT STAT ANALYSIS:	TYPE I OUTPUT MULTIPLIERS					TYPE III OUTPUT MULTIPLIERS				
	SDPLK	FLRLK	ALTFLK	BSTLK	UNCHLK	SDPLK	FLRLK	ALTFLK	BSTLK	UNCHLK
SQUARE ERROR	31.2921	31.2365	19.0061	6.1365		86.0665	188.5304	140.3166	49.6995	
MEAN SQUARE ERROR	0.0623	0.0622	0.0379	0.0122		0.1714	0.3756	0.2795	0.0990	
ROOT MEAN SQUARE ERROR (RMSE)	0.2497	0.2494	0.1946	0.1106		0.4141	0.6128	0.5287	0.3146	
CORRELATION COEFFICIENT	0.8178	0.8549	0.8675	0.9354		0.9433	0.7761	0.7781	0.8006	
MEAN	1.6099	1.1896	1.2577	1.4870	1.4043	2.3132	1.4382	1.5399	2.0688	1.9436
STANDARD DEVIATION	0.2463	0.1004	0.1007	0.2063	0.2015	0.5505	0.2050	0.2146	0.4041	0.4807
ROOT MEAN SQUARED	1.6286	1.1938	1.2617	1.5012	1.4187	2.3778	1.4528	1.5548	2.1079	2.0021
MEAN ABSOLUTE DIFFERENCE (MAD)	0.2055	0.2152	0.1499	0.0865		0.3696	0.5054	0.4038	0.1536	
STANDARDIZED MEAN ABS DIFF	0.1488	0.1460	0.0992	0.0633		0.1953	0.2467	0.1933	0.0781	
CHI SQUARE	22.8956	19.5706	11.2777	4.5844		45.6302	72.3189	49.4527	12.4403	
THEIL'S INEQUALITY INDEX	0.0819	0.0955	0.0726	0.0379		0.0945	0.1774	0.1486	0.0766	
Um, bias	0.6778	0.7414	0.5681	0.5585		0.7967	0.6800	0.5829	0.1583	
Us,variance	0.0321	0.1642	0.2683	0.0019		0.0284	0.2025	0.2533	0.0593	
Uc, coveriance	0.2901	0.0944	0.1635	0.4396		0.1749	0.1175	0.1638	0.7824	
U sum = 1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	

DISAGLK PERS INC STAT ANALYSIS:	TYPE I PERS INC MULTIPLIERS					TYPE III PERS INC MULTIPLIERS				
	SDPLK	FLRLK	ALTFLK	BSTLK	UNCHLK	SDPLK	FLRLK	ALTFLK	BSTLK	UNCHLK
SQUARE ERROR	55.9916	57.0350	29.9879	27.0539		166.2081	259.5379	168.7184	75.1043	
MEAN SQUARE ERROR	0.1115	0.1136	0.0597	0.0539		0.3311	0.5170	0.3361	0.1496	
ROOT MEAN SQUARE ERROR (RMSE)	0.3340	0.3371	0.2444	0.2321		0.5754	0.7190	0.5797	0.3868	
CORRELATION COEFFICIENT	0.9499	0.9149	0.9581	0.9768		0.9638	0.9283	0.9388	0.9667	
MEAN	1.7405	1.2660	1.3671	1.6486	1.4978	2.5308	1.5698	1.7176	2.3358	2.1042
STANDARD DEVIATION	0.6361	0.3036	0.3415	0.6203	0.4896	1.1713	0.4923	0.5465	1.0784	0.9018
ROOT MEAN SQUARED	1.8531	1.3019	1.4091	1.7614	1.5758	2.7887	1.6452	1.8024	2.5728	2.2893
MEAN ABSOLUTE DIFFERENCE (MAD)	0.2427	0.2349	0.1442	0.1546		0.4266	0.5347	0.3890	0.2510	
STANDARDIZED MEAN ABS DIFF	0.1566	0.1380	0.0805	0.0945		0.1981	0.2285	0.1600	0.1101	
CHI SQUARE	31.6818	25.4267	12.0454	13.2851		61.8939	79.1880	46.6448	23.2877	
THEIL'S INEQUALITY INDEX	0.0974	0.1171	0.0819	0.0696		0.1133	0.1828	0.1417	0.0796	
Um, bias	0.5281	0.4728	0.2860	0.4219		0.5495	0.5525	0.4448	0.3586	
Us,variance	0.1923	0.3046	0.3673	0.3167		0.2195	0.3244	0.3758	0.2084	
Uc, coveriance	0.2795	0.2226	0.3467	0.2614		0.2311	0.1231	0.1794	0.4330	
U sum = 1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	

DISAGLK EMPLOYMENT STAT ANALYSIS:	TYPE I EMPLOYMENT MULTIPLIERS					TYPE III EMPLOYMENT MULTIPLIERS				
	SDPLK	FLRLK	ALTFLK	BSTLK	UNCHLK	SDPLK	FLRLK	ALTFLK	BSTLK	UNCHLK
SQUARE ERROR	176.2328	144.0859	94.6109	19.8965		406.4913	430.5600	295.9232	43.9649	
MEAN SQUARE ERROR	0.3511	0.2870	0.1885	0.0396		0.8097	0.8577	0.5895	0.0876	
ROOT MEAN SQUARE ERROR (RMSE)	0.5925	0.5357	0.4341	0.1991		0.8999	0.9261	0.7678	0.2959	
CORRELATION COEFFICIENT	0.9158	0.9123	0.9351	0.9885		0.9158	0.9123	0.9351	0.9885	
MEAN	1.8176	1.2747	1.3790	1.6860	1.5676	2.6251	1.5719	1.7230	2.3840	2.1992
STANDARD DEVIATION	1.1679	0.4339	0.4889	0.9020	0.8077	1.6867	0.5350	0.6108	1.2755	1.1331
ROOT MEAN SQUARED	2.1604	1.3466	1.4631	1.9122	1.7635	3.1203	1.6604	1.8280	2.7038	2.4740
MEAN ABSOLUTE DIFFERENCE (MAD)	0.2499	0.2944	0.1964	0.1234		0.4259	0.6274	0.4772	0.1892	
STANDARDIZED MEAN ABS DIFF	0.1394	0.1495	0.0928	0.0727		0.1729	0.2512	0.1875	0.0800	
CHI SQUARE	49.2184	41.9725	23.5516	9.2979		84.8348	105.5553	65.3096	14.6494	
THEIL'S INEQUALITY INDEX	0.1510	0.1723	0.1345	0.0542		0.1609	0.2240	0.1785	0.0572	
Um, bias	0.1779	0.2989	0.1888	0.3536		0.2240	0.4589	0.3848	0.3899	
Us,variance	0.3695	0.4869	0.5395	0.2244		0.3785	0.4171	0.4629	0.2313	
Uc, coveriance	0.4526	0.2142	0.2718	0.4220		0.3975	0.1240	0.1523	0.3788	
U sum = 1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	

Appendix H (cont'd.)

UNAGMNLK OUTPUT STAT ANALYSIS:	TYPE I OUTPUT MULTIPLIERS					TYPE III OUTPUT MULTIPLIERS				
	SDPLK	FLRLK	ALTFLK	BESTLK	UNCHLK	SDPLK	FLRLK	ALTFLK	BESTL	UNCHLK
SQUARE ERROR	34.8953	23.9308	15.4188	3.1041		107.4145	112.4333	82.4725	15.5237	
MEAN SQUARE ERROR	0.1133	0.0777	0.0501	0.0101		0.3487	0.3650	0.2678	0.0504	
ROOT MEAN SQUARE ERROR (RMSE)	0.3366	0.2787	0.2237	0.1004		0.5905	0.6042	0.5175	0.2245	
CORRELATION COEFFICIENT	0.8045	0.8701	0.8661	0.9489		0.7682	0.8335	0.8357	0.8679	
MEAN	1.6996	1.1673	1.2336	1.4819	1.4098	2.4375	1.3870	1.4838	2.0260	1.9259
STANDARD DEVIATION	0.2872	0.1032	0.1037	0.2190	0.2176	0.4521	0.1792	0.1854	0.3621	0.4039
ROOT MEAN SQUARED	1.7257	1.1719	1.2379	1.4980	1.4265	2.4791	1.3985	1.4954	2.0581	1.9678
MEAN ABSOLUTE DIFFERENCE (MAD)	0.2899	0.2425	0.1775	0.0766		0.5301	0.5390	0.4421	0.1242	
STANDARDIZED MEAN ABS DIFF	0.2082	0.1636	0.1170	0.0561		0.2791	0.2685	0.2172	0.0646	
CHI SQUARE	25.1924	14.8789	9.1270	2.3417		54.7575	49.5796	34.8712	5.3777	
THEIL'S INEQUALITY INDEX	0.1068	0.1073	0.0840	0.0343		0.1328	0.1795	0.1494	0.0558	
Um, bias	0.7415	0.7566	0.6201	0.5161		0.7505	0.7957	0.7299	0.1988	
Us,variance	0.0428	0.1683	0.2591	0.0002		0.0067	0.1383	0.1783	0.0346	
Uc, covariance	0.2157	0.0751	0.1207	0.4837		0.2428	0.0660	0.0919	0.7666	
U sum = 1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	

UNAGMNLK PERS INC STAT ANALYSIS:	TYPE I PERS INC MULTIPLIERS					TYPE III PERS INC MULTIPLIERS				
	SDPLK	FLRLK	ALTFLK	BSTLK	UNCHLK	SDPLK	FLRLK	ALTFLK	BSTLK	UNCHLK
SQUARE ERROR	94.3441	53.4454	29.7599	12.4257		264.9841	206.8504	138.1436	28.6481	
MEAN SQUARE ERROR	0.3063	0.1735	0.0966	0.0403		0.8603	0.6716	0.4485	0.0930	
ROOT MEAN SQUARE ERROR (RMSE)	0.5535	0.4166	0.3108	0.2009		0.9275	0.8195	0.6697	0.3050	
CORRELATION COEFFICIENT	0.9493	0.9387	0.9601	0.9809		0.9565	0.9423	0.9553	0.9790	
MEAN	1.9443	1.2283	1.3332	1.6570	1.5248	2.8435	1.4958	1.6458	2.3153	2.1259
STANDARD DEVIATION	0.8188	0.2618	0.3071	0.6257	0.5241	1.3758	0.4036	0.4606	1.0242	0.8866
ROOT MEAN SQUARED	2.1097	1.2559	1.3682	1.7712	1.6124	3.1589	1.5493	1.7091	2.5317	2.3034
MEAN ABSOLUTE DIFFERENCE (MAD)	0.4195	0.2966	0.1946	0.1357		0.7299	0.6301	0.4801	0.2054	
STANDARDIZED MEAN ABS DIFF	0.2595	0.1699	0.1067	0.0833		0.3280	0.2681	0.1990	0.0814	
CHI SQUARE	49.1885	23.0059	11.5387	6.2370		95.3850	64.4648	39.7900	9.9015	
THEIL'S INEQUALITY INDEX	0.1487	0.1452	0.1043	0.0594		0.1698	0.2127	0.1669	0.0631	
Um, bias	0.5744	0.5067	0.3799	0.4332		0.5986	0.5911	0.5138	0.3857	
Us,variance	0.2835	0.3964	0.4872	0.2559		0.2782	0.3473	0.4047	0.2035	
Uc, covariance	0.1421	0.0969	0.1329	0.3109		0.1232	0.0615	0.0815	0.4109	
U sum = 1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	

