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DEVELOPMENT AND APPLICATION OF AN INPUT-OUTPUT SIMULATION MODEL FOR FOREST INDUSTRY DEVELOPMENT IN NORTHEASTERN MINNESOTA

by

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The purpose of this work is to: 1) summarize the results of a preliminary simulation project conducted at the University of Minnesota, Duluth which employed a large scale, input-output based, computerized model to project the effects of assumed levels of production in the wood products industry in Minnesota (including particleboard) to the year 2000, and 2) present a detailed description of the model itself.

The simulation model (named SIMLAB) used for this project was developed at the University of Minnesota, St. Paul campus, primarily by Wilbur Maki, Professor of Agriculture and Applied Economics. Professor Maki, et. al., have completed a series of reports based on SIMLAB which simulate developments in various industrial sectors in Minnesota into the future [3], [4], and [6].

Other works have also employed the Maki model as it gains increasing familiarity and acceptance in the field. Erkkila, Rose, and Lundgren used the model to project the impact of expanded timber-based industry activity in northeast Minnesota [2]. Their results showed that increased activity could be supported by the Arrowhead regional economy, which served to demonstrate one of SIMLAB's uses.

The model has frequently been used in analyzing industries in the Arrowhead region and Minnesota. However, this paper is the first to employ it in the study of the wood products industry. First, problems encountered in procuring data will be discussed, followed by a general background of the wood products and particleboard industry. Second, the structure and features of SIMLAB will be presented. Third, the results of the simulation and the implications to be drawn from them will be discussed. Finally, future research plans for the Minnesota particleboard industry will be discussed.

DATA PROBLEMS

It should be explained that interpretable information on the wood products and particleboard industries are extremely difficult to find. The first problem is in the compilation of statistics under the categories of particleboard and structural building panels. Waferboard is a type of particleboard and is a structural building

panel. Much particleboard is not structural. Statistics on particleboard don't generally break out the waferboard element. Likewise, statistics on structural building panels generally don't distinguish among plywood, waferboard and other types of building panels.

Even using the Standard Industrial Classification Code (SIC) doesn't add clarification because different compilers of statistics have different interpretations. One source places waferboard under SIC 2499, along with lathes, railroad ties, and redwood planters, while particleboard is listed under SIC 2492.

Interpretation of trends in the waferboard industry disclose further problems. Different sources use different categories of end use of particleboard and different time frames for estimates. Couple these problems with different measurement bases of consumption, and it is nearly impossible to trace a prior year's estimates from one source to current year's actual figures from another.

In addition, the SIMLAB system lumps particleboard and waferboard into the SIC 2499 classification. Thus, this paper will be aggregating the estimates for these industries with several other industries that are related only by their inclusion in a "miscellaneous" classification. That is why the results of this analysis are to be taken as preliminary. However, the exercise does point to the procedures for simulating waferboard and particleboard activity and provides a starting place for more complete analysis at a later time. The final section of this paper will deal with current plans for future research on this growing Minnesota industry.

GENERAL BACKGROUND OF THE PARTICLEBOARD INDUSTRY

Particleboard is a relative newcomer to the forest products industry. Although it was patented in 1905, it was not until 1945 that the first particleboard was produced commercially in the United States. Initially, particleboard was used in large quantities for core material in furniture. In 1975, this industrial use was still providing most of the market for particleboard. However, with the addition of structural composite panels, housing and construction have become the fastest growing market.

One reason for increased interest in particleboard is its price compared to that of plywood. This is determined in part by cost of raw material, labor and overhead. At increasing capacities, particleboard has an advantage over plywood of reduced labor and capital cost. However, economies of scale can only be obtained to a certain point. Then, other costs make an impact — raw materials and transportation. These are the major concerns of the particleboard industry today.

Wood furnished in the West and South is heavily dependent on sawmill residues and planer shavings. Initially, this was an advantage; there was plenty to go around. However, new sawmill technology, the energy crisis, and the paper industry have made the material a problem to procure.

Transportation is another concern. Most of the particleboard industry is located in a few geographical regions due to the availability of large quantities of raw material at affordable prices. But what about distance from intended market? The productive capacity is located principally in the West and South. Economies of scale in Minnesota could easily be offset by transportation.

Fortunately, there is at least a partial solution. A new interest has been taken in waferboard. Historically, U.S. production of particleboard was spurred by a need for utilization of wood wastes, while in Europe, production was based on roundwood. While most of the particleboard plants in the U.S. use wood waste as finish, some plants, particularly in the North and Northeast, have recently been built which depend to a great extent on roundwood sources. Such is the case in Minnesota.

Waferboard has a lot of potential in Minnesota. The state has an abundance of roundwood (particularly aspen) which needs to be harvested. It is also close to large markets in the Midwestern United States, making the transportation cost factor less of a problem.

Because of the rapid growth of this industry and the difficulty of isolating data on waferboard, the impact of the industry on Minnesota is uncertain. As the waferboard

industry grows, and data become more available and interpretable, SIMLAB should prove to be a valuable tool in providing insights on the developments in the industry and their implications in terms of the Minnesota economy, and northeast Minnesota.

THE SIMLAB SYSTEM

The most complete guide to the structure and use of SIMLAB is contained in USER'S GUIDE TO THE MINNESOTA REGIONAL DEVELOPMENT SIMULATION LABORATORY, by Wilbur R. Maki and others [5]. This guide is not current in terms of the updated version of SIMLAB (updated from a base year 1970 to a base year 1977) or for the changes in SIMLAB as it now relates to northeast Minnesota. A more current guide is planned for publication during late 1982 or the early 1983.

The description of the SIMLAB system here will rely heavily on the older version of the USER'S MANUAL. However, any changes in the model that are particularly relevant to this work will be incorporated into this description.

SIMLAB is a user interactive computer based simulation model. Since the first operational system was developed by Wilbur Maki and others for the state of Minnesota in 1970, it has been expanded to include additional industries, additional modules and to relate to additional planning regions in the state. SIMLAB is now available for the state as a whole and for the Headwaters and Arrowhead planning regions.

SIMLAB is a series of modules. Each module is interactive with the others in the system. In other words, the output of one module becomes input to other modules in the system. The production module is central to the system. It links the regional or state economy to the rest of the nation. This module's core is made up of a regional input-output system reduced from a larger set of tables comprising a 214 sector two region system constructed from secondary information. The elements of input-output are reviewed in Appendix I of this report. The production module for northeast Minnesota is composed of seventy-five sectors, all classified in terms of SIC definitions.

Seven other modules interact with the production module to make up the system.

The market module links the region's economic activity to the rest of the nation's. This is accomplished through regional market share ratios, which are ratios of regional export activity to total activity in the rest of the country. The market module drives the system by predicting regional activity from assumed national growth rates in specified industrial groupings.

The investment module links private spending for plant and equipment to the gross output of capital producing industries in the region. Thus, investment in the region is related to the output estimates obtained from the interaction between the market and the production modules.

The demand module links final users of goods and services in the region with the gross output of the region's industrial sectors. The link is also carried out through the region's imports from the rest of the nation.

The employment module links gross output levels to regional employment by industry and by skill category. This is accomplished through a series of output employment ratios of the type commonly used in input-output analysis.

The value added module links gross output with depreciation, business taxes and profits in the region. This is consistent with the definitions used in the construction of the national input-output system.

The labor force module contains information related to the supply of labor in the region. Variables in this module include such things as labor force participation rates and the age and sex composition of the regional population.

The population module includes standard demographic measures such as birth rates, death rates and computed rates of migration. The migration computation is related to the employment and labor force modules. Out of these two modules, levels and rates of change in levels of unemployment are computed based on the projected changes in gross output from the market and production modules. Increasing

unemployment leads to out-commuting at first, and later to out-migration of population. Decreasing rates of unemployment have the opposite effect.

It is probably worth mentioning at this point that an additional module is currently being developed for the SIMLAB system. There will soon be a household module linking population, income and output levels to the demand for housing units in the region. This module will eventually feed back into the rest of the system through the construction industry in the input-output system and, perhaps eventually, to the wood products industry as it, in turn, relates to the construction sector. Other modules are also being discussed as new research needs are perceived by private and governmental planning agencies.

Although the use of econometric forecasting techniques for projecting national or regional output levels is compatable with the SIMLAB system, it should be pointed out that SIMLAB itself is not based on inferential techniques and is not, therefore, capable of being evaluated in terms of confidence intervals and probability theory. Rather, the accuracy of the results is evaluated in terms of consistency between module outputs.

For example, if a projected level of gross output is of such a high level that the capital stock of the region is incapable of accommodating such an increase, the SIMLAB system will show the region importing its additional production needs from the rest of the nation. This means that the SIMLAB system will flag impossible production levels for the user by indicating insufficient capacity.

Similarly, if production is shown to be increasing at a faster rate than would be warranted by current population, labor force and labor productivity measures, in-migration will be shown to occur, warning the user of potential inconsistencies in projected results. The system is, first and foremost, a simulation system. Its only requirement in terms of accuracy is that the user be able to logically explain the

results. This logical explanation must relate to the outputs of all of the modules in the system, thus, the requirment of consistency in explained outcomes.

The SIMLAB system has one other feature of some interest. It is interactive with the user. Once the system is accessed, the user works with the system through a series of questions and user responses. The system can print out on remote terminal paper, or it can be forwarded to high speed printers with additional, relatively simple computer commands. As such, "It extends the use of available information on regional economic conditions to a much wider range of user clientele than simply the technicians and analysts working on environmental and economic impact studies." [5]. The model being used here was constructed under a series of cooperative agreements between the University of Minnesota and the U. S. Forest Service. It is anticipated that Forest Service personnel will be able to access and use SIMLAB for a variety of studies and data analysis as early as the summer of this year.