UNAGMNLK EMPLOYMENT STAT ANALYSIS:	TYPE I EMPLOYMENT MULTIPLIERS					TYPE III EMPLOYMENT MULTIPLIERS				
	SDPLK	FLRLK	ALTFLK	BSTLK	UNCHLK	SDPLK	FLRLK	ALTFLK	BSTLK	UNCHLK
SQUARE ERROR	94.2044	120.8786	76.3043	9.0755		248.7807	373.0468	257.9773	16.6051	
MEAN SQUARE ERROR	0.3059	0.3925	0.2477	0.0295		0.8077	1.2112	0.8376	0.0539	
ROOT MEAN SQUARE ERROR (RMSE)	0.5530	0.6265	0.4977	0.1717		0.8987	1.1005	0.9152	0.2322	
CORRELATION COEFFICIENT	0.9752	0.9577	0.9639	0.9915		0.9752	0.9577	0.9639	0.9915	
. MEAN	2.0347	1.2666	1.3814	1.7444	1.6525	2.9832	1.5471	1.7094	2.4517	2.3349
STANDARD DEVIATION	1.2290	0.4689	0.5321	0.9822	0.9055	1.8019	0.5727	0.6585	1.3804	1.2794
ROOT MEAN SQUARED	2.3770	1.3506	1.4804	2.0019	1.8844	3.4852	1.6497	1.8319	2.8136	2.6624
MEAN ABSOLUTE DIFFERENCE (MAD)	0.3833	0.3865	0.2725	0.1054		0.6491	0.7878	0.6256	0.1397	
STANDARDIZED MEAN ABS DIFF	0.2120	0.1894	0.1274	0.0601		0.2574	0.2988	0.2348	0.0563	
CHI SQUARE	40.7722	37.5367	21.0686	4.2275		76.0744	92.1843	59.5878	5.5096	
THEIL'S INEQUALITY INDEX	0.1298	0.1957	0.1479	0.0442		0.1462	0.2552	0.2036	0.0424	
Um, bias	0.4774	0.3795	0.2967	0.2864		0.5204	0.5124	0.4671	0.2529	
Us,variance	0.3421	0.4856	0.5627	0.1999		0.3380	0.4122	0.4602	0.1896	
Uc, covariance	0.1805	0.1348	0.1406	0.5137		0.1416	0.0754	0.0727	0.5576	
U sum = 1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	

Appendix H (cont'd.)

AGDMNLK OUTPUT STAT ANALYSIS:	TYPE I OUTPUT MULTIPLIERS					TYPE III OUTPUT MULTIPLIERS				
	SDPLK	FLRLK	ALTFLK	BESTLK	UNCHLK	SDPLK	FLRLK	ALTFLK	BESTLK	UNCHLK
SQUARE ERROR	16.1323	14.0000	9.0446	1.1905		64.4350	67.6850	50.6442	12.2310	
MEAN SQUARE ERROR	0.1015	0.0881	0.0569	0.0075		0.4053	0.4257	0.3185	0.0769	
ROOT MEAN SQUARE ERROR (RMSE)	0.3185	0.2967	0.2385	0.0865		0.6366	0.6525	0.5644	0.2774	
CORRELATION COEFFICIENT	0.8958	0.8604	0.8715	0.9727		0.7435	0.7543	0.7630	0.8058	
MEAN	1.7158	1.1746	1.2612	1.4967	1.4308	2.5136	1.3975	1.4968	2.0635	1.9665
STANDARD DEVIATION	0.3072	0.1129	0.1179	0.2615	0.2554	0.4646	0.1853	0.1950	0.3727	0.4367
ROOT MEAN SQUARED	1.7431	1.1800	1.2468	1.5161	1.4500	2.5562	1.4097	1.5095	2.0969	2.0135
MEAN ABSOLUTE DIFFERENCE (MAD)	0.2850	0.2562	0.1899	0.0688		0.5829	0.5681	0.4688	0.1382	
STANDARDIZED MEAN ABS DIFF	0.1993	0.1689	0.1225	0.0489		0.2969	0.2754	0.2241	0.0670	
CHI SQUARE	11.2321	8.5712	5.3167	0.8639		30.8349	28.2938	20.1768	3.4995	
THEIL'S INEQUALITY INDEX	0.0998	0.1128	0.0884	0.0292		0.1395	0.1906	0.1602	0.0675	
Um, bias	0.8007	0.7454	0.6320	0.5808		0.7413	0.7581	0.6898	0.1247	
Us,variance	0.0508	0.1703	0.2427	0.0050		0.0019	0.1485	0.1835	0.0533	
Uc, covariance	0.1485	0.0843	0.1253	0.4143		0.2568	0.0934	0.1268	0.8220	
U sum = 1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	

AGDMNLK PERS INC STAT ANALYSIS:	TYPE I PERS INC MULTIPLIERS					TYPE III PERS INC MULTIPLIERS				
	SDPLK	FLRLK	ALTFLK	BESTLK	UNCHLK	SDPLK	FLRLK	ALTFLK	BESTLK	UNCHLK
SQUARE ERROR	74.4314	55.5841	38.7482	9.2869		237.0275	183.1557	136.3765	25.2552	
MEAN SQUARE ERROR	0.4681	0.3496	0.2437	0.0584		1.4907	1.1519	0.8577	0.1588	
ROOT MEAN SQUARE ERROR (RMSE)	0.6842	0.5913	0.4937	0.2417		1.2210	1.0733	0.9261	0.3985	
CORRELATION COEFFICIENT	0.9843	0.9561	0.9634	0.9920		0.9756	0.9449	0.9511	0.9838	
MEAN	2.1543	1.2970	1.3998	1.8181	1.6678	3.2805	1.5957	1.7445	2.6113	2.3792
STANDARD DEVIATION	1.3363	0.4785	0.5255	1.0408	0.8962	2.0229	0.6071	0.6708	1.4881	1.2797
ROOT MEAN SQUARED	2.5351	1.3825	1.4952	2.0949	1.8933	3.8541	1.7073	1.8690	3.0056	2.7016
MEAN ABSOLUTE DIFFERENCE (MAD)	0.4896	0.3734	0.2729	0.1539		0.9313	0.7885	0.6387	0.2625	
STANDARDIZED MEAN ABS DIFF	0.2632	0.1837	0.1260	0.0820		0.3619	0.2929	0.2304	0.1002	
CHI SQUARE	29.0331	17.2548	10.7263	3.6935		66.4091	45.9311	31.9116	7.1421	
THEIL'S INEQUALITY INDEX	0.1545	0.1805	0.1457	0.0606		0.1862	0.2434	0.2026	0.0698	
Um, bias	0.5056	0.3933	0.2947	0.3865		0.5449	0.5330	0.4697	0.3991	
Us,variance	0.4139	0.4990	0.5637	0.3584		0.3705	0.3927	0.4323	0.2735	
Uc, covariance	0.0805	0.1077	0.1416	0.2551		0.0846	0.0743	0.0980	0.3875	
U sum = 1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	

AGDMNLK EMPLOYMENT STAT ANALYSIS:	TYPE I EMPLOYMENT MULTIPLIERS					TYPE III EMPLOYMENT MULTIPLIERS				
	SDPLK	FLRLK	ALTFLK	BESTLK	UNCHLK	SDPLK	FLRLK	ALTFLK	BESTLK	UNCHLK
SQUARE ERROR	68.0188	85.8222	61.9568	7.1447		196.1167	247.9253	187.4633	14.1347	
MEAN SQUARE ERROR	0.4278	0.5398	0.3897	0.0449		1.2334	1.5595	1.1790	0.0889	
ROOT MEAN SQUARE ERROR (RMSE)	0.6541	0.7347	0.6242	0.2120		1.1106	1.2487	1.0858	0.2982	
CORRELATION COEFFICIENT	0.9795	0.9198	0.9333	0.9882		0.9795	0.9198	0.9333	0.9882	
MEAN	2.1595	1.2912	1.4001	1.8314	1.7291	3.2041	1.5633	1.7162	2.5734	2.4295
STANDARD DEVIATION	1.4240	0.4723	0.5358	1.0888	0.9944	2.1127	0.5718	0.6568	1.5300	1.3971
ROOT MEAN SQUARED	2.5867	1.3748	1.4991	2.1306	1.9947	3.8379	1.6646	1.8376	2.9939	2.8024
MEAN ABSOLUTE DIFFERENCE (MAD)	0.4348	0.4418	0.3341	0.1184		0.7801	0.8715	0.7178	0.1667	
STANDARDIZED MEAN ABS DIFF	0.2156	0.1963	0.1398	0.0601		0.2830	0.3066	0.2474	0.0602	
CHI SQUARE	25.1207	24.3825	16.0214	2.8565		51.9613	56.1281	39.7724	4.0224	
THEIL'S INEQUALITY INDEX	0.1428	0.2180	0.1787	0.0514		0.1673	0.2795	0.2340	0.0514	
Um, bias	0.4330	0.3553	0.2778	0.2328		0.4867	0.4810	0.4313	0.2337	
Us,variance	0.4313	0.5051	0.5397	0.1984		0.4152	0.4368	0.4648	0.1988	
Uc, covariance	0.1357	0.1396	0.1825	0.5688		0.0981	0.0822	0.1039	0.5676	
U sum = 1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	

Appendix H (cont'd.)

AG30LK OUTPUT STAT ANALYSIS:	TYPE I OUTPUT MULTIPLIERS					TYPE III OUTPUT MULTIPLIERS				
	SDPLK	FLRLK	ALTFLK	BESTLK	UNCHLK	SDPLK	FLRLK	ALTFLK	BESTLK	UNCHLK
SQUARE ERROR	2.9805	2.0181	1.1815	0.2097		16.2088	22.4500	18.7264	9.7934	
MEAN SQUARE ERROR	0.0961	0.0651	0.0381	0.0068		0.5229	0.7242	0.6041	0.3159	
ROOT MEAN SQUARE ERROR (RMSE)	0.3101	0.2551	0.1952	0.0822		0.7231	0.8510	0.7772	0.5621	
CORRELATION COEFFICIENT	0.6839	0.9369	0.9200	0.9354		0.3311	0.4726	0.4927	0.4698	
MEAN	1.6495	1.1658	1.2304	1.4583	1.4026	2.3667	1.3829	1.4798	1.9926	2.0078
STANDARD DEVIATION	0.2567	0.0764	0.0833	0.1710	0.1626	0.3950	0.1600	0.1750	0.3223	0.6359
ROOT MEAN SQUARED	1.6693	1.1683	1.2332	1.4683	1.4120	2.3994	1.3922	1.4901	2.0183	2.1061
MEAN ABSOLUTE DIFFERENCE (MAD)	0.2468	0.2369	0.1722	0.0607		0.5421	0.6248	0.5280	0.1911	
STANDARDIZED MEAN ABS DIFF	0.1765	0.1636	0.1176	0.0437		0.2618	0.2825	0.2528	0.0706	
CHI SQUARE	2.1526	1.3465	0.7686	0.1529		6.0992	7.1045	5.5066	2.1159	
THEIL'S INEQUALITY INDEX	0.1006	0.0989	0.0738	0.0286		0.1605	0.2433	0.2161	0.1363	
Um, bias	0.6336	0.8618	0.7781	0.4585		0.2463	0.5391	0.4614	0.0008	
Us,variance	0.0921	0.1141	0.1651	0.0105		0.1110	0.3127	0.3517	0.3112	
Uc, covariance	0.2743	0.0241	0.0568	0.5311		0.6427	0.1482	0.1869	0.6880	
U sum = 1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	

AG30LK PERS INC STAT ANALYSIS:	TYPE I PERS INC MULTIPLIERS					TYPE III PERS INC MULTIPLIERS				
	SDPLK	FLRLK	ALTFLK	BESTLK	UNCHLK	SDPLK	FLRLK	ALTFLK	BESTLK	UNCHLK
SQUARE ERROR	5.4278	6.4209	4.3752	0.4457		18.6885	24.7454	18.6415	5.0306	
MEAN SQUARE ERROR	0.1751	0.2071	0.1411	0.0144		0.6029	0.7982	0.6013	0.1623	
ROOT MEAN SQUARE ERROR (RMSE)	0.4184	0.4551	0.3757	0.1199		0.7764	0.8934	0.7755	0.4028	
CORRELATION COEFFICIENT	0.9433	0.8797	0.9070	0.9818		0.8506	0.8145	0.8337	0.8833	
MEAN	1.8054	1.1874	1.2774	1.5635	1.4878	2.5682	1.4156	1.5462	2.1264	2.0736
STANDARD DEVIATION	0.6717	0.1636	0.1948	0.4891	0.4769	1.1155	0.3102	0.3551	0.8236	0.8296
ROOT MEAN SQUARED	1.9263	1.1986	1.2921	1.6382	1.5624	2.8000	1.4492	1.5864	2.2803	2.2334
MEAN ABSOLUTE DIFFERENCE (MAD)	0.3176	0.3004	0.2104	0.0871		0.6156	0.6580	0.5275	0.1966	
STANDARDIZED MEAN ABS DIFF	0.2082	0.1636	0.1170	0.0561		0.2791	0.2685	0.2172	0.0646	
CHI SQUARE	3.2038	2.5966	1.5957	0.2630		7.2784	7.7297	5.4891	1.5153	
THEIL'S INEQUALITY INDEX	0.1199	0.1648	0.1316	0.0375		0.1543	0.2426	0.2030	0.0892	
Um, bias	0.5760	0.4357	0.3138	0.3981		0.4057	0.5425	0.4627	0.0171	
Us,variance	0.2167	0.4737	0.5639	0.0104		0.1356	0.3380	0.3744	0.0002	
Uc, covariance	0.2073	0.0906	0.1223	0.5915		0.4587	0.1196	0.1629	0.9827	
U sum = 1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	

AG30LK EMPLOYMENT STAT ANALYSIS:	TYPE I EMPLOYMENT MULTIPLIERS					TYPE III EMPLOYMENT MULTIPLIERS				
	SDPLK	FLRLK	ALTFLK	BESTLK	UNCHLK	SDPLK	FLRLK	ALTFLK	BESTLK	UNCHLK
SQUARE ERROR	6.2305	13.6209	9.5946	0.5055		16.6793	37.2086	27.1865	0.9560	
MEAN SQUARE ERROR	0.2010	0.4394	0.3095	0.0163		0.5380	1.2003	0.8770	0.0308	
ROOT MEAN SQUARE ERROR (RMSE)	0.4483	0.6629	0.5563	0.1277		0.7335	1.0956	0.9365	0.1756	
CORRELATION COEFFICIENT	0.9634	0.8852	0.9290	0.9885		0.9634	0.8852	0.9290	0.9885	
MEAN	1.8903	1.2020	1.3062	1.6259	1.5691	2.7547	1.4567	1.6077	2.2683	2.2003
STANDARD DEVIATION	0.9409	0.2006	0.2591	0.6784	0.7215	1.3712	0.2431	0.3189	0.9464	1.0117
ROOT MEAN SQUARED	2.1115	1.2186	1.3316	1.7618	1.7271	0.7335	1.0956	0.9365	0.1756	2.4218
MEAN ABSOLUTE DIFFERENCE (MAD)	0.3212	0.3722	0.2740	0.0887		0.5544	0.7436	0.5946	0.1195	
STANDARDIZED MEAN ABS DIFF	0.2082	0.1636	0.1170	0.0561		0.2791	0.2685	0.2172	0.0646	
CHI SQUARE	3.2934	3.9521	2.5133	0.2885		6.2310	9.1414	6.1875	0.3771	
THEIL'S INEQUALITY INDEX	0.1168	0.2250	0.1819	0.0366		0.2325	0.3115	0.2789	0.0676	
Um, bias	0.5132	0.3067	0.2234	0.1978		0.5712	0.4607	0.4005	0.1499	
Us,variance	0.2395	0.6176	0.6908	0.1139		0.2401	0.4922	0.5473	0.1383	
Uc, covariance	0.2472	0.0757	0.0857	0.6883		0.1887	0.0471	0.0522	0.7118	
U sum = 1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	

Appendix H (cont'd.)

AG16LK OUTPUT STAT ANALYSIS:	TYPE I OUTPUT MULTIPLIERS					TYPE III OUTPUT MULTIPLIERS				
	SDPLK	FLRLK	ALTFLK	BSTLK	UNCHLK	SDPLK	FLRLK	ALTFLK	BSTLK	UNCHLK
SQUARE ERROR	0.9472	1.2922	0.8308	0.0427		11.1844	19.2128	16.8132	9.4741	
MEAN SQUARE ERROR	0.0592	0.0808	0.0519	0.0027		0.6990	1.2008	1.0508	0.5921	
ROOT MEAN SQUARE ERROR (RMSE)	0.2433	0.2842	0.2279	0.0517		0.8361	1.0958	1.0251	0.7695	
CORRELATION COEFFICIENT	0.8638	0.9529	0.9540	0.9788		0.2705	0.3539	0.3811	0.3590	
MEAN	1.6359	1.1803	1.2415	1.4689	1.4417	2.4525	1.4427	1.5348	2.0903	2.2353
STANDARD DEVIATION	0.2799	0.0987	0.1065	0.2122	0.2014	0.4501	0.1916	0.2110	0.3854	0.8030
ROOT MEAN SQUARED	1.6596	1.1844	1.2461	1.4861	1.4557	2.4935	1.4554	1.5492	2.1256	2.3751
MEAN ABSOLUTE DIFFERENCE (MAD)	0.1942	0.2614	0.2002	0.0359		0.5712	0.7926	0.7005	0.2551	
STANDARDIZED MEAN ABS DIFF	0.1331	0.1739	0.1315	0.0247		0.2333	0.3138	0.2709	0.0712	
CHI SQUARE	0.6556	0.8303	0.5219	0.0298		3.2035	5.3708	4.4779	1.9381	
THEIL'S INEQUALITY INDEX	0.0781	0.1076	0.0843	0.0176		0.1717	0.2861	0.2612	0.1710	
Um, bias	0.6367	0.8462	0.7720	0.2766		0.0675	0.5252	0.4670	0.0355	
Us,variance	0.1040	0.1307	0.1735	0.0437		0.1781	0.3112	0.3335	0.2944	
Uc, covariance	0.2592	0.0232	0.0545	0.6797		0.7544	0.1656	0.1995	0.6701	
U sum = 1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	

AG16LK PERS INC STAT ANALYSIS:	TYPE I PERS INC MULTIPLIERS					TYPE III PERS INC MULTIPLIERS				
	SDPLK	FLRLK	ALTFLK	BESTLK	UNCHLK	SDPLK	FLRLK	ALTFLK	BESTLK	UNCHLK
SQUARE ERROR	2.6068	5.5699	4.4434	0.2017		12.1743	21.4446	18.1290	4.6495	
MEAN SQUARE ERROR	0.1629	0.3481	0.2777	0.0126		0.7609	1.3403	1.1331	0.2906	
ROOT MEAN SQUARE ERROR (RMSE)	0.4036	0.5900	0.5270	0.1123		0.8723	1.1577	1.0645	0.5391	
CORRELATION COEFFICIENT	0.9794	0.8880	0.9087	0.9883		0.8528	0.7791	0.7950	0.8654	
MEAN	1.8913	1.2355	1.3039	1.6529	1.6008	2.8094	1.5134	1.6139	2.3406	2.3758
STANDARD DEVIATION	0.8797	0.2164	0.2436	0.6526	0.6447	1.4116	0.3822	0.4198	1.0413	1.0320
ROOT MEAN SQUARED	2.0859	1.2543	1.3265	1.7771	1.7257	3.1441	1.5609	1.6676	2.5618	2.5903
MEAN ABSOLUTE DIFFERENCE (MAD)	0.2905	0.3653	0.2969	0.0725		0.6706	0.8624	0.7620	0.2463	
STANDARDIZED MEAN ABS DIFF	0.1610	0.1806	0.1389	0.0389		0.2546	0.3074	0.2646	0.0821	
CHI SQUARE	1.2526	1.9270	1.4591	0.0961		3.7957	5.9756	4.9293	1.2921	
THEIL'S INEQUALITY INDEX	0.1059	0.1980	0.1727	0.0321		0.1521	0.2789	0.2500	0.1046	
Um, bias	0.5181	0.3832	0.3173	0.2158		0.2470	0.5549	0.5124	0.0043	
Us,variance	0.3389	0.5270	0.5795	0.0050		0.1893	0.3150	0.3308	0.0003	
Uc, covariance	0.1431	0.0898	0.1032	0.7792		0.5636	0.1300	0.1568	0.9954	
U sum = 1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	