THE CONCEPT OF THE BASELINE AND BASELINE RUNS

The first step in using the SIMLAB model is to run a baseline projection series. This series includes several identified rates of growth for seventy-five industrial sectors at the national level, along with levels of labor productivity, levels of local investment (both capacity increasing investment and pollution abatement investment), labor force participation rates, and other parameters reflecting economic and demographic behavior for the region.

These parameters of the system are used to calculate variable values in a series of eight tables that can be accessed through the SIMLAB system. The titles of the eight tables are summarized in Table 1. The titles reflect the information contained in each of these tables. The user may access one or all of the tables through the process of answering questions through the user interactive program.

This paper will emphasize the information contained in the first and the sixth table of this series. The first table, titled Export Market Indicators of Specified

Table 1: DATA BASE TABLES IN SIMLAB

Table Number	Table Titles
1	Export Market Indicators of Specified Industries
2	Intermediate and Local Final Demand Indicators of Specified Industries
3	Investment and Capital Stock Indicators of Specified Industries
4	Intermediate Purchasers, Imports, and Value Added Indicators of Specified Industries
5	Output, Earnings, and Employee Compensation Per Worker For Specified Industries
6	Total Employment in Specified Industries, By Occupation
7	Total Population and Labor Force Indicators of Specified Sex and Age Class
8	Productivity Indicators of Specified Industries

Industries, reflects the link between industries in the region being studied and the rest of the nation. It should be emphasized at this point that the rest of the nation does exclude all activity in the region being studied with the exception of the region's exports. In other words, the region's exports appear as a part of the output of the rest of the nation. The result is as follows: when the output of the nation increases, the region's output, in the form of exports, is assumed to increase at the same level. This increase, of course, will also be reflected in increased local employment, investment, etc., that appear in the remaining tables.

The Export Market Indicators that appear in the first year for the simulation (the base year of the program) appear in Table 2. In that table, the gross output for the United States and the region appear in the first two columns. The gross output, in the parlence of interindustry analysis, represents the sales by industries to one another plus sales to final demand (household consumption, various types of investment, various levels of government spending and net exports). This bit of explanation is required to point out that the gross output will be larger than the more familiar measures of gross national or gross regional product due to the fact that double counting takes place. The value of output of firms selling intermediate and semifinished products is added to the value of final outputs.

In addition to gross outputs, the indicators table includes the level of regional exports and the percent those exports represent of national output. This percentage figure is not the percentage of national output that is represented by total regional output, but rather, the percent of U.S. output that is made up by the region's exports.

The annual change column of this table will have zeros in the base year. This calculated value only begins to take on meaning as several years are included in the simulation.

All of these export and percentage figures are included under two supercategories, "Actual" and "Potential" market shares. The actual market share, as

TABLE 2. EXPORT MARKET INDICATORS OF SPECIFIED INDUSTRIES
ARROWHEAD , 1977

NO.	INDUSTRY TITLE	GROSS OUTPUT		ACTUAL MARKET SHARE			POTENTIAL MARKET SHARE	
		UNITED STATES	TOTAL REGION	REGIONAL EXPORT	PERCENT OF U.S. GROSS OUTPUT	ANNUAL CHANGE	IMPORTS	PERCENT OF OF U.S. GROSS OUTPUT
		(THOU)	(HUND)	(HUND)	(PERCENT)	(PERCENT)	(HUND)	(PERCENT)
1	DAIRY & PO	208347.	214750.	2010.	.0010	0.0000	0.	0.0000
2	MEAT AN. &	403814.	188030.	4440.	.0011	0.0000	0.	0.0000
3	FOOD, FEED	295462.	56070.	34310.	.0116	0.0000	0.	0.0000
4	OTHER CROP	344825.	37490.	10520.	.0031	0.0000	0.	0.0000
5	FOREST., F	40781.	28970.	-9020.	-.0221	0.0000	0.	0.0000
6	AGR..FOR..	68971.	44960.	-16120.	-.0234	0.0000	20306.	.0294
7	IRON & FER	19327.	8186570.	8005600.	41.4218	0.0000	8059222.	41.6993
8	NONFERROUS	26000.	0.	0.	0.0000	0.0000	13733.	.0536
9	COAL & PEA	164709.	0.	0.	0.0000	0.0000	0.	0.0000
10	OIL & NAT.	479923.	0.	0.	0.0000	0.0000	0.	0.0000
11	STONE,CLAY	43019.	47350.	2830.	.0066	0.0000	0.	0.0000
12	OTHER MINI	24511.	0.	0.	0.0000	0.0000	0.	0.0000
13	NEW CONSTR	1773208.	6194380.	3115990.	.1757	0.0000	2906128.	.1639
14	MAIN. & RE	516527.	928350.	0.	0.0000	0.0000	0.	0.0000
15	ORDNANCE	129509.	0.	0.	0.0000	0.0000	0.	0.0000
16	MEAT PRODU	534932.	2174360.	929730.	.1738	0.0000	1024726.	.1916
17	DAIRY PROD	341136.	1513030.	958580.	.2810	0.0000	958674.	.2810
18	CANNED,FRO	233628.	960930.	800880.	.3427	0.0000	813881.	.3484
19	GRAIN MILL	270213.	92490.	28070.	.0104	0.0000	0.	0.0000
20	BAKERY PRO	138083.	214470.	6340.	.0046	0.0000	9575.	.0069
21	ALCH. BEV.	275045.	544210.	369270.	.1343	0.0000	369220.	.1342
22	MISC. FOOD	556793.	156790.	-12000.	-.0022	0.0000	0.	0.0000
23	TEXTILE GO	386328.	75900.	37320.	.0097	0.0000	85869.	.0222
24	APPAREL, F	533133.	519790.	101320.	.0190	0.0000	189609.	.0356
25	LOGGING	125284.	771400.	302230.	.2413	0.0000	213030.	.1700
26	SAWMILLS	125015.	242490.	-15000.	-.0120	0.0000	24522.	.0196
27	OTHER WOOD	201240.	648470.	433930.	.2156	0.0000	401536.	.1995
28	FURNITURE	162266.	33450.	-1360.	-.0008	0.0000	247.	.0002
29	PULP & PAP	447600.	5127150.	4950860.	1.1061	0.0000	5013312.	1.1200
30	PAPERBOARD	139623.	85830.	-104.	-.0001	0.0000	0.	0.0000
31	PRINTING &	423628.	483120.	122120.	.0285	0.0000	136042.	.0317
32	CHEM. & AL	1374882.	679930.	229240.	.0167	0.0000	266727.	.0194
33	PETR. REF.	1036742.	2289080.	196950.	.0190	0.0000	927449.	.0895
34	RUBBER PRO	445208.	102550.	7550.	.0017	0.0000	0.	0.0000
35	LEATHER PR	73332.	1500.	-8590.	-.0117	0.0000	2775.	.0038
36	GLASS, STO	383179.	795850.	461560.	.1205	0.0000	387911.	.1012
37	PRIMARY FE	570115.	432720.	-312090.	-.0547	0.0000	122883.	.0216
38	IRON & STE	202329.	260180.	91070.	.0450	0.0000	79758.	.0394
39	PRIMARY CO	177508.	4090.	-180.	-.0001	0.0000	14423.	.0081
40	OTHER PRIM	295188.	53140.	-18900.	-.0064	0.0000	130036.	.0441
41	FABRICATED	873035.	575230.	237120.	.0272	0.0000	234192.	.0268
42	FARM MACHI	109838.	253380.	84470.	.0769	0.0000	99824.	.0909
43	MACHINE SH	93397.	37350.	13890.	.0141	0.0000	0.	0.0000
44	OTHER NON.	793280.	806090.	220010.	.0277	0.0000	121459.	.0153
45	COMP., OFF	140299.	0.	0.	0.0000	0.0000	0.	0.0000
46	SERV. IND.	109283.	30040.	840.	.0008	0.0000	0.	0.0000
47	ELECTRICAL	908580.	58030.	-133920.	-.0147	0.0000	45384.	.0050
48	MOTOR VEHI	1133338.	86010.	-39850.	-.0035	0.0000	0.	0.0000
49	OTHER TRAN	480549.	4460.	-38030.	-.0079	0.0000	42173.	.0088
50	PROF., SCI	164978.	5410.	-17670.	-.0107	0.0000	6459.	.0039
51	OPTICAL, C	120632.	43020.	1660.	.0014	0.0000	4397.	.0036
52	MISC. MFG.	185113.	235390.	23940.	.0129	0.0000	80811.	.0437
53	RAILROAD T	225700.	1367680.	875120.	.3877	0.0000	848670.	.3760
54	LOCAL TRAN	110569.	67480.	0.	0.0000	0.0000	0.	0.0000
55	TRUCK TRAN	436926.	261840.	17420.	.0040	0.0000	0.	0.0000
56	AIR TRANS.	254065.	81250.	600.	.0002	0.0000	0.	0.0000
57	OTHER TRAN	182408.	160850.	59370.	.0325	0.0000	0.	0.0000
58	COMMUNICAT	586..9.	645810.	87740.	.0149	0.0000	166175.	.0283
59	ELECTRIC U	664771.	1762460.	228800.	.0344	0.0000	238114.	.0358
60	GAS UTILIT	467573.	861000.	-33180.	-.0071	0.0000	0.	0.0000
61	WATER & SA	106092.	341470.	112360.	.1059	0.0000	112114.	.1057
62	WHOLESALE	1837770.	1795760.	-105240.	-.0046	0.0000	0.	0.0000
63	RETAIL TRA	1881835.	3176210.	165250.	.0088	0.0000	161273.	.0086
64	FINANCE, I	1252083.	1016570.	5260.	.0004	0.0000	0.	0.0000
65	REAL ESTAT	2650651.	3730250.	21520.	.0008	0.0000	0.	0.0000
66	HOTELS, PE	433334.	653360.	133050.	.0307	0.0000	122583.	.0307
67	BUSINESS S	1362731.	1096460.	23760.	.0015	0.0000	0.	0.0000
68	EAT.&DRINK	801791.	1274970.	133410.	.0166	0.0000	133408.	.0166
69	AUTOMOBILE	419303.	448720.	0.	0.0000	0.0000	0.	0.0000
70	MOTION PIC	257773.	159860.	8160.	.0032	0.0000	0.	0.0000
71	HEALTH SER	1049273.	1913960.	100370.	.0096	0.0000	100378.	.0096
72	EDUC., NON	517460.	556290.	12680.	.0025	0.0000	12678.	.0025
73	FED. GOV'T	210456.	227920.	-100310.	-.0477	0.0000	370.	.0002
74	STATE & LO	201942.	348500.	0.	0.0000	0.0000	0.	0.0000
75	SCRAP, USE	22588.	2778530.	-19370.	-.0867	0.0000	0.	0.0000
	TOTAL	34999320.	61051970.	22889140.	.0065	0.0000	24713083.	.0071