AG16LK EMPLOYMENT STAT ANALYSIS:	TYPE I EMPLOYMENT MULTIPLIERS					TYPE III EMPLOYMENT MULTIPLIERS				
	SDPLK	FLRLK	ALTFLK	BESTLK	UNCHLK	SDPLK	FLRLK	ALTFLK	BESTLK	UNCHLK
SQUARE ERROR	2.6801	13.1281	10.8069	0.3336		7.8443	33.5650	28.2406	0.6679	
MEAN SQUARE ERROR	0.1675	0.8205	0.6754	0.0208		0.4903	2.0978	1.7650	0.0417	
ROOT MEAN SQUARE ERROR (RMSE)	0.4093	0.9058	0.8218	0.1444		0.7002	1.4484	1.3285	0.2043	
CORRELATION COEFFICIENT	0.9904	0.9165	0.9403	0.9952		0.9904	0.9165	0.9403	0.9952	
MEAN	1.9784	1.2609	1.3324	1.7276	1.7007	2.8908	1.5260	1.6291	2.4152	2.3892
STANDARD DEVIATION	1.3155	0.3065	0.3603	0.9867	1.0632	1.9222	0.3709	0.4406	1.3794	1.4936
ROOT MEAN SQUARED	2.3758	1.2976	1.3803	1.9895	2.0057	3.4715	1.5705	1.6877	2.7813	2.8176
MEAN ABSOLUTE DIFFERENCE (MAD)	0.2777	0.4514	0.3873	0.0874		0.5016	0.8631	0.7600	0.1216	
STANDARDIZED MEAN ABS DIFF	0.1459	0.1816	0.1498	0.0481		0.1919	0.2854	0.2441	0.0473	
CHI SQUARE	1.1206	2.9651	2.3581	0.1575		2.2859	6.1830	5.0197	0.2143	
THEIL'S INEQUALITY INDEX	0.0934	0.2742	0.2427	0.0361		0.1113	0.3301	0.2949	0.0365	
Um, bias	0.4603	0.2358	0.2008	0.0345		0.5133	0.3551	0.3273	0.0162	
Us,variance	0.3799	0.6979	0.7315	0.2812		0.3747	0.6008	0.6282	0.3125	
Uc, covariance	0.1598	0.0663	0.0677	0.6843		0.1120	0.0441	0.0445	0.6713	
U sum = 1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	

APPENDIX I: MICHIGAN RPC AND MULTIPLIER ANALYSIS

This analysis is very similar to the Lake State RPC and multiplier analysis except for the addition of a set of RPCs (REMIMI) based on REMI model RPCs for the state of Michigan. The results indicate that the "best" (BSTMI) and "unchanged" (UNCHMI) RPCs and associated multipliers are less similar for Michigan than they were for the Lake States. This largely reflects the greater number of questionable, zero-value RPCs in the unchanged Michigan RPC set as compared to the unchanged Lake State RPC set. More RPC values were radically changed to arrive at the BSTMI RPC set than were changed to arrive at the BSTLK RPC set.

Differences between the sets of Michigan RPCs are presented below. Differences between sets of multipliers at different aggregation levels are presented on the following pages.

MEASUREMENT OF MICHIGAN MODEL RPC DIFFERENCES

Dependent variable = UNCHMI (unchanged IMPLAN RPCs)

	SDP	FLRMI	ALTFLRMI	BSTMI	REMIMI	UNCHMI
MEAN	0.556	0.209	0.233	0.366	0.318	0.330
SQUARE ERROR (SUM)	73.480	27.394	32.122	19.052	41.864	
MEAN SQUARE ERROR	0.139	0.052	0.061	0.036	0.079	
ROOT MEAN SQUARE ERROR	0.373	0.228	0.247	0.190	0.282	
CORRELATION COEFFICIENT	0.647	0.803	0.710	0.821	0.587	
STANDARD DEVIATION	0.375	0.244	0.240	0.298	0.295	0.322
ROOT MEAN SQUARE	0.671	0.321	0.335	0.472	0.434	0.461
MEAN ABSOLUTE DIFFERENCE	0.227	0.122	0.147	0.091	0.182	
THEIL'S INEQUALITY INDEX	0.330	0.291	0.310	0.204	0.315	
Um, bias	0.367	0.285	0.154	0.035	0.002	
Us, variance	0.020	0.117	0.110	0.016	0.009	
Uc, covariance	0.613	0.597	0.736	0.949	0.989	
U sum (=1.000)	1.00	1.00	1.00	1.00	1.00	

Appendix I (cont'd.)

DISAGMI OUTPUT STAT ANALYSIS: TYPE I OUTPUT MULTIPLIERS

	SDPMI	FLRMI	ALTFLM	BSTMI	REMIMI	UNCMI
SQUARE ERROR	57.9984	4.1793	2.6474	11.0656	11.2896	
MEAN SQUARE ERROR	0.1198	0.0086	0.0055	0.0229	0.0233	
ROOT MEAN SQUARE ERROR	0.3462	0.0929	0.0740	0.1512	0.1527	
CORRELATION COEFFICIENT	0.7353	0.9024	0.8649	0.8958	0.7790	
MEAN	1.5532	1.1611	1.1979	1.3734	1.3632	1.2355
STANDARD DEVIATION	0.2001	0.0988	0.0968	0.1387	0.1270	0.1249
ROOT MEAN SQUARED	1.5661	1.1652	1.2018	1.3803	1.3691	1.2418
MEAN ABSOLUTE DIFFERENCE	0.3177	0.0745	0.0495	0.1383	0.1348	
STANDARDIZED MEAN ABS DIF	0.2575	0.0583	0.0381	0.1128	0.1105	
CHI SQUARE	46.9477	3.0873	1.8983	9.0515	9.2801	
THEIL'S INEQUALITY INDEX	0.1233	0.0386	0.0305	0.0577	0.0585	
Um, bias	0.8424	0.6423	0.2590	0.8309	0.6995	
Us, variance	0.0472	0.0789	0.1438	0.0083	0.0002	
Uc, covariance	0.1104	0.2787	0.5971	0.1608	0.3005	
U sum = 1.00	1.00	1.00	1.00	1.00	1.00	

TYPE III OUTPUT MULTIPLIERS

	SDPMI	FLRMI	ALTFLM	BSTMI	REMIMI	UNCMI
SQUARE ERROR	250.543	25.5742	19.7428	50.6190	46.1913	
MEAN SQUARE ERROR	0.5177	0.0528	0.0408	0.1046	0.0954	
ROOT MEAN SQUARE ERROR	0.7195	0.2299	0.2020	0.3234	0.3089	
CORRELATION COEFFICIENT	0.9383	0.8152	0.8068	0.8088	0.7831	
MEAN	2.2255	1.4110	1.4656	1.8149	1.7896	1.5558
STANDARD DEVIATION	0.5254	0.2138	0.2191	0.3204	0.3101	0.3029
ROOT MEAN SQUARED	2.2867	1.4271	1.4819	1.8430	1.8162	1.5850
MEAN ABSOLUTE DIFFERENCE	0.6697	0.1448	0.0954	0.2741	0.2524	
STANDARDIZED MEAN ABS DIF	0.4262	0.0874	0.0556	0.1734	0.1604	
CHI SQUARE	150.701	9.6628	6.3056	26.7540	24.2807	
THEIL'S INEQUALITY INDEX	0.1858	0.0763	0.0659	0.0943	0.0908	
Um, bias	0.8664	0.3967	0.1992	0.6421	0.5727	
Us, variance	0.0956	0.1502	0.1721	0.0029	0.0005	
Uc, covariance	0.0380	0.4532	0.6287	0.3549	0.4268	
U sum = 1.00	1.00	1.00	1.00	1.00	1.00	

DISAGMI PERS INC STAT ANALYSIS: TYPE I PERSONAL INCOME MULTIPLIERS

	SDPMI	FLRMI	ALTFLM	BSTMI	REMIMI	UNCMI
SQUARE ERROR	118.096	8.7096	5.4543	36.5907	41.0074	
MEAN SQUARE ERROR	0.2440	0.0180	0.0113	0.0756	0.0847	
ROOT MEAN SQUARE ERROR	0.4940	0.1341	0.1062	0.2750	0.2911	
CORRELATION COEFFICIENT	0.9331	0.9655	0.9561	0.9596	0.9127	
MEAN	1.6725	1.1902	1.2427	1.4886	1.4895	1.2765
STANDARD DEVIATION	0.5541	0.2220	0.2368	0.4405	0.4294	0.2992
ROOT MEAN SQUARED	1.7619	1.2107	1.2650	1.5524	1.5502	1.3111
MEAN ABSOLUTE DIFFERENCE	0.3960	0.0863	0.0538	0.2122	0.2184	
STANDARDIZED MEAN ABS DIF	0.2956	0.0610	0.0371	0.1569	0.1622	
CHI SQUARE	77.5638	4.4857	2.5626	23.7038	27.1039	
THEIL'S INEQUALITY INDEX	0.1607	0.0532	0.0412	0.0960	0.1017	
Um, bias	0.6427	0.4140	0.1017	0.5950	0.5355	
Us, variance	0.2663	0.3312	0.3458	0.2640	0.1999	
Uc, covariance	0.0910	0.2548	0.5525	0.1410	0.2646	
U sum = 1.00	1.00	1.00	1.00	1.00	1.00	

TYPE III PERSONAL INCOME MULTIPLIERS

	SDPMI	FLRMI	ALTFLM	BSTMI	REMIMI	UNCMI
SQUARE ERROR	450.290	29.5886	18.8662	117.829	118.181	
MEAN SQUARE ERROR	0.9304	0.0611	0.0390	0.2434	0.2442	
ROOT MEAN SQUARE ERROR	0.9645	0.2473	0.1974	0.4934	0.4941	
CORRELATION COEFFICIENT	0.9643	0.9596	0.9562	0.9574	0.9367	
MEAN	2.4405	1.4869	1.5635	2.0362	2.0257	1.6511
STANDARD DEVIATION	1.0581	0.4155	0.4400	0.7848	0.7710	0.5421
ROOT MEAN SQUARED	2.6599	1.5439	1.6243	2.1822	2.1656	1.7378
MEAN ABSOLUTE DIFFERENCE	0.7894	0.1641	0.0982	0.3954	0.3871	
STANDARDIZED MEAN ABS DIF	0.4505	0.0896	0.0510	0.2248	0.2206	
CHI SQUARE	211.317	11.1567	6.2190	54.7398	55.7054	
THEIL'S INEQUALITY INDEX	0.2195	0.0753	0.0587	0.1259	0.1266	
Um, bias	0.6698	0.4406	0.1966	0.6091	0.5686	
Us, variance	0.2862	0.2619	0.2672	0.2421	0.2146	
Uc, covariance	0.0440	0.2975	0.5361	0.1488	0.2167	
U sum = 1.00	1.00	1.00	1.00	1.00	1.00	

DISAGMI EMPLOYMENT STAT ANALYSIS: TYPE I EMPLOYMENT MULTIPLIERS

	SDPMI	FLRMI	ALTFLM	BSTMI	REMIMI	UNCMI
SQUARE ERROR	136.712	10.5855	6.2650	29.4451	29.3382	
MEAN SQUARE ERROR	0.2825	0.0219	0.0129	0.0608	0.0606	
ROOT MEAN SQUARE ERROR	0.5315	0.1479	0.1138	0.2467	0.2462	
CORRELATION COEFFICIENT	0.9340	0.9745	0.9737	0.9655	0.9435	
MEAN	1.6648	1.2014	1.2518	1.4746	1.4649	1.2951
STANDARD DEVIATION	0.7335	0.3282	0.3472	0.5250	0.5009	0.4074
ROOT MEAN SQUARED	1.8192	1.2454	1.2990	1.5653	1.5481	1.3577
MEAN ABSOLUTE DIFFERENCE	0.3697	0.0945	0.0589	0.1795	0.1746	
STANDARDIZED MEAN ABS DIF	0.2599	0.0645	0.0389	0.1295	0.1277	
CHI SQUARE	77.9432	5.3899	3.0020	18.7680	19.5023	
THEIL'S INEQUALITY INDEX	0.1673	0.0568	0.0428	0.0844	0.0847	
Um, bias	0.4839	0.4011	0.1449	0.5299	0.4756	
Us, variance	0.3763	0.2872	0.2803	0.2273	0.1441	
Uc, covariance	0.1397	0.3117	0.5748	0.2429	0.3803	
U sum = 1.00	1.00	1.00	1.00	1.00	1.00	

TYPE III EMPLOYMENT MULTIPLIERS

	SDPMI	FLRMI	ALTFLM	BSTMI	REMIMI	UNCMI
SQUARE ERROR	423.686	24.6761	13.5746	84.9305	75.8453	
MEAN SQUARE ERROR	0.8754	0.0510	0.0280	0.1755	0.1567	
ROOT MEAN SQUARE ERROR	0.9356	0.2258	0.1675	0.4189	0.3959	
CORRELATION COEFFICIENT	0.9340	0.9745	0.9737	0.9655	0.9435	
MEAN	2.3642	1.4718	1.5438	1.9769	1.9467	1.6379
STANDARD DEVIATION	1.0416	0.4020	0.4282	0.7038	0.6656	0.5153
ROOT MEAN SQUARED	2.5835	1.5257	1.6021	2.0984	2.0574	1.7171
MEAN ABSOLUTE DIFFERENCE	0.7263	0.1668	0.1031	0.3389	0.3119	
STANDARDIZED MEAN ABS DIF	0.4145	0.0935	0.0561	0.1971	0.1835	
CHI SQUARE	198.698	10.6599	5.3847	43.4968	40.3642	
THEIL'S INEQUALITY INDEX	0.2176	0.0696	0.0505	0.1098	0.1049	
Um, bias	0.6026	0.5413	0.3158	0.6547	0.6085	
Us, variance	0.3165	0.2516	0.2704	0.2026	0.1443	
Uc, covariance	0.0810	0.2072	0.4138	0.1427	0.2472	
U sum = 1.00	1.00	1.00	1.00	1.00	1.00	

Appendix I (cont'd.)

UNAGNI OUTPUT STAT ANALYSIS: TYPE I OUTPUT MULTIPLIERS

	SOPNI	FUNI	ALTFUN	BSTNI	REMINI	UNCNI
SQUARE ERROR	53.4188	1.7896	1.3616	0.5585	6.7062	
MEAN SQUARE ERROR	0.1734	0.0058	0.0044	0.0018	0.0218	
ROOT MEAN SQUARE ERROR	0.4165	0.0762	0.0665	0.0426	0.1476	
CORRELATION COEFFICIENT	0.7409	0.9120	0.8810	0.9890	0.80621	
MEAN	1.6239	1.1890	1.2282	1.2756	1.3600	1.2387
STANDARD DEVIATION	0.2528	0.1115	0.1106	0.1429	0.1341	0.1372
ROOT MEAN SQUARED	1.6405	1.1942	1.2331	1.2835	1.3666	1.2463
MEAN ABSOLUTE DIFFERENCE	0.3851	0.0527	0.0428	0.0370	0.1305	
STANDARDIZED MEAN ABS DIF	0.3109	0.0405	0.0333	0.0298	0.1066	
CHI SQUARE	42.9916	1.2759	0.9798	0.4495	5.4906	
THEIL'S INEQUALITY INDEX	0.1443	0.0312	0.0268	0.0168	0.0565	
Um, bias	0.8552	0.4255	0.0254	0.7481	0.6752	
Us, variance	0.0526	0.1139	0.1605	0.0174	0.0005	
Uc, covariance	0.0955	0.4639	0.8176	0.2378	0.3276	
U sum = 1.00	1.00	1.00	1.00	1.00	1.00	

TYPE III OUTPUT MULTIPLIERS

	SOPNI	FUNI	ALTFUN	BSTNI	REMINI	UNCNI
SQUARE ERROR	211.920	9.0195	6.7295	5.8041	23.7901	
MEAN SQUARE ERROR	0.6905	0.0294	0.0219	0.0189	0.0775	
ROOT MEAN SQUARE ERROR	0.8308	0.1714	0.1481	0.1375	0.2784	
CORRELATION COEFFICIENT	0.7799	0.8633	0.8531	0.8851	0.82623	
MEAN	2.3264	1.4443	1.5025	1.6003	1.7705	1.5459
STANDARD DEVIATION	0.4396	0.2068	0.2114	0.2545	0.2861	0.2690
ROOT MEAN SQUARED	2.3676	1.4592	1.5173	1.6204	1.7935	1.5692
MEAN ABSOLUTE DIFFERENCE	0.7904	0.1050	0.0851	0.0683	0.2616	
STANDARDIZED MEAN ABS DIF	0.5094	0.0619	0.0384	0.0418	0.1554	
CHI SQUARE	133.317	3.8336	2.5689	2.1386	14.0229	
THEIL'S INEQUALITY INDEX	0.2110	0.0566	0.0480	0.0431	0.0828	
Um, bias	0.8826	0.3504	0.0860	0.1565	0.6511	
Us, variance	0.0422	0.1317	0.1518	0.0112	0.0057	
Uc, covariance	0.0754	0.5180	0.7622	0.8323	0.3432	
U sum = 1.00	1.00	1.00	1.00	1.00	1.00	

UNAGNI PERS INC STAT ANALYSIS: TYPE I PERSONAL INCOME MULTIPLIERS

	SOPNI	FUNI	ALTFUN	BSTNI	REMINI	UNCNI
SQUARE ERROR	160.095	2.7646	3.2737	5.0215	27.3501	
MEAN SQUARE ERROR	0.5198	0.0090	0.0106	0.0163	0.0888	
ROOT MEAN SQUARE ERROR	0.7210	0.0947	0.1051	0.1277	0.2980	
CORRELATION COEFFICIENT	0.9204	0.9995	0.9502	0.9816	0.9208	
MEAN	1.8494	1.2580	1.3174	1.3682	1.5109	1.2874
STANDARD DEVIATION	0.7266	0.2882	0.3105	0.3885	0.4453	0.3153
ROOT MEAN SQUARED	1.9870	1.2906	1.3535	1.4222	1.5752	1.3255
MEAN ABSOLUTE DIFFERENCE	0.5620	0.0695	0.0602	0.0808	0.2258	
STANDARDIZED MEAN ABS DIF	0.4092	0.0547	0.0438	0.0574	0.1676	
CHI SQUARE	99.4854	1.4449	2.0210	2.9554	18.3720	
THEIL'S INEQUALITY INDEX	0.2176	0.0362	0.0385	0.0465	0.1027	
Um, bias	0.6076	0.0968	0.0842	0.3998	0.5625	
Us, variance	0.3255	0.0819	0.0021	0.3272	0.1905	
Uc, covariance	0.0702	0.8246	0.9169	0.2762	0.2505	
U sum = 1.00	1.00	1.00	1.00	1.00	1.00	

TYPE III PERSONAL INCOME MULTIPLIERS

	SOPNI	FUNI	ALTFUN	BSTNI	REMINI	UNCNI
SQUARE ERROR	542.268	8.4360	6.7873	11.8843	73.8154	
MEAN SQUARE ERROR	1.7663	0.0275	0.0221	0.0387	0.2404	
ROOT MEAN SQUARE ERROR	1.3290	0.1658	0.1487	0.1968	0.4903	
CORRELATION COEFFICIENT	0.9526	0.9653	0.9602	0.9770	0.9433	
MEAN	2.7205	1.5757	1.6632	1.7746	2.0410	1.6567
STANDARD DEVIATION	1.2695	0.4734	0.5089	0.6291	0.7499	0.5319
ROOT MEAN SQUARED	3.0020	1.6452	1.7388	1.8528	2.1744	1.7400
MEAN ABSOLUTE DIFFERENCE	1.0707	0.0928	0.0700	0.1275	0.3940	
STANDARDIZED MEAN ABS DIF	0.6078	0.0509	0.0387	0.0698	0.2263	
CHI SQUARE	252.005	3.2975	2.8162	5.0944	36.8664	
THEIL'S INEQUALITY INDEX	0.2805	0.0490	0.0427	0.0543	0.1253	
Um, bias	0.6406	0.2391	0.0019	0.3588	0.6142	
Us, variance	0.3078	0.1243	0.0281	0.2442	0.1977	
Uc, covariance	0.0515	0.6366	0.9700	0.3970	0.1881	
U sum = 1.00	1.00	1.00	1.00	1.00	1.00	