the name implies, represents the actual figures calculated for the years in question. Potential market share represents the difference between actual market share and the potential created by existing capacity plus capacity increasing investment. A zero appears in that particular column when the industry is operating at or near capacity.

Table 3 is actually taken from the sixth title in the series appearing in Table 1. This is the unemployment and employment information for the seventy-five sector grouping for the region being analyzed. The employment information is given both as a total and by occupation classification for each of the seventy-five industries.

Tables 2 and 3 reflect the base information in the system for export market indicators and unemployment and employment. As was mentioned earlier, several rates are also included in the system reflecting the parameters to the system. One series of such rates are a matrix of growth rates, on a national level, for the seventy-five sectors. All of the parameter information in the SIMLAB system for northeast Minnesota were collected from secondary data sources. This does not preclude the inclusion of primary data in the future, as warranted.

The national growth rates were obtained from two sources out of the Department of Labor [1], [2]. The initial growth rates are shown in Table 4. It must be emphasized that these are parameters to the system and not calculated values. The calculated values appear in future versions of the eight tables and are calculated on the basis of these assumed parameter values. This is, after all, a simulation model, which means the calculated values are only as accurate as the assumed parameters and relationships imply.

Tables 5 and 6 present the format of the two tables discussed earlier for the year 2000. The user has the ability to obtain these values for that specific year, or for any individual year in between. This is shown most clearly by referring to Table 7, which summarizes the industrial totals over several years in terms of U.S. gross output, regional gross output and regional total employment.

Looking at these series of tables once again, and emphasizing the twenty-seventh sector, "Other Wood Products," it can be seen that the growth rates summarized in Table

TABLE 3: UNEMPLOYMENT AND EMPLOYMENT IN SPECIFIED INDUSTRIES, BY OCCUPATION
ARROWHEAD , 1977

NO.	INDUSTRY TITLE	PROFESSIONAL	MANAGERIAL	SALES WORKER	CLERICAL	CRAFTS	OPERATIVES	NONFARM NONMINE SERVICE	FARM	TOTALS
		(NO.)	(NO.)	(NO.)	(NO.)	(NO.)	(NO.)	(NO.)	(NO.)	(NO.)
1	DAIRY & PO	75.	19.	21.	22.	26.	74.	183.	8.	1494.	1871.
2	MEAT AN. &	38.	10.	11.	11.	13.	38.	94.	4.	765.	958.
3	FOOD, FEED	24.	6.	7.	7.	8.	24.	59.	3.	480.	601.
4	OTHER CROP	22.	6.	6.	6.	8.	22.	54.	2.	438.	548.
5	FOREST., F	1.	0.	0.	0.	1.	2.	3.	0.	36.	43.
6	AGR.,FOR.,	6.	2.	2.	2.	2.	6.	14.	1.	120.	151.
7	IRON & FER	1264.	625.	13.	647.	4613.	4588.	0.	225.	0.	11351.
8	NONFERROUS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
9	COAL & PEA	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
10	OIL & NAT.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
11	STONE,CLAY	28.	15.	2.	35.	20.	40.	6.	5.	0.	148.
12	OTHER MINI	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
13	NEW CONSTR	333.	461.	70.	439.	3897.	675.	1645.	5636.	0.	6299.
14	MAIN. & RE	145.	72.	433.	6.	92.	229.	99.	23.	0.	1358.
15	ORDNANCE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
16	MEAT PRODU	109.	161.	42.	172.	135.	411.	61.	105.	0.	1119.
17	DAIRY PROD	40.	58.	14.	55.	58.	133.	21.	33.	0.	414.
18	CANNED,FRO	156.	255.	59.	274.	182.	574.	85.	158.	0.	1602.
19	GRAIN MILL	3.	4.	1.	5.	3.	12.	2.	3.	0.	33.
20	BAKERY PRO	29.	37.	10.	42.	33.	109.	16.	26.	0.	297.
21	ALCH. BEV.	63.	99.	24.	86.	75.	235.	35.	46.	0.	643.
22	MISC. FOOD	12.	14.	4.	16.	15.	46.	5.	8.	0.	110.
23	TEXTILE GO	20.	12.	2.	17.	22.	44.	3.	5.	0.	109.
24	APPAREL, F	474.	245.	48.	333.	477.	1209.	63.	107.	0.	2549.
25	LOGGING	25.	32.	16.	45.	70.	164.	21.	41.	0.	389.
26	SAWMILLS	14.	29.	11.	35.	53.	100.	10.	18.	0.	227.
27	OTHER WOOD	69.	140.	53.	170.	258.	482.	48.	85.	0.	1095.
28	FURNITURE	3.	3.	2.	5.	9.	14.	2.	3.	0.	40.
29	PULP & PAP	567.	257.	46.	519.	274.	384.	244.	80.	0.	2126.
30	PAPERBOARD	32.	15.	2.	22.	15.	21.	15.	5.	0.	119.
31	PRINTING &	104.	76.	63.	239.	703.	223.	64.	76.	0.	1517.
32	CHEM. & AL	83.	43.	10.	82.	28.	47.	38.	7.	0.	335.
33	PETR. REF.	88.	44.	12.	76.	57.	75.	22.	14.	0.	389.
34	RUBBER PRO	31.	4.	2.	11.	24.	58.	7.	6.	0.	171.
35	LEATHER PR	1.	0.	0.	1.	1.	2.	0.	0.	0.	5.
36	GLASS, STO	93.	48.	14.	85.	89.	176.	24.	31.	0.	523.
37	PRIMARY FE	2.	9.	2.	13.	82.	64.	24.	9.	0.	197.
38	IRON & STE	0.	3.	0.	3.	24.	19.	7.	2.	0.	57.
39	PRIMARY CO	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
40	OTHER PRIM	1.	4.	1.	5.	35.	26.	10.	3.	0.	84.
41	FABRICATED	33.	21.	11.	40.	118.	210.	18.	16.	0.	470.
42	FARM MACHI	69.	16.	2.	22.	37.	50.	2.	7.	0.	207.
43	MACHINE SH	16.	4.	1.	5.	8.	11.	0.	2.	0.	47.
44	OTHER NON.	184.	49.	6.	56.	95.	124.	5.	18.	0.	530.
45	COMP., OFF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
46	SERV. IND.	11.	3.	0.	3.	6.	7.	0.	1.	0.	32.
47	ELECTRICAL	12.	5.	1.	6.	7.	14.	0.	1.	0.	46.
48	MOTOR VEHI	11.	4.	1.	5.	7.	23.	2.	3.	0.	60.
49	OTHER TRAN	1.	0.	0.	1.	1.	3.	0.	0.	0.	7.
50	PROF., SCI	1.	0.	0.	0.	1.	2.	0.	0.	0.	5.
51	OPTICAL, O	9.	4.	1.	4.	8.	19.	1.	2.	0.	51.
52	MISC. MFG.	55.	24.	5.	36.	55.	127.	7.	15.	0.	305.
53	RAILROAD T	292.	386.	10.	1515.	725.	474.	134.	86.	0.	3268.
54	LOCAL TRAN	14.	52.	3.	27.	44.	55.	3.	31.	0.	221.
55	TRUCK TRAN	25.	67.	9.	146.	89.	446.	66.	13.	0.	794.
56	AIR TRANS.	9.	22.	2.	10.	27.	34.	2.	14.	0.	127.
57	OTHER TRAN	32.	130.	8.	69.	139.	134.	5.	62.	0.	514.
58	COMMUNICAT	231.	144.	34.	895.	390.	23.	3.	11.	0.	1644.
59	ELECTRIC U	134.	107.	12.	177.	466.	135.	50.	28.	0.	1114.
60	GAS UTILIT	41.	32.	8.	66.	126.	43.	33.	4.	0.	353.
61	WATER & SA	5.	10.	0.	7.	31.	37.	81.	1.	0.	162.
62	WHOLESALE	580.	1183.	802.	1315.	589.	1009.	250.	155.	0.	5397.
63	RETAIL TRA	1066.	3126.	4258.	4541.	2521.	2858.	1172.	6273.	0.	25189.
64	FINANCE, I	274.	583.	453.	1261.	37.	10.	12.	100.	0.	2426.
65	REAL ESTAT	120.	264.	212.	514.	20.	5.	6.	58.	0.	1062.
66	HOTELS, PE	300.	293.	63.	661.	272.	704.	24.	1877.	0.	4411.
67	BUSINESS S	1195.	179.	67.	767.	157.	278.	25.	236.	0.	2784.
68	EAT.&DRINK	244.	789.	1087.	1247.	598.	735.	329.	1371.	0.	5763.
69	AUTOMOBILE	439.	62.	6.	204.	92.	43.	27.	230.	0.	1038.
70	MOTION PIC	225.	35.	4.	133.	45.	32.	13.	135.	0.	623.
71	HEALTH SER	4311.	388.	28.	313.	112.	131.	19.	1076.	0.	9130.
72	EDUC., NON	1637.	136.	13.	525.	62.	59.	10.	916.	0.	3475.
73	FED. GOV'T	160.	97.	1.	342.	80.	29.	47.	19.	0.	799.
74	STATE & LO	147.	133.	2.	166.	54.	24.	43.	190.	0.	853.
75	SCRAP, USE	11665.	2000.	26.	6807.	727.	390.	364.	4001.	0.	25990.
	TOTAL	27979.	13182.	8144.	25397.	18581.	18409.	5733.	23739.	3333.	144296.
	UNEMPLOYMENT	5730.	2748.	1698.	5295.	3874.	3840.	1195.	4949.	695.	30083.