UNAGNI EMPLOYMENT STAT ANALYSIS: TYPE I EMPLOYMENT MULTIPLIERS

	SOPNI	FUNI	ALTFUN	BSTNI	REMINI	UNCNI
SQUARE ERROR	152.689	4.1928	3.1395	2.5090	20.1571	
MEAN SQUARE ERROR	0.4957	0.0136	0.0102	0.0081	0.0654	
ROOT MEAN SQUARE ERROR	0.7041	0.1167	0.1010	0.0902	0.2558	
CORRELATION COEFFICIENT	0.9511	0.9800	0.9767	0.9911	0.9528	
MEAN	1.8670	1.2796	1.3376	1.3885	1.5156	1.3380
STANDARD DEVIATION	0.8923	0.4175	0.4426	0.5044	0.5633	0.4670
ROOT MEAN SQUARED	2.0512	1.3460	1.4087	1.4773	1.6169	1.4172
MEAN ABSOLUTE DIFFERENCE	0.5090	0.0672	0.0550	0.0565	0.1840	
STANDARDIZED MEAN ABS DIF	0.3501	0.0447	0.0379	0.0389	0.1326	
CHI SQUARE	86.0715	2.1548	1.7740	1.5065	13.0062	
THEIL'S INEQUALITY INDEX	0.2050	0.0422	0.0357	0.0512	0.0843	
Um, bias	0.5225	0.2505	0.0000	0.3138	0.4822	
Us, variance	0.3649	0.1802	0.0595	0.1717	0.1417	
Uc, covariance	0.1159	0.5726	0.9437	0.5177	0.3794	
U sum = 1.00	1.00	1.00	1.00	1.00	1.00	

TYPE III EMPLOYMENT MULTIPLIERS

	SOPNI	FUNI	ALTFUN	BSTNI	REMINI	UNCNI
SQUARE ERROR	462.897	10.4269	5.7665	4.3290	48.8860	
MEAN SQUARE ERROR	1.5078	0.0340	0.0188	0.0141	0.1592	
ROOT MEAN SQUARE ERROR	1.2279	0.1843	0.1371	0.1187	0.3990	
CORRELATION COEFFICIENT	0.9511	0.9800	0.9767	0.9911	0.9528	
MEAN	2.6996	1.5739	1.6577	1.7681	2.0085	1.6985
STANDARD DEVIATION	1.2949	0.5135	0.5483	0.6423	0.7454	0.5929
ROOT MEAN SQUARED	2.9537	1.6856	1.7460	1.8811	2.1395	1.7990
MEAN ABSOLUTE DIFFERENCE	0.9612	0.1309	0.0780	0.0766	0.3110	
STANDARDIZED MEAN ABS DIF	0.5272	0.0708	0.0414	0.0413	0.1789	
CHI SQUARE	210.492	4.4379	2.4478	2.0530	26.9912	
THEIL'S INEQUALITY INDEX	0.2584	0.0533	0.0387	0.0523	0.1013	
Um, bias	0.6127	0.4565	0.0886	0.3439	0.5920	
Us, variance	0.3177	0.1852	0.1056	0.1733	0.1461	
Uc, covariance	0.0696	0.3583	0.8058	0.4828	0.2619	
U sum = 1.00	1.00	1.00	1.00	1.00	1.00	

Appendix I (cont'd.)

AGDMMI OUTPUT STAT ANALYSIS: TYPE I OUTPUT MULTIPLIERS

	SDPMI	FLRMI	ALTFLM	BSTMI	REMIMI	UNCMI
SQUARE ERROR	27.3613	1.0775	0.7878	0.3069	3.1310	
MEAN SQUARE ERROR	0.1754	0.0069	0.0051	0.0020	0.0201	
ROOT MEAN SQUARE ERROR	0.4188	0.0831	0.0711	0.0444	0.1417	
CORRELATION COEFFICIENT	0.8273	0.9220	0.9048	0.9909	0.8528	
MEAN	1.6436	1.2011	1.2395	1.2912	1.3668	1.2530
STANDARD DEVIATION	0.2537	0.1272	0.1286	0.1652	0.1493	0.1596
ROOT MEAN SQUARED	1.6631	1.2079	1.2462	1.3017	1.3750	1.2631
MEAN ABSOLUTE DIFFERENCE	0.3906	0.0565	0.0440	0.0383	0.1261	
STANDARDIZED MEAN ABS DIF	0.3107	0.0425	0.0335	0.0306	0.1023	
CHI SQUARE	21.6126	0.7435	0.5451	0.2459	2.5502	
THEIL'S INEQUALITY INDEX	0.1431	0.0336	0.0283	0.0173	0.0537	
Um, bias	0.8698	0.3899	0.0361	0.7392	0.6452	
Us, variance	0.0505	0.1514	0.1901	0.0162	0.0052	
Uc, covariance	0.0797	0.4587	0.7737	0.2446	0.3495	
U sum = 1.00	1.00	1.00	1.00	1.00	1.00	

AGDMMI OUTPUT STAT ANALYSIS: TYPE III OUTPUT MULTIPLIERS

	SDPMI	FLRMI	ALTFLM	BSTMI	REMIMI	UNCMI
SQUARE ERROR	131.599	7.3028	5.8452	5.3097	14.5523	
MEAN SQUARE ERROR	0.8436	0.0468	0.0375	0.0340	0.0933	
ROOT MEAN SQUARE ERROR	0.9185	0.2164	0.1936	0.1845	0.3054	
CORRELATION COEFFICIENT	0.7706	0.8158	0.8112	0.8329	0.7921	
MEAN	2.4421	1.4755	1.5353	1.6388	1.8110	1.5869
STANDARD DEVIATION	0.5118	0.2333	0.2401	0.2858	0.3257	0.3176
ROOT MEAN SQUARED	2.4951	1.4938	1.5539	1.6635	1.8400	1.6184
MEAN ABSOLUTE DIFFERENCE	0.8739	0.1145	0.0728	0.0795	0.2547	
STANDARDIZED MEAN ABS DIF	0.5466	0.0649	0.0398	0.0459	0.1580	
CHI SQUARE	79.4251	2.7405	1.9966	1.7711	7.8474	
THEIL'S INEQUALITY INDEX	0.2233	0.0695	0.0610	0.0562	0.0883	
Um, bias	0.8669	0.2652	0.0712	0.0791	0.5382	
Us, variance	0.0447	0.1519	0.1603	0.0297	0.0007	
Uc, covariance	0.0884	0.5829	0.7685	0.8913	0.4611	
U sum = 1.00	1.00	1.00	1.00	1.00	1.00	

AGDMMI PERS INC STAT ANALYSIS: TYPE I PERSONAL INCOME MULTIPLIERS

	SDPMI	FLRMI	ALTFLM	BSTMI	REMIMI	UNCMI
SQUARE ERROR	147.817	6.0784	5.4812	4.0434	18.6182	
MEAN SQUARE ERROR	0.9475	0.0390	0.0351	0.0259	0.1193	
ROOT MEAN SQUARE ERROR	0.9734	0.1974	0.1874	0.1610	0.3455	
CORRELATION COEFFICIENT	0.9454	0.9892	0.9858	0.9917	0.9471	
MEAN	2.0670	1.3421	1.4030	1.4825	1.6268	1.3820
STANDARD DEVIATION	1.2843	0.5400	0.5698	0.7504	0.7471	0.6637
ROOT MEAN SQUARED	2.4335	1.4466	1.5143	1.6616	1.7902	1.5331
MEAN ABSOLUTE DIFFERENCE	0.6851	0.0718	0.0831	0.1007	0.2531	
STANDARDIZED MEAN ABS DIF	0.4502	0.0406	0.0513	0.0662	0.1791	
CHI SQUARE	71.9502	1.7310	1.9758	2.1762	11.7671	
THEIL'S INEQUALITY INDEX	0.2454	0.0662	0.0615	0.0504	0.1040	
Um, bias	0.4953	0.0409	0.0126	0.3903	0.5023	
Us, variance	0.4064	0.3950	0.2509	0.2898	0.0583	
Uc, covariance	0.0983	0.5662	0.7365	0.3199	0.4394	
U sum = 1.00	1.00	1.00	1.00	1.00	1.00	

AGDMMI PERS INC STAT ANALYSIS: TYPE III PERSONAL INCOME MULTIPLIERS

	SDPMI	FLRMI	ALTFLM	BSTMI	REMIMI	UNCMI
SQUARE ERROR	530.088	11.6726	9.5657	9.8901	52.7321	
MEAN SQUARE ERROR	3.3980	0.0748	0.0613	0.0634	0.3380	
ROOT MEAN SQUARE ERROR	1.8434	0.2735	0.2476	0.2518	0.5814	
CORRELATION COEFFICIENT	0.9378	0.9644	0.9620	0.9835	0.9460	
MEAN	3.2075	1.7156	1.8070	1.9551	2.2525	1.8106
STANDARD DEVIATION	1.9800	0.7252	0.7669	0.9889	1.0743	0.8698
ROOT MEAN SQUARED	3.7694	1.8626	1.9630	2.1910	2.4955	2.0087
MEAN ABSOLUTE DIFFERENCE	1.4094	0.1186	0.1011	0.1633	0.4608	
STANDARDIZED MEAN ABS DIF	0.7236	0.0543	0.0472	0.0821	0.2486	
CHI SQUARE	203.064	3.0880	2.8599	3.9497	26.4728	
THEIL'S INEQUALITY INDEX	0.3190	0.0707	0.0623	0.0600	0.1291	
Um, bias	0.5742	0.1206	0.0002	0.3295	0.5776	
Us, variance	0.3627	0.2797	0.1729	0.2236	0.1237	
Uc, covariance	0.0631	0.5997	0.8269	0.4471	0.2987	
U sum = 1.00	1.00	1.00	1.00	1.00	1.00	

AGDMMI EMPLOYMENT STAT ANALYSIS: TYPE I EMPLOYMENT MULTIPLIERS

	SDPMI	FLRMI	ALTFLM	BSTMI	REMIMI	UNCMI
SQUARE ERROR	128.109	5.1756	4.2255	1.9033	12.8747	
MEAN SQUARE ERROR	0.8212	0.0332	0.0271	0.0122	0.0825	
ROOT MEAN SQUARE ERROR	0.9062	0.1821	0.1646	0.1105	0.2873	
CORRELATION COEFFICIENT	0.9488	0.9571	0.9558	0.9895	0.9536	
MEAN	1.9416	1.3037	1.3614	1.4212	1.5519	1.3624
STANDARD DEVIATION	1.1941	0.4554	0.4877	0.5908	0.6610	0.5470
ROOT MEAN SQUARED	2.2794	1.3809	1.4461	1.5391	1.6869	1.4681
MEAN ABSOLUTE DIFFERENCE	0.5792	0.0750	0.0673	0.0658	0.1977	
STANDARDIZED MEAN ABS DIF	0.3663	0.0433	0.0406	0.0432	0.1377	
CHI SQUARE	59.1585	1.7629	1.6242	1.1383	8.1513	
THEIL'S INEQUALITY INDEX	0.2418	0.0639	0.0565	0.0367	0.0911	
Um, bias	0.4086	0.1038	0.0000	0.2839	0.4355	
Us, variance	0.5100	0.2527	0.1298	0.1575	0.1576	
Uc, covariance	0.0814	0.6435	0.8702	0.5587	0.4069	
U sum = 1.00	1.00	1.00	1.00	1.00	1.00	