Table 4: Growth Rates Currently In SIMLAB

	Industry	1977-80	1980-85	1985-90	1990-2000	2000-05
1	DAIRY & PO	-.07215	.01000	.01000	.01000	.01000
2	MEAT AN. &	.00668	.01000	.01000	.01000	.01000
3	FOOD, FEED	.00655	.01610	.01610	.01610	.01610
4	OTHER CROP	.00646	.01610	.01610	.01610	.01610
5	FOREST., F	.10788	.03860	.00220	.02030	.02040
6	AGR.,FOR.,	.10801	.03860	.00220	.02030	.02040
7	IRON & FER	0.00000	.01600	.01600	.01600	.01600
8	NONFERROUS	.05282	.04426	.04426	.04426	.04426
9	COAL & PEA	.06398	.03040	.03040	.03040	.03040
10	OIL & NAT.	.01555	.03040	.03040	.03040	.03040
11	STONE,CLAY	.04993	.03040	.03040	.03040	.03040
12	OTHER MINI	.04979	.03040	.03040	.03040	.03040
13	NEW CONSTR	.01514	.03070	.03100	.03130	.03170
14	MAIN. & RE	.02613	.03070	.03100	.03130	.03170
15	ORDNANCE	.09058	.03600	.03600	.03600	.03600
16	MEAT PRODU	.01913	.02020	.02020	.02020	.02020
17	DAIRY PROD	.02897	.02020	.02020	.02020	.02020
18	CANNED,FRO	.01680	.02020	.02020	.02020	.02020
19	GRAIN MILL	.01300	.02020	.02020	.02020	.02020
20	BAKERY PRO	.02030	.02020	.02020	.02020	.02020
21	ALCH. BEV.	.05752	.02020	.02020	.02020	.02020
22	MISC. FOOD	.02101	.02244	.02244	.02244	.02244
23	TEXTILE GO	.04624	.02900	.02900	.02900	.02900
24	APPAREL, F	-.00838	.02900	.02900	.02900	.02900
25	LOGGING	.02149	.01920	.01920	.01920	.01920
26	SAWMILLS	.02158	.01944	.01945	.01945	.01945
27	OTHER WOOD	.02346	.02055	.02061	.02061	.02061
28	FURNITURE	.05791	.02140	.02150	.02150	.02150
29	PULP & PAP	.04536	.03130	.03130	.03130	.03130
30	PAPERBOARD	.05374	.03130	.03130	.03130	.03130
31	PRINTING &	.03475	.02840	.02850	.02850	.02850
32	CHEM. & AL	.04825	.04380	.04390	.04400	.04410
33	PETR. REF.	.00350	.01610	.01610	.01610	.01610
34	RUBBER PRO	.07267	.01600	.01600	.01600	.01600
35	LEATHER PR	-.01186	.01600	.01600	.01600	.01600
36	GLASS, STO	.05279	.03040	.03040	.03040	.03040
37	PRIMARY FE	.05938	.02020	.02020	.02020	.02020
38	IRON & STE	-.01230	.02020	.02020	.02020	.02020
39	PRIMARY CO	.08519	.02730	.02730	.02730	.02730
40	OTHER PRIM	.04304	.04340	.04370	.04410	.04440
41	FABRICATED	.05854	.03380	.03200	.02990	.03400
42	FARM MACHI	.04865	.05400	.05400	.05400	.05400
43	MACHINE SH	.07138	.05400	.05400	.05400	.05400
44	OTHER NON.	.06603	.05400	.05400	.05400	.05400
45	COMP., OFF	.07147	.05400	.05400	.05400	.05400
46	SERV. IND.	.07138	.05400	.05400	.05400	.05400
47	ELECTRICAL	.09137	.04450	.04450	.04450	.04450
48	MOTOR VEHI	-.00342	.02600	.02600	.02600	.02600
49	OTHER TRAN	.14670	.03514	.03514	.03514	.03514
50	PROF., SCI	.07200	.05500	.05500	.05500	.05500
51	OPTICAL, O	.04026	.05500	.05500	.05500	.05500
52	MISC. MFG.	.01676	.03600	.03600	.03600	.03600
53	RAILROAD T	.04734	.01210	.01210	.01210	.01210
54	LOCAL TRAN	-.00070	.00600	.00600	.00600	.00600
55	TRUCK TRAN	.05112	.03040	.03040	.03040	.03040
56	AIR TRANS.	.06953	.07340	.07340	.07340	.07340
57	OTHER TRAN	.01614	.01920	.01920	.01920	.01920
58	COMMUNICAT	.09290	.05260	.05310	.05350	.05380
59	ELECTRIC U	.02741	.05750	.05750	.05750	.05750
60	GAS UTILIT	.02024	.01610	.01610	.01610	.01610
61	WATER & SA	.02144	.02430	.02430	.02430	.02430
62	WHOLESALE	.03877	.03250	.03250	.03250	.03250
63	RETAIL TRA	.02889	.02730	.02730	.02730	.02730
64	FINANCE, I	.04611	.03970	.03970	.03970	.03970
65	REAL ESTAT	.05035	.03250	.03250	.03250	.03250
66	HOTELS, PE	.00680	.02390	.02400	.02410	.02420
67	BUSINESS S	.06288	.03250	.03250	.03250	.03250
68	EAT.&DRINK	.02168	.02730	.02730	.02730	.02730
69	AUTOMOBILE	.06696	.02730	.02730	.02730	.02730
70	MOTION PIC	.02805	.03450	.03450	.03450	.03450
71	HEALTH SER	.03762	0.00000	0.00000	0.00000	0.00000
72	EDUC., NON	.01697	0.00000	0.00000	0.00000	0.00000
73	FED. GOV'T	.00733	0.00000	0.00000	0.00000	0.00000
74	STATE & LO	.00644	0.00000	0.00000	0.00000	0.00000
75	SCRAP, USE	.00700	0.00000	0.00000	0.00000	0.00000