AGDMMI EMPLOYMENT STAT ANALYSIS: TYPE III EMPLOYMENT MULTIPLIERS

	SDPMI	FLRMI	ALTFLM	BSTMI	REMIMI	UNCMI
SQUARE ERROR	387.256	9.8422	6.9756	3.1769	30.7645	
MEAN SQUARE ERROR	2.4824	0.0631	0.0447	0.0204	0.1972	
ROOT MEAN SQUARE ERROR	1.5756	0.2512	0.2115	0.1427	0.4441	
CORRELATION COEFFICIENT	0.9488	0.9571	0.9558	0.9895	0.9536	
MEAN	2.8215	1.5899	1.6662	1.7816	2.0318	1.7016
STANDARD DEVIATION	1.7352	0.5533	0.5969	0.7406	0.8654	0.6831
ROOT MEAN SQUARED	3.3124	1.6778	1.7699	1.9295	2.2085	1.8336
MEAN ABSOLUTE DIFFERENCE	1.1199	0.1308	0.0860	0.0880	0.3357	
STANDARDIZED MEAN ABS DIF	0.5896	0.0658	0.0414	0.0466	0.1898	
CHI SQUARE	150.043	2.8860	2.0623	1.5194	15.5387	
THEIL'S INEQUALITY INDEX	0.3062	0.0715	0.0587	0.0379	0.1099	
Um, bias	0.5052	0.2193	0.0279	0.3140	0.5531	
Us, variance	0.4459	0.2672	0.1664	0.1620	0.1685	
Uc, covariance	0.0489	0.5134	0.8057	0.5240	0.2785	
U sum = 1.00	1.00	1.00	1.00	1.00	1.00	

Appendix I (cont'd.)

AG30MI OUTPUT STAT ANALYSIS: TYPE I OUTPUT MULTIPLIERS

	SDPMI	FLRMI	ALTFLM	BSTMI	REMIMI	UNCMI
SQUARE ERROR	5.1306	0.1039	0.0636	0.0277	0.6870	
MEAN SQUARE ERROR	0.1655	0.0034	0.0021	0.0009	0.0222	
ROOT MEAN SQUARE ERROR	0.4068	0.0579	0.0453	0.0299	0.1489	
CORRELATION COEFFICIENT	0.7838	0.9149	0.8807	0.9891	0.8422	
MEAN	1.5952	1.1839	1.2221	1.2503	1.3596	1.2248
STANDARD DEVIATION	0.2316	0.0709	0.0758	0.1005	0.1169	0.0943
ROOT MEAN SQUARED	1.6119	1.1861	1.2245	1.2543	1.3646	1.2284
MEAN ABSOLUTE DIFFERENCE	0.3704	0.0409	0.0259	0.0255	0.1352	
STANDARDIZED MEAN ABS DIF	0.2983	0.0318	0.0201	0.0206	0.1104	
CHI SQUARE	4.0990	0.0760	0.0457	0.0223	0.5600	
THEIL'S INEQUALITY INDEX	0.1432	0.0240	0.0185	0.0120	0.0574	
Um, bias	0.8290	0.4985	0.0036	0.7257	0.8198	
Us, variance	0.1139	0.1621	0.1667	0.0442	0.0252	
Uc, coveriance	0.0570	0.3394	0.8297	0.2302	0.1570	
U sum = 1.00	1.00	1.00	1.00	1.00	1.00	

TYPE III OUTPUT MULTIPLIERS

	SDPMI	FLRMI	ALTFLM	BSTMI	REMIMI	UNCMI
SQUARE ERROR	20.5829	4.8788	4.4236	4.3371	5.3325	
MEAN SQUARE ERROR	0.6640	0.1574	0.1427	0.1399	0.1720	
ROOT MEAN SQUARE ERROR	0.8148	0.3967	0.3778	0.3740	0.4147	
CORRELATION COEFFICIENT	0.2404	0.3420	0.3514	0.3218	0.3428	
MEAN	2.2482	1.4187	1.4765	1.5437	1.7442	1.5675
STANDARD DEVIATION	0.3317	0.1465	0.1551	0.1729	0.2102	0.3911
ROOT MEAN SQUARED	2.2726	1.4263	1.4846	1.5534	1.7568	1.6156
MEAN ABSOLUTE DIFFERENCE	0.7752	0.1488	0.1026	0.1115	0.2945	
STANDARDIZED MEAN ABS DIF	0.4961	0.0715	0.0422	0.0487	0.1735	
CHI SQUARE	12.7088	1.4836	1.2938	1.2643	2.2616	
THEIL'S INEQUALITY INDEX	0.2096	0.1304	0.1218	0.1180	0.1230	
Um, bias	0.6978	0.1407	0.0581	0.0040	0.1815	
Us, variance	0.0053	0.3801	0.3905	0.3405	0.1903	
Uc, coveriance	0.2969	0.4792	0.5514	0.6555	0.6282	
U sum = 1.00	1.00	1.00	1.00	1.00	1.00	

AG30MI PERS INC STAT ANALYSIS: TYPE I PERSONAL INCOME MULTIPLIERS

	SDPMI	FLRMI	ALTFLM	BSTMI	REMIMI	UNCMI
SQUARE ERROR	14.6513	1.0296	0.7928	0.1132	1.3154	
MEAN SQUARE ERROR	0.4726	0.0332	0.0256	0.0037	0.0424	
ROOT MEAN SQUARE ERROR	0.6875	0.1822	0.1599	0.0604	0.2060	
CORRELATION COEFFICIENT	0.9857	0.9616	0.9581	0.9969	0.9715	
MEAN	1.7713	1.2203	1.2727	1.3191	1.4554	1.2742
STANDARD DEVIATION	0.8357	0.2146	0.2350	0.3974	0.4034	0.3702
ROOT MEAN SQUARED	1.9586	1.2391	1.2942	1.3776	1.5103	1.3269
MEAN ABSOLUTE DIFFERENCE	0.4971	0.0543	0.0563	0.0449	0.1812	
STANDARDIZED MEAN ABS DIF	0.3519	0.0279	0.0317	0.0330	0.1420	
CHI SQUARE	7.8576	0.3369	0.2687	0.0743	0.9952	
THEIL'S INEQUALITY INDEX	0.2092	0.0710	0.0610	0.0223	0.0726	
Um, bias	0.5228	0.0875	0.0001	0.5508	0.7735	
Us, variance	0.4584	0.7288	0.7150	0.2019	0.0260	
Uc, coveriance	0.0188	0.1838	0.2849	0.2473	0.2005	
U sum = 1.00	1.00	1.00	1.00	1.00	1.00	

TYPE III PERSONAL INCOME MULTIPLIERS

	SDPMI	FLRMI	ALTFLM	BSTMI	REMIMI	UNCMI
SQUARE ERROR	42.4579	3.6771	3.0444	2.2704	5.4160	
MEAN SQUARE ERROR	1.3696	0.1186	0.0982	0.0732	0.1747	
ROOT MEAN SQUARE ERROR	1.1703	0.3444	0.3134	0.2706	0.4180	
CORRELATION COEFFICIENT	0.8496	0.8077	0.8102	0.8633	0.8382	
MEAN	2.4744	1.4643	1.5412	1.6270	1.8742	1.6009
STANDARD DEVIATION	1.1661	0.3218	0.3498	0.5174	0.5774	0.5128
ROOT MEAN SQUARED	2.7354	1.4992	1.5804	1.7073	1.9611	1.6810
MEAN ABSOLUTE DIFFERENCE	0.9368	0.1366	0.1025	0.1181	0.3519	
STANDARDIZED MEAN ABS DIF	0.5467	0.0613	0.0422	0.0603	0.2115	
CHI SQUARE	19.8095	1.2494	1.0344	0.8711	2.8262	
THEIL'S INEQUALITY INDEX	0.2650	0.1083	0.0961	0.0799	0.1148	
Um, bias	0.5571	0.1574	0.0363	0.0093	0.4275	
Us, variance	0.3116	0.3075	0.2706	0.0003	0.0239	
Uc, coveriance	0.1313	0.5351	0.6932	0.9904	0.5486	
U sum = 1.00	1.00	1.00	1.00	1.00	1.00	

AG30MI EMPLOYMENT STAT ANALYSIS: TYPE I EMPLOYMENT MULTIPLIERS

	SDPMI	FLRMI	ALTFLM	BSTMI	REMIMI	UNCMI
SQUARE ERROR	20.4648	1.6488	1.1267	0.0695	1.5057	
MEAN SQUARE ERROR	0.6602	0.0532	0.0363	0.0022	0.0486	
ROOT MEAN SQUARE ERROR	0.8125	0.2306	0.1906	0.0473	0.2204	
CORRELATION COEFFICIENT	0.9854	0.9703	0.9666	0.9976	0.9784	
MEAN	1.8359	1.2525	1.2952	1.3370	1.4925	1.3049
STANDARD DEVIATION	1.0683	0.2635	0.3013	0.4777	0.5194	0.4652
ROOT MEAN SQUARED	2.1240	1.2604	1.3279	1.4198	1.5803	1.3853
MEAN ABSOLUTE DIFFERENCE	0.5309	0.0795	0.0592	0.0334	0.1876	
STANDARDIZED MEAN ABS DIF	0.3532	0.0413	0.0310	0.0255	0.1428	
CHI SQUARE	9.4133	0.4906	0.3425	0.0521	1.1067	
THEIL'S INEQUALITY INDEX	0.2315	0.0872	0.0703	0.0169	0.0743	
Um, bias	0.4270	0.0985	0.0038	0.4613	0.7247	
Us, variance	0.5509	0.7646	0.7586	0.0706	0.0604	
Uc, coveriance	0.0220	0.1369	0.2376	0.4681	0.2149	
U sum = 1.00	1.00	1.00	1.00	1.00	1.00	

TYPE III EMPLOYMENT MULTIPLIERS

	SDPMI	FLRMI	ALTFLM	BSTMI	REMIMI	UNCMI
SQUARE ERROR	59.2921	2.9923	1.8900	0.1195	4.1852	
MEAN SQUARE ERROR	1.9126	0.0965	0.0610	0.0039	0.1350	
ROOT MEAN SQUARE ERROR	1.3830	0.3107	0.2469	0.0621	0.3674	
CORRELATION COEFFICIENT	0.9854	0.9703	0.9666	0.9976	0.9784	
MEAN	2.6261	1.4990	1.5875	1.6748	1.9592	1.6309
STANDARD DEVIATION	1.5281	0.3205	0.3699	0.5984	0.6817	0.5814
ROOT MEAN SQUARED	3.0383	1.5329	1.6301	1.7785	2.0744	1.7314
MEAN ABSOLUTE DIFFERENCE	0.9952	0.1380	0.0730	0.0450	0.3283	
STANDARDIZED MEAN ABS DIF	0.5488	0.0653	0.0296	0.0275	0.2003	
CHI SQUARE	23.2735	0.7639	0.4448	0.0713	2.4222	
THEIL'S INEQUALITY INDEX	0.2900	0.0952	0.0735	0.0177	0.0965	
Um, bias	0.5178	0.1801	0.0308	0.5001	0.7986	
Us, variance	0.4686	0.7053	0.7336	0.0753	0.0746	
Uc, coveriance	0.0136	0.1146	0.2356	0.4246	0.1268	
U sum = 1.00	1.00	1.00	1.00	1.00	1.00	

Appendix I (cont'd.)