NO.	INDUSTRY TITLE	GROSS OUTPUT UNITED STATES	GROSS OUTPUT TOTAL REGION	ACTUAL MARKET SHARE REGIONAL EXPORT	ACTUAL MARKET SHARE PERCENT OF U.S. GROSS OUTPUT	ACTUAL MARKET SHARE ANNUAL CHANGE	POTENTIAL MARKET SHARE EXPORTS	POTENTIAL MARKET SHARE PERCENT OF OF U.S. GROSS OUTPUT
		(THOU)	(HUND)	(HUND)	(PERCENT)	(PERCENT)	(HUND)	(PERCENT)
1	DAIRY & PO	221050.	258764.	-28.	-.0000	-.2222	0.	0.0000
2	MEAT AN. &	504326.	252673.	-482.	-.0001	-.0646	0.	0.0000
3	FOOD, FEED	418635.	26120.	0.	0.0000	0.0000	0.	0.0000
4	OTHER CROP	488491.	27224.	0.	0.0000	0.0000	0.	0.0000
5	FOREST., F	76334.	36833.	-29.	-.0000	-.0064	0.	0.0000
6	AGR.,FOR.,	129130.	106279.	37908.	.0294	.0002	38017.	.0294
7	IRON & FER	26973.	11385345.	11070612.	41.0430	-.0000	11247629.	41.6993
8	NONFERROUS	71564.	2149841.	1975448.	2.7604	.0183	2474227.	3.4573
9	COAL & PEA	349711.	-29.	-10914.	-.0031	-.0017	0.	0.0000
10	OIL & NAT.	928313.	0.	0.	0.0000	0.0000	0.	0.0000
11	STONE.CLAY	88941.	14614.	-41402.	-.0466	.0010	0.	0.0000
12	OTHER MINI	50443.	0.	0.	0.0000	0.0000	0.	0.0000
13	NEW CONSTR	3483490.	8137340.	5513160.	.1583	-.0003	5709126.	.1639
14	MAIN. & RE	1036814.	1061453.	-777.	-.0001	-.0159	0.	0.0000
15	ORDNANCE	323720.	0.	-1104.	-.0003	-.0054	0.	0.0000
16	MEAT PRODU	845546.	3066753.	1607759.	.1901	.0004	1619784.	.1916
17	DAIRY PROD	549700.	1810778.	1222631.	.2224	-.0008	1225966.	.2230
18	CANNED,FRO	367610.	1167063.	1010579.	.2749	-.0009	1016326.	.2765
19	GRAIN MILL	422003.	71416.	0.	0.0000	0.0000	0.	0.0000
20	BAKERY PRO	218769.	211460.	12039.	.0055	-.0010	12039.	.0055
21	ALCH. BEV.	468135.	786252.	622124.	.1329	.0003	628424.	.1342
22	MISC. FOOD	925008.	145255.	0.	0.0000	0.0000	0.	0.0000
23	TEXTILE GO	770801.	677.	-39388.	-.0051	-.0025	85030.	.0110
24	APPAREL, F	955540.	553863.	168644.	.0177	-.0030	168644.	.0177
25	LOGGING	194899.	708568.	331403.	.1700	0.0000	331403.	.1700
26	SAWMILLS	193306.	309115.	34895.	.0178	-.0012	35589.	.0182
27	OTHER WOOD	323450.	684145.	419014.	.1295	-.0019	420723.	.1301
28	FURNITURE	283739.	65091.	214.	.0001	-.0030	214.	.0001
29	PULP & PAP	934343.	3336169.	3216503.	.3443	-.0051	3216503.	.3443
30	PAPERBOARD	296148.	106760.	-128.	-.0000	.0007	0.	0.0000
31	PRINTING &	827611.	34866.	-209856.	-.0254	-.0101	262675.	.0317
32	CHEM. & AL	3728446.	1298297.	705038.	.0189	-.0001	723319.	.0194
33	PETR. REF.	1460067.	3640599.	1300242.	.0891	.0001	1306146.	.0895
34	RUBBER PRO	714925.	122032.	-722.	-.0001	.0628	0.	0.0000
35	LEATHER PR	100203.	122.	-9464.	-.0094	-.0030	33862.	.0338
36	GLASS, STO	796536.	1230709.	785415.	.0986	.0001	806374.	.1012
37	PRIMARY FE	973769.	1649041.	192526.	.0198	-.0030	209886.	.0216
38	IRON & STE	300399.	431870.	110744.	.0369	-.0021	118417.	.0394
39	PRIMARY CO	368023.	86708.	29074.	.0079	.0007	29902.	.0081
40	OTHER PRIM	792036.	553503.	268138.	.0339	-.0010	276898.	.0350
41	FABRICATED	1914811.	1047527.	496308.	.0259	-.0012	513648.	.0268
42	FARM MACHI	364473.	433325.	195339.	.0536	-.0083	208136.	.0571
43	MACHINE SH	340817.	34594.	0.	0.0000	0.0000	0.	0.0000
44	OTHER NON.	2720288.	1551002.	242383.	.0089	-.0096	261709.	.0096
45	COMP., OFF	486038.	0.	-166706.	-.0343	.0006	0.	0.0000
46	SERV. IND.	378525.	74521.	0.	0.0000	0.0000	0.	0.0000
47	ELECTRICAL	2700104.	823732.	32498.	.0012	-.0042	32498.	.0012
48	MOTOR VEHI	1929978.	269481.	0.	0.0000	0.0000	0.	0.0000
49	OTHER TRAN	1303118.	221322.	82051.	.0063	-.0049	85100.	.0065
50	PROF., SCI	583397.	89409.	22848.	.0039	0.0000	22848.	.0039
51	OPTICAL, O	401838.	81847.	14647.	.0036	0.0000	14647.	.0036
52	MISC. MFG.	402189.	376343.	174930.	.0435	-.0001	175376.	.0437
53	RAILROAD T	318715.	1776698.	1190071.	.3734	-.0000	1198422.	.3760
54	LOCAL TRAN	125193.	67600.	0.	0.0000	0.0000	0.	0.0000
55	TRUCK TRAN	905396.	3084.	-260305.	-.0288	-.0026	0.	0.0000
56	AIR TRANS.	1286244.	84410.	0.	0.0000	0.0000	0.	0.0000
57	OTHER TRAN	280803.	39691.	-55679.	-.0198	.0026	0.	0.0000
58	COMMUNICAT	2089405.	1095744.	586138.	.0281	.0003	590361.	.0283
59	ELECTRIC U	2270113.	2619127.	789220.	.0348	.0003	813132.	.0358
60	GAS UTILIT	680649.	1121792.	-1803.	-.0003	-.0073	0.	0.0000
61	WATER & SA	183265.	306832.	59027.	.0322	-.1070	193667.	.1057
62	WHOLESALE	3353649.	2132871.	0.	0.0000	0.0000	0.	0.0000
63	RETAIL TRA	3507202.	3325473.	593195.	.0169	.0030	593195.	.0169
64	FINANCE, I	3103506.	1001217.	0.	0.0000	0.0000	0.	0.0000
65	REAL ESTAT	3724162.	3774447.	0.	0.0000	0.0000	0.	0.0000
66	HOTELS, PE	723669.	723026.	221913.	.0307	0.0000	221913.	.0307
67	BUSINESS S	3455757.	275049.	-893212.	-.0258	.0256	0.	0.0000
68	EAT.&DRINK	1473427.	1579266.	483851.	.0328	.0030	483851.	.0328
69	AUTOMOBILE	840368.	441395.	0.	0.0000	0.0000	0.	0.0000
70	MOTION PIC	555406.	36975.	-95080.	-.0171	-.0042	0.	0.0000
71	HEALTH SER	1129772.	1746334.	108633.	.0096	0.0000	108633.	.0096
72	EDUC., NON	535174.	525129.	13112.	.0025	0.0000	13112.	.0025
73	FED. GOVT	213333.	372546.	374.	.0002	.0529	374.	.0002
74	STATE & LO	204551.	385843.	-769.	-.0004	-.0776	0.	0.0000
75	SCRAP, USE	22388.	2542400.	0.	0.0000	0.0000	0.	0.0000
	TOTAL	72521473.	76529439.	34152918.	.0047	0.0000	3752790.	.0052

TABLE 6. UNEMPLOYMENT AND EMPLOYMENT IN SPECIFIED INDUSTRIES, BY OCCUPATION
ARROWHEAD , 2000

NO.	INDUSTRY TITLE	PROFESSIONAL	MANAGERIAL	SALES WORKER	CLERICAL	CRAFTS	OPERATIVES	NONFARM NONMINE SERVICE	FARM	TOTALS
		(NO.)	(NO.)	(NO.)	(NO.)	(NO.)	(NO.)	(NO.)	(NO.)	(NO.)
1	DAIRY & PO	37.	10.	10.	11.	13.	37.	92.	4.	749.	964.
2	MEAT AN. &	21.	6.	6.	6.	7.	21.	32.	2.	428.	550.
3	FOOD, FEED	5.	1.	1.	1.	2.	4.	11.	0.	90.	116.
4	OTHER CROP	6.	2.	2.	2.	2.	6.	16.	1.	128.	165.
5	FOREST., F	1.	0.	0.	0.	1.	2.	3.	0.	43.	52.
6	AGR.,FOR.,	12.	4.	4.	4.	5.	13.	32.	1.	266.	341.
7	IRON & FER	729.	360.	8.	373.	2314.	2645.	0.	130.	0.	6558.
8	NONFERROUS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
9	COAL & PEA	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
10	OIL & NAT.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
11	STONE,CLAY	6.	3.	0.	7.	4.	8.	1.	1.	0.	30.
12	OTHER MINI	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
13	NEW CONSTR	176.	243.	37.	232.	2059.	356.	869.	2977.	0.	6950.
14	MAIN. & RE	172.	85.	511.	7.	109.	270.	117.	33.	0.	1304.
15	ORDNANCE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
16	MEAT PRODU	100.	147.	39.	158.	124.	377.	56.	96.	0.	1096.
17	DAIRY PROD	28.	41.	11.	39.	41.	94.	14.	25.	0.	293.
18	CANNED,FRO	103.	148.	39.	181.	120.	379.	56.	104.	0.	1149.
19	GRAIN MILL	2.	2.	1.	2.	2.	5.	1.	1.	0.	16.
20	BAKERY PRO	17.	21.	6.	24.	19.	63.	9.	15.	0.	173.
21	ALCH. BEV.	52.	83.	20.	71.	63.	196.	29.	38.	0.	552.
22	MISC. FOOD	7.	8.	2.	9.	8.	26.	3.	5.	0.	68.
23	TEXTILE GO	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
24	APPAREL, F	226.	117.	23.	159.	228.	577.	30.	51.	0.	1409.
25	LOGGING	11.	14.	7.	20.	31.	73.	9.	18.	0.	185.
26	SAWMILLS	8.	17.	6.	20.	31.	58.	6.	10.	0.	156.
27	OTHER WOOD	33.	67.	26.	82.	124.	231.	23.	41.	0.	626.
28	FURNITURE	3.	4.	2.	6.	10.	16.	2.	3.	0.	46.
29	PULP & PAP	190.	86.	16.	174.	92.	129.	82.	27.	0.	795.
30	PAPERBOARD	21.	10.	1.	14.	10.	14.	10.	4.	0.	85.
31	PRINTING &	6.	4.	3.	13.	39.	12.	4.	4.	0.	85.
32	CHEM. & AL	83.	43.	10.	81.	28.	47.	38.	7.	0.	336.
33	PETR. REF.	103.	52.	14.	89.	67.	89.	25.	16.	0.	455.
34	RUBBER PRO	24.	3.	2.	8.	19.	46.	6.	5.	0.	111.
35	LEATHER PR	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
36	GLASS, STO	82.	42.	12.	75.	79.	155.	21.	28.	0.	495.
37	PRIMARY FE	4.	23.	4.	32.	198.	134.	57.	21.	0.	492.
38	IRON & STE	0.	3.	1.	4.	25.	20.	7.	2.	0.	62.
39	PRIMARY CO	0.	1.	0.	1.	6.	4.	2.	0.	0.	13.
40	OTHER PRIM	4.	21.	4.	29.	200.	147.	57.	18.	0.	481.
41	FABRICATED	43.	28.	14.	52.	135.	275.	24.	22.	0.	612.
42	FARM MACHI	73.	17.	2.	23.	39.	52.	2.	7.	0.	216.
43	MACHINE SH	9.	2.	0.	3.	5.	6.	0.	1.	0.	26.
44	OTHER NON.	220.	59.	8.	68.	114.	149.	6.	22.	0.	645.
45	COMP., OFF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
46	SERV. IND.	13.	4.	0.	4.	7.	9.	0.	1.	0.	39.
47	ELECTRICAL	86.	36.	4.	39.	52.	95.	3.	10.	0.	327.
48	MOTOR VEHI	22.	8.	2.	10.	15.	47.	3.	7.	0.	114.
49	OTHER TRAN	49.	17.	4.	28.	36.	118.	7.	13.	0.	272.
50	PROF., SCI	8.	4.	1.	4.	7.	18.	1.	2.	0.	44.
51	OPTICAL, O	10.	4.	1.	5.	8.	21.	1.	2.	0.	52.
52	MISC. MFG.	34.	15.	3.	23.	34.	79.	4.	10.	0.	202.
53	RAILROAD T	118.	156.	4.	610.	304.	191.	54.	35.	0.	1471.
54	LOCAL TRAN	8.	29.	2.	15.	25.	31.	1.	17.	0.	126.
55	TRUCK TRAN	0.	0.	0.	1.	1.	3.	0.	0.	0.	6.
56	AIR TRANS.	4.	11.	1.	5.	14.	17.	1.	7.	0.	60.
57	OTHER TRAN	5.	22.	1.	12.	23.	23.	1.	10.	0.	98.
58	COMMUNICAT	142.	81.	19.	505.	220.	13.	2.	6.	0.	988.
59	ELECTRIC U	80.	64.	7.	105.	276.	80.	29.	17.	0.	638.
60	GAS UTILIT	31.	24.	6.	50.	96.	33.	25.	3.	0.	269.
61	WATER & SA	4.	8.	0.	6.	25.	29.	64.	1.	0.	136.
62	WHOLESALE	392.	799.	541.	889.	398.	682.	169.	105.	0.	3974.
63	RETAIL TRA	610.	1790.	2438.	2600.	1443.	1636.	671.	3591.	0.	14781.
64	FINANCE, I	187.	397.	389.	860.	25.	7.	8.	68.	0.	1862.
65	REAL ESTAT	78.	171.	138.	336.	13.	3.	4.	38.	0.	780.
66	HOTELS, PE	191.	184.	41.	420.	173.	449.	15.	1193.	0.	2669.
67	BUSINESS S	244.	36.	14.	156.	32.	57.	5.	48.	0.	592.
68	EAT.&DRINK	152.	493.	679.	779.	374.	460.	204.	857.	0.	4001.
69	AUTOMOBILE	228.	32.	3.	104.	48.	22.	14.	119.	0.	572.
70	MOTION PIC	43.	5.	1.	20.	7.	5.	2.	20.	0.	103.
71	HEALTH SER	4467.	402.	29.	325.	116.	136.	20.	1115.	0.	6610.
72	EDUC., NON	1266.	105.	10.	406.	48.	44.	8.	708.	0.	2597.
73	FED. GOV'T	268.	163.	2.	607.	134.	49.	79.	32.	0.	1336.
74	STATE & LO	196.	206.	3.	221.	72.	31.	57.	253.	0.	1039.
75	SCRAP, USE	11177.	1917.	25.	4322.	697.	373.	348.	3833.	0.	24892.
	TOTAL	22728.	8986.	5143.	17748.	11111.	11521.	3573.	12864.	1705.	98381.
	UNEMPLOYMENT	4032.	1429.	1084.	3316.	1732.	2232.	462.	2425.	393.	17327.

Table 7: Selected Gross Output and Employment Intermediate Year Totals, Baseline 1977-2000

Year	U.S. Gross Output (100,000)	Regional Output (100)	Regional Employment (No)
1977	34,999,320	61,051,970	144,296
1980	38,901,815	65,808,633	137,706
1985	45,177,768	68,008,705	132,545
1990	52,656,285	70,142,853	122,010
2000	72,521,673	76,529,439	98,381

4 are reflected in an increase of a little over one hundred billion dollars in increased output for the industry (in 1977 prices). At the present time, Waferboard is included in this All Other category, and it is impossible to separate the proportion of the total growth reflected by this particular industry. This does give an indication of the way in which this tool might be used through the baseline projection process, however.

One interesting event occurs in the region through this simulation. Although the region participates in the national increase in this industry to the tune of an over one and one-half billion dollar increase in gross output, the employment in this industry for the region is seen to fall by over 450 employees. In analyzing the parameters in the system, it is found that the explanation for this decrease, and indeed, the general decrease in employment for the region, can be attributed to two factors.

First, the rate of investment in new plant and equipment is in the most recent technologies. This leads to increases in labor productivity and decreases in the demand for labor at every level of output.

Second, assumed increases in labor force participation rates leads to changing structures of employment for the region. This leads to substitution in the labor force categories. Of the two, the best explanation seems to come from the increase in labor productivity in the system.

These reasons for increased outputs, but decreases in labor inputs, are reflected in other industries that are assumed to go through changes in the intervening years. One of the most important of these industries is that of iron mining and taconite production. As new plants in this industry came on line, they reflected large increases in labor productivity through incorporating the latest in technology compared to early mining years. It is often said that the economy of northeast Minnesota is characterized by the four "T's": Taconite, Timber, Tourism and Transportation. Three of these four are currently undergoing, or have recently undergone such changes in technology. This is reflected in the employment and output totals, as mentioned.

RUN MODIFICATIONS

The baseline run is made with the parameters currently in the system unchanged. However, the SIMLAB model allows the user to change any or all of the parameters in the system. Of the 118 parameters and variables in the system, 65 are changeable by the user. These can be changed to more closely reflect what the user sees to be reality, or simply for the purpose of seeing what happens to the calculated values for the variables when such changes are made.

For example, the internal values for the parameters for the Other Wood Products industry are certainly seen to be too high from actual experience between the years 1977 and 1982. The industry, like many others, has simply not performed up to the expectations from the sources used for original values. Two values, in particular, are seen to be out of line on the high side: the U.S. national growth rate for 1977-1982 and the rate of change in weeks worked per year for the regional industries. These two parameters were changed for the Other Wood Products industry to more closely fit reality and to demonstrate the model.

The national growth rate for this industry for the years 1977-1980 was listed as being roughly 2 percent per year. The actual performance in this industry saw zero growth to be more realistic. Note that the zero growth did involve more than just the waferboard industry and reflected, in large measure, a poor performance during those years in the housing and construction industry. The 2 percent stated rate of growth was, therefore, replaced with a zero percent rate of growth.

The national growth rate was seen to be 2 percent (roughly) once again for the years 1980-1985. The zero percent rate of growth for this industry was extended for three of those years, from 1980-1983. The original rate of growth from Department of Commerce sources was then re-introduced in the year 1984, assuming an end to the current recession. The Department of Labor rates were then continued throughout the remainder of the simulation.

The rate of change in weeks worked per year for sector 27 was minus two-tenths of 1 percent throughout the simulation period. This is consistent with the rate of change in this parameter for most of the other industries in the region due to the importance of changing technologies in the region. This value was accelerated for the Other Wood Products industry for the years 1977-1983 to minus 2 percent per year, again reflecting difficult times in the industry. The old rate of minus two tenths of a percent was then re-introduced in the year 1984 and continued throughout the simulation.

Tables 8, 9 and 10 reflect the results of such changes in parameters. These tales are similar to the ones discussed in the baseline presentation and such discussion need not be repeated in detail here. It might just be noted that sector 27 shows a decline in every case over the baseline results, as would be expected with the rather negative new set of values for the parameters.

Of greater interest, perhaps, is the information contained in Table 11, comparing the results of the two scenerios on a more aggregated basis. Although the results do show a decline for the revised output figures as compared to the baseline figure in every case, the decline is not as great as one might originally suppose given the importance of the wood products industries in general to the region.

A review of the information over the period of analysis gives some clues as to why this might be true. In the first place, the multipliers for the Other Wood Products industry in the region, as shown in the inverse matrix of the input output system, are lower than for many of the other major industries in the region. This means that the spin-off results of decline or expansion of this industry are not expected to be as great as would be true should other industries experience changes.