AG16MI OUTPUT STAT ANALYSIS: TYPE I OUTPUT MULTIPLIERS

	SDPMI	FLRMI	ALTFLM	BSTMI	REMIMI	UNCMI
SQUARE ERROR	2.1995	0.0703	0.0531	0.0109	0.2841	
MEAN SQUARE ERROR	0.1375	0.0044	0.0033	0.0007	0.0178	
ROOT MEAN SQUARE ERROR	0.3707	0.0663	0.0576	0.0261	0.1333	
CORRELATION COEFFICIENT	0.8767	0.9156	0.8728	0.9956	0.8671	
MEAN	1.5751	1.1926	1.2283	1.2557	1.3520	1.2346
STANDARD DEVIATION	0.2369	0.0835	0.0896	0.1226	0.1260	0.1151
ROOT MEAN SQUARED	1.5928	1.1955	1.2315	1.2617	1.3579	1.2400
MEAN ABSOLUTE DIFFERENCE	0.3404	0.0421	0.0315	0.0211	0.1187	
STANDARDIZED MEAN ABS DIF	0.2707	0.0316	0.0238	0.0167	0.0968	
CHI SQUARE	1.7320	0.0493	0.0372	0.0085	0.2323	
THEIL'S INEQUALITY INDEX	0.1309	0.0272	0.0233	0.0104	0.0513	
Um, bias	0.8432	0.4029	0.0121	0.6513	0.7761	
Us, variance	0.1079	0.2278	0.1970	0.0830	0.0067	
Uc, coveriance	0.0489	0.3693	0.7908	0.2657	0.2172	
U sum = 1.00	1.00	1.00	1.00	1.00	1.00	

TYPE III OUTPUT MULTIPLIERS

	SDPMI	FLRMI	ALTFLM	BSTMI	REMIMI	UNCMI
SQUARE ERROR	11.4056	4.8123	4.4486	4.3101	4.3125	
MEAN SQUARE ERROR	0.7129	0.3008	0.2780	0.2694	0.2695	
ROOT MEAN SQUARE ERROR	0.8443	0.5484	0.5273	0.5190	0.5192	
CORRELATION COEFFICIENT	0.1701	0.2171	0.2345	0.1965	0.2485	
MEAN	2.3098	1.4698	1.5238	1.5990	1.7892	1.6911
STANDARD DEVIATION	0.3656	0.1749	0.1861	0.2052	0.2535	0.5098
ROOT MEAN SQUARED	2.3385	1.4801	1.5351	1.6121	1.8071	1.7663
MEAN ABSOLUTE DIFFERENCE	0.8023	0.2214	0.1750	0.1704	0.3284	
STANDARDIZED MEAN ABS DIF	0.4759	0.0922	0.0649	0.0628	0.1678	
CHI SQUARE	6.3474	1.4258	1.2926	1.2369	1.5314	
THEIL'S INEQUALITY INDEX	0.2057	0.1689	0.1597	0.1536	0.1453	
Um, bias	0.5369	0.1629	0.1007	0.0315	0.0357	
Us, variance	0.0292	0.3728	0.3768	0.3444	0.2437	
Uc, coveriance	0.4340	0.4643	0.5224	0.6241	0.7206	
U sum = 1.00	1.00	1.00	1.00	1.00	1.00	

AG16MI PERS INC STAT ANALYSIS: TYPE I PERSONAL INCOME MULTIPLIERS

	SDPMI	FLRMI	ALTFLM	BSTMI	REMIMI	UNCMI
SQUARE ERROR	10.8273	1.1214	0.9213	0.0689	0.4300	
MEAN SQUARE ERROR	0.6767	0.0701	0.0576	0.0043	0.0269	
ROOT MEAN SQUARE ERROR	0.8226	0.2647	0.2400	0.0656	0.1639	
CORRELATION COEFFICIENT	0.9956	0.9773	0.9750	0.9982	0.9892	
MEAN	1.8712	1.2731	1.3122	1.3995	1.4970	1.3541
STANDARD DEVIATION	1.1718	0.2992	0.3189	0.5704	0.5473	0.5363
ROOT MEAN SQUARED	2.2078	1.3078	1.3504	1.5113	1.5939	1.4564
MEAN ABSOLUTE DIFFERENCE	0.5171	0.0810	0.0788	0.0454	0.1430	
STANDARDIZED MEAN ABS DIF	0.3167	0.0316	0.0331	0.0301	0.1095	
CHI SQUARE	4.4746	0.3371	0.2792	0.0402	0.3203	
THEIL'S INEQUALITY INDEX	0.2245	0.0958	0.0855	0.0221	0.0537	
Um, bias	0.3952	0.0935	0.0304	0.4786	0.7605	
Us, variance	0.5967	0.8023	0.8208	0.2699	0.0045	
Uc, coveriance	0.0081	0.1042	0.1488	0.2515	0.2350	
U sum = 1.00	1.00	1.00	1.00	1.00	1.00	

TYPE III PERSONAL INCOME MULTIPLIERS

	SDPMI	FLRMI	ALTFLM	BSTMI	REMIMI	UNCMI
SQUARE ERROR	31.4232	3.7211	3.2540	2.1218	3.1547	
MEAN SQUARE ERROR	1.9640	0.2326	0.2034	0.1326	0.1972	
ROOT MEAN SQUARE ERROR	1.4014	0.4823	0.4510	0.3642	0.4440	
CORRELATION COEFFICIENT	0.8596	0.7991	0.8014	0.8606	0.8411	
MEAN	2.6979	1.5600	1.6178	1.7599	1.9682	1.7733
STANDARD DEVIATION	1.5793	0.4043	0.4298	0.6962	0.7262	0.6808
ROOT MEAN SQUARED	3.1261	1.6115	1.6739	1.8926	2.0979	1.8995
MEAN ABSOLUTE DIFFERENCE	1.0479	0.2134	0.1717	0.1628	0.3499	
STANDARDIZED MEAN ABS DIF	0.5277	0.0811	0.0604	0.0726	0.1876	
CHI SQUARE	11.9579	1.2116	1.0658	0.7959	0.4378	
THEIL'S INEQUALITY INDEX	0.2789	0.1374	0.1262	0.0960	0.1111	
Um, bias	0.4353	0.1957	0.1189	0.0014	0.1926	
Us, variance	0.4110	0.3287	0.3097	0.0018	0.0105	
Uc, coveriance	0.1537	0.4756	0.5714	0.9968	0.7969	
U sum = 1.00	1.00	1.00	1.00	1.00	1.00	

AG16MI EMPLOYMENT STAT ANALYSIS: TYPE I EMPLOYMENT MULTIPLIERS

	SDPMI	FLRMI	ALTFLM	BSTMI	REMIMI	UNCMI
SQUARE ERROR	15.9485	1.8566	1.4649	0.0479	0.4691	
MEAN SQUARE ERROR	0.9968	0.1160	0.0916	0.0030	0.0293	
ROOT MEAN SQUARE ERROR	0.9984	0.3406	0.3026	0.0547	0.1712	
CORRELATION COEFFICIENT	0.9941	0.9791	0.9773	0.9983	0.9924	
MEAN	1.9482	1.2990	1.3406	1.4336	1.5431	1.4012
STANDARD DEVIATION	1.5318	0.3977	0.4320	0.7181	0.7404	0.7042
ROOT MEAN SQUARED	2.4783	1.3586	1.4085	1.6034	1.7115	1.5682
MEAN ABSOLUTE DIFFERENCE	0.5469	0.1167	0.0962	0.0338	0.1418	
STANDARDIZED MEAN ABS DIF	0.3003	0.0466	0.0379	0.0246	0.1049	
CHI SQUARE	5.2636	0.4839	0.3882	0.0359	0.3383	
THEIL'S INEQUALITY INDEX	0.2467	0.1164	0.1017	0.0173	0.0522	
Um, bias	0.3001	0.0900	0.0402	0.3497	0.6860	
Us, variance	0.6872	0.8092	0.8088	0.0649	0.0448	
Uc, coveriance	0.0127	0.1008	0.1510	0.5854	0.2692	
U sum = 1.00	1.00	1.00	1.00	1.00	1.00	

TYPE III EMPLOYMENT MULTIPLIERS

	SDPMI	FLRMI	ALTFLM	BSTMI	REMIMI	UNCMI
SQUARE ERROR	45.9476	3.2167	2.4717	0.0817	1.4883	
MEAN SQUARE ERROR	2.8717	0.2010	0.1545	0.0051	0.0930	
ROOT MEAN SQUARE ERROR	1.6946	0.4484	0.3930	0.0715	0.3050	
CORRELATION COEFFICIENT	0.9941	0.9791	0.9773	0.9983	0.9924	
MEAN	2.7955	1.5772	1.6375	1.7897	2.0137	1.7450
STANDARD DEVIATION	2.1980	0.4829	0.5277	0.8965	0.9662	0.8769
ROOT MEAN SQUARED	3.5562	1.6495	1.7204	2.0016	2.2335	1.9529
MEAN ABSOLUTE DIFFERENCE	1.0505	0.1814	0.1354	0.0458	0.2687	
STANDARDIZED MEAN ABS DIF	0.4983	0.0673	0.0454	0.0266	0.1579	
CHI SQUARE	13.1749	0.6897	0.5206	0.0483	0.8107	
THEIL'S INEQUALITY INDEX	0.3076	0.1265	0.1070	0.0181	0.0729	
Um, bias	0.3843	0.1399	0.0748	0.3912	0.7764	
Us, variance	0.6078	0.7721	0.7892	0.0749	0.0858	
Uc, coveriance	0.0079	0.0879	0.1361	0.5338	0.1378	
U sum = 1.00	1.00	1.00	1.00	1.00	1.00	

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