Second, the employment impacts that result from this industry are less than is the case for some others. This means that, not only are the multipliers coming out of sales between industries lower for this particular industry, but the related employment

[illegible] EXPORT MARKET INDICATORS OF SPECIFIED INDUSTRIES
ARROWHEAD , 2000

NO.	INDUSTRY TITLE	GROSS OUTPUT: UNITED STATES	GROSS OUTPUT: TOTAL REGION	ACTUAL MARKET SHARE: REGIONAL EXPORT	ACTUAL MARKET SHARE: PERCENT OF U.S. GROSS OUTPUT	ACTUAL MARKET SHARE: ANNUAL CHANGE	POTENTIAL MARKET SHARE: EXPORTS	POTENTIAL MARKET SHARE: PERCENT OF U.S. GROSS OUTPUT
		(THOU)	(HUND)	(HUND)	(PERCENT)	(PERCENT)	(HUND)	(PERCENT)
1	DAIRY & PO	221050.	258694.	-29.	-.0000	0.0000	0.	0.0000
2	MEAT AN. S	504326.	252600.	-485.	-.0001	0.0000	0.	0.0000
3	FOOD, FEED	413e35.	26112.	0.	0.0000	0.0000	0.	0.0000
4	OTHER CROP	468491.	27193.	0.	0.0000	0.0000	0.	0.0000
5	FOREST.. F	75334.	56633.	-30.	-.0000	0.0000	0.	0.0000
6	AGR.,FOR..	129130.	106213.	37997.	.0294	0.0000	38017.	.0294
7	IRON & FER	26973.	11382278.	11070613.	41.0433	0.0000	11247349.	41.6993
8	NONFERROUS	71564.	2149819.	1975448.	2.7604	0.0000	2474212.	3.4573
9	COAL & PEA	349711.	-29.	-10906.	-.0031	0.0000	0.	0.0000
10	OIL & NAT.	928313.	0.	0.	0.0000	0.0000	0.	0.0000
11	STONE,CLAY	88941.	14614.	-41379.	-.0465	0.0000	0.	0.0000
12	OTHER MINI	00ee3.	0.	0.	0.0000	0.0000	0.	0.0000
13	NEW CONSTR	3483490.	8133457.	5513214.	.1583	0.0000	5709127.	.1639
14	MAIN. & RE	1036814.	1060735.	-781.	-.0001	0.0000	0.	0.0000
15	ORDNANCE	323720.	0.	-1103.	-.0003	0.0000	0.	0.0000
16	MEAT PRODU	845566.	3065913.	1607713.	.1901	0.0000	1619783.	.1916
17	DAIRY PROD	549700.	1810453.	1222633.	.2224	0.0000	1225968.	.2230
18	CANNED.FRO	367610.	1166924.	1010569.	.2749	0.0000	1016324.	.2765
19	GRAIN MILL	422003.	71391.	0.	0.0000	0.0000	0.	0.0000
20	BAKERY PRO	218769.	211288.	12039.	.0055	0.0000	12039.	.0055
21	ALCH. BEV.	468135.	786069.	622109.	.1329	0.0000	628424.	.1342
22	MISC. FOOD	925008.	165115.	0.	0.0000	0.0000	0.	0.0000
23	TEXTILE GO	770801.	677.	-39348.	-.0051	0.0000	85027.	.0110
24	APPAREL, F	955540.	533579.	168664.	.0177	0.0000	168662.	.0177
25	LUGGING	194899.	703397.	331403.	.1700	0.0000	331402.	.1700
26	SAWMILLS	195506.	301619.	34849.	.0178	0.0000	35588.	.0182
27	OTHER WOOD	284660.	631761.	370268.	.1301	0.0000	370269.	.1301
28	FURNITURE	283739.	64997.	214.	.0001	0.0000	213.	.0001
29	PULP & PAP	934343.	3335429.	3216503.	.3443	0.0000	3216504.	.3443
30	PAPERBOARD	296148.	106414.	-129.	-.0000	0.0000	0.	0.0000
31	PRINTING &	827611.	34681.	-209624.	-.0253	0.0000	262675.	.0317
32	CHEM. & AL	3728446.	1297176.	705018.	.0189	0.0000	723319.	.0194
33	PETR. REF.	1460067.	3638326.	1300213.	.0891	0.0000	1306147.	.0895
34	RUBBER PRO	714925.	121904.	-724.	-.0001	0.0000	0.	0.0000
35	LEATHER PR	100203.	122.	-9457.	-.0094	0.0000	33863.	.0338
36	GLASS, STO	796536.	1229597.	785379.	.0986	0.0000	806373.	.1012
37	PRIMARY ME	973769.	1647854.	192525.	.0198	0.0000	209986.	.0216
38	IRON & STE	300399.	431738.	110745.	.0369	0.0000	118417.	.0394
39	PRIMARY CO	368023.	86688.	29074.	.0079	0.0000	29902.	.0081
40	OTHER PRIM	792036.	553343.	268137.	.0339	0.0000	276896.	.0350
41	FABRICATED	1914811.	1045966.	496278.	.0259	0.0000	513648.	.0268
42	FARM MACHI	344473.	432899.	195231.	.0536	0.0000	208136.	.0571
43	MACHINE SH	340817.	34527.	0.	0.0000	0.0000	0.	0.0000
44	OTHER NON.	2720298.	1549430.	242211.	.0089	0.0000	241719.	.0094
45	COMP., OFF	486038.	0.	-166459.	-.0342	0.0000	0.	0.0000
46	SERV.. IND.	378525.	76433.	0.	0.0000	0.0000	0.	0.0000
47	ELECTRICAL	2700104.	823306.	32498.	.0012	0.0000	32509.	.0012
48	MOTOR VEHI	1929978.	269124.	0.	0.0000	0.0000	0.	0.0000
49	OTHER TRAN	1305118.	221192.	82031.	.0063	0.0000	85107.	.0065
50	PROF.. SCI	583597.	89350.	22848.	.0039	0.0000	22946.	.0039
51	OPTICAL, O	401838.	81786.	14647.	.0036	0.0000	14647.	.0036
52	MISC. MFG.	402189.	375893.	174928.	.0435	0.0000	175576.	.0437
53	RAILROAD T	318715.	1775178.	1190048.	.3734	0.0000	1198423.	.3760
54	LOCAL TRAN	125193.	67539.	0.	0.0000	0.0000	0.	0.0000
55	TRUCK TRAN	905396.	3085.	-259959.	-.0287	0.0000	0.	0.0000
56	AIR TRANS.	1236244.	84248.	0.	0.0000	0.0000	0.	0.0000
57	OTHER TRAN	280803.	39713.	-55537.	-.0198	0.0000	0.	0.0000
58	COMMUNICAT	2089405.	1095227.	586143.	.0281	0.0000	590361.	.0283
59	ELECTRIC U	2270113.	2617392.	789241.	.0348	0.0000	813132.	.0358
60	GAS UTILIT	e80649.	1120676.	-1812.	-.0003	0.0000	0.	0.0000
61	WATER & SA	183285.	306753.	59124.	.0323	0.0000	193667.	.1057
62	WHOLESALE	3333649.	2129455.	0.	0.0000	0.0000	0.	0.0000
63	RETAIL TRA	3507202.	3322527.	593195.	.0169	0.0000	593208.	.0169
64	FINANCE, I	3103306.	1000082.	0.	0.0000	0.0000	0.	0.0000
65	REAL ESTAT	5724162.	3771855.	0.	0.0000	0.0000	0.	0.0000
66	HOTELS, PE	723669.	722478.	221913.	.0307	0.0000	221913.	.0307
67	BUSINESS S	3453737.	274799.	-892279.	-.0258	0.0000	0.	0.0000
68	EAT.&DRINK	1473427.	1527698.	483851.	.0328	0.0000	483859.	.0328
69	AUTOMOBILE	644168.	440779.	0.	0.0000	0.0000	0.	0.0000
70	MOTION PIC	555496.	36975.	-94973.	-.0171	0.0000	0.	0.0000
71	HEALTH SER	1129712.	1744712.	1086e33.	.0096	0.0000	108e33.	.0096
72	EDUC.. NON	533178.	324530.	13112.	.0024	0.0000	131[illegible]2.	.0025
73	FED. GOV'T	313333.	370313.	371.	.0002	0.0000	374.	.0002
74	STATE & LO	324451.	385617.	-771.	-.0004	0.0000	0.	0.0000
75	SCRAP, USE	22288.	2540182.	0.	0.0000	0.0000	0.	0.0000
	TOTAL	72482382.	78423596.	34106734.	.0047	0.0000	37477466.	.0052

TABLE 9: UNEMPLOYMENT AND EMPLOYMENT IN SPECIFIED INDUSTRIES, BY OCCUPATION
ARROWHEAD , 2000

NO.	INDUSTRY TITLE	PROFESSIONAL	MANAGERIAL	SALES WORKER	CLERICAL	CRAFTS	OPERATIVES	NONFARM NONMINE SERVICE	FARM	TOTALS
		(NO.)	(NO.)	(NO.)	(NO.)	(NO.)	(NO.)	(NO.)	(NO.)	(NO.)
1	DAIRY & PO	37.	10.	10.	11.	13.	37.	92.	4.	749.	964.
2	MEAT AN. &	21.	e.	e.	6.	7.	21.	52.	2.	428.	550.
3	FOOD, FEED	5.	1.	1.	1.	2.	4.	11.	0.	90.	116.
4	OTHER CROP	e.	2.	2.	2.	2.	6.	16.	1.	128.	165.
5	FOREST., F	1.	0.	0.	0.	1.	2.	3.	0.	43.	52.
6	AGR.,FOR.,	12.	4.	4.	4.	5.	13.	31.	1.	266.	340.
7	IRON & FER	729.	360.	8.	373.	2314.	2645.	0.	130.	0.	6558.
8	NONFERROUS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
9	COAL & PEA	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
10	OIL & NAT.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
11	STONE,CLAY	6.	3.	0.	7.	4.	8.	1.	1.	0.	30.
12	OTHER MINI	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
13	NEW CONSTR	176.	243.	37.	232.	2058.	356.	869.	2977.	0.	6948.
14	MAIN. & RE	172.	85.	511.	7.	108.	270.	117.	33.	0.	1303.
15	ORDNANCE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
16	MEAT PRODU	100.	147.	39.	158.	124.	377.	56.	96.	0.	1096.
17	DAIRY PROD	28.	41.	11.	39.	41.	94.	14.	25.	0.	293.
18	CANNED,FRO	103.	168.	39.	181.	120.	379.	56.	104.	0.	1149.
19	GRAIN MILL	2.	2.	1.	2.	2.	6.	1.	1.	0.	16.
20	BAKERY PRO	17.	21.	6.	24.	19.	63.	9.	15.	0.	173.
21	ALCH. BEV.	52.	83.	20.	71.	63.	196.	29.	38.	0.	552.
22	MISC. FOOD	7.	8.	2.	9.	8.	26.	3.	5.	0.	68.
23	TEXTILE GO	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
24	APPAREL, F	226.	117.	23.	159.	227.	576.	30.	51.	0.	1409.
25	LUMBING	11.	14.	7.	20.	31.	73.	9.	18.	0.	183.
26	SHAVILLS	8.	16.	6.	20.	30.	56.	6.	10.	0.	152.
27	OTHER WOOD	34.	69.	26.	84.	127.	238.	23.	42.	0.	645.
28	FURNITURE	3.	4.	2.	6.	10.	16.	2.	3.	0.	46.
29	PULP & PAP	190.	86.	16.	174.	92.	129.	82.	27.	0.	795.
30	PAPERBOARD	21.	10.	1.	14.	10.	14.	10.	4.	0.	85.
31	PRINTING &	6.	4.	3.	13.	39.	12.	4.	4.	0.	85.
32	CHEM. & AL	83.	43.	10.	81.	28.	47.	38.	7.	0.	336.
33	PETR. REF.	103.	52.	14.	89.	67.	89.	25.	16.	0.	455.
34	RUBBER PRO	24.	3.	2.	6.	18.	45.	6.	5.	0.	111.
35	LEATHER PR	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
36	GLASS, STO	82.	42.	12.	75.	79.	155.	21.	28.	0.	494.
37	PRIMARY PE	4.	23.	4.	32.	198.	154.	57.	21.	0.	492.
38	IRON & STE	0.	3.	1.	4.	25.	20.	7.	2.	0.	62.
39	PRIMARY CO	0.	1.	0.	1.	5.	4.	2.	0.	0.	13.
40	OTHER PRIM	4.	21.	4.	29.	200.	147.	57.	18.	0.	481.
41	FABRICATED	43.	28.	14.	52.	154.	275.	24.	22.	0.	612.
42	FARM MACHI	73.	17.	2.	23.	39.	52.	2.	7.	0.	215.
43	MACHINE SH	9.	2.	0.	3.	5.	6.	0.	1.	0.	26.
44	OTHER NON.	220.	59.	7.	67.	114.	149.	6.	22.	0.	644.
45	COMP., OFF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
46	SERV. IND.	13.	4.	0.	4.	7.	9.	0.	1.	0.	39.
47	ELECTRICAL	86.	36.	4.	39.	52.	95.	3.	10.	0.	326.
48	MOTOR VEHI	22.	8.	2.	10.	15.	47.	3.	7.	0.	114.
49	OTHER TRAN	49.	17.	4.	28.	36.	118.	7.	13.	0.	272.
50	PROF., SCI	8.	4.	1.	4.	7.	17.	1.	2.	0.	44.
51	OPTICAL, C	10.	4.	1.	5.	8.	21.	1.	2.	0.	52.
52	MISC. MFG.	34.	15.	3.	23.	34.	79.	4.	10.	0.	202.
53	RAILROAD T	116.	155.	4.	610.	304.	191.	54.	35.	0.	1470.
54	LOCAL TRAN	8.	29.	2.	15.	24.	30.	1.	17.	0.	126.
55	TRUCK TRAN	0.	0.	0.	1.	1.	3.	0.	0.	0.	6.
56	AIR TRANS.	4.	11.	1.	5.	14.	17.	1.	7.	0.	60.
57	OTHER TRAN	5.	22.	1.	12.	23.	23.	1.	10.	0.	98.
58	COMMUNICAT	142.	81.	19.	504.	220.	13.	2.	6.	0.	987.
59	ELECTRIC U	80.	63.	7.	105.	276.	80.	29.	17.	0.	657.
60	GAS UTILIT	31.	24.	6.	30.	96.	33.	25.	3.	0.	248.
61	WATER & SA	4.	8.	0.	6.	25.	29.	64.	1.	0.	136.
62	WHOLESALE	391.	798.	541.	887.	397.	681.	168.	105.	0.	3968.
63	RETAIL TRA	610.	1788.	2436.	2598.	1442.	1635.	671.	3588.	0.	14768.
64	FINANCE, I	187.	397.	309.	859.	25.	7.	8.	68.	0.	1860.
65	REAL ESTAT	78.	171.	138.	335.	13.	3.	4.	38.	0.	780.
66	HOTELS, PE	191.	186.	41.	420.	173.	448.	15.	1192.	0.	2667.
67	BUSINESS S	244.	36.	14.	156.	32.	57.	5.	46.	0.	592.
68	EAT.&DRINK	152.	493.	679.	779.	374.	459.	205.	856.	0.	3997.
69	AUTOMOBILE	227.	32.	3.	106.	48.	22.	14.	119.	0.	571.
70	MOTION PIC	43.	5.	1.	29.	7.	0.	2.	20.	0.	103.
71	HEALTH SER	4463.	401.	29.	325.	116.	135.	20.	1114.	0.	6604.
72	EDUC., NON	1264.	105.	10.	406.	48.	46.	8.	707.	0.	2594.
73	FED. GOV'T	268.	163.	2.	607.	134.	49.	79.	32.	0.	1335.
74	STATE & LO	196.	206.	3.	221.	72.	31.	57.	253.	9.	1038.
75	SCRAP, USE	11167.	1915.	23.	6516.	696.	373.	348.	3833.	0.	24871.
	TOTAL	22709.	8980.	5139.	17735.	11148.	11918.	3573.	15803.	1794.	98319.
	UNEMPLOYMENT	4029.	1428.	1082.	3313.	1730.	2230.	462.	2423.	393.	17310.

Table 10: Selected Gross Output and Employment Intermediate Year Totals, Revised 1977-2000

Year	U.S. Gross Output (100,000)	Regional Output (100)	Regional Employment (No)
1980	38,887,931	65,760,324	137,726
1985	45,149,206	67,908,667	132,482
1990	52,624,653	70,033,740	121,920
2000	72,482,882	76,423,596	98,319

Table 11: Regional Output & Employment Comparisons

Year	Baseline Output (100)	Revised Output (100)	Baseline Empl (No)	Revised Empl (No)
1980	65,808,633	65,760,324	137,706	137,726
1985	68,008,705	67,908,660	132,545	132,482
1990	70,142,853	70,033,740	122,010	121,920
2000	76,529,439	76,423,596	98,381	98,319

impact of the industry is less than might have been supposed without the benefit of the input output system that is such an important element in SIMLAB.

THE MEANING OF THE RESULTS

The next question that might be asked is, "What does all of this mean for the region?" In the first place, it is not meant to be an accurate reflection of the future state of the economy in northeast Minnesota in the year 2000. To change the parameters of a single industry would not necessarily reflect changes in the other industries in the region. That is precisely why the baseline run is so important to understanding the strengths of the system.

The baseline provides a growth path given the best-guess parameter values and relationships for the base year in the system. Until better information is obtained, this baseline represents a type of growth path for the region under those early assumptions. When the parameters for any one industry are changed, and a new growth path is obtained, the comparison between the baseline and the new growth path may be attributed to those parameter changes and the related influence of that industry on the economy.

In other words, the comparison between the baseline and the revised runs represents the effects from changes in conditions for that one industry on the rest of the economy and on the demographic make-up of the region. With over sixty-five parameters available for such changes, the user has the option of experimenting with a one-at-a-time type of scenerio development, or with a multiple-change type of simulation run. At every point, these changes can be compared against an all other things being equal simulation run as a measure of industrial impacts on the region.

If the user wishes, and if the information can be obtained, all parameters may be changed to more closely reflect reality. Under such conditions, the SIMLAB system becomes a forecasting model for the region.

How accurate are the changes? As mentioned early in this report, the SIMLAB

system is not a statistical model of the type generally looked at when dealing with econometric techniques. It does force one thing on the user that inferential statistical models do not, the requirement for consistency in results. The user is forced to explain the results of any simulation run, not only in terms of the economics of the change, but also in terms of the demographics and related variable values contained or computed in the system. In that sense, the system is a general equilibrium type of model that highlights the fact that everything depends on everything else in a functioning economy.

USING SIMLAB FOR PARTICLEBOARD AND WAFERBOARD: THE NEXT STEPS

Two things were accomplished over the past year. First, a 214 sector, two-region input output system was aggregated to a 75 sector system and made compatable with the requirements of SIMLAB. Second, the necessary data collection for the rest of the system was accomplished and verification of results, at least at a first approximation basis, was undertaken. Third, the SIMLAB system was built and made operational for northeast Minnesota. Fourth, sources of information for the particleboard and waferboard industries were identified and some analysis was made concerning the strengths and weaknesses of this information for SIMLAB requirements. Finally, preliminary runs were made with the existing system to identify the requirements for more detailed runs to be made in the coming year.

Two problems emerged with respect to the current information and the SIMLAB system. The first, identified in an earlier portion of this report, has to do with the definitions of the industry and consistency in data. The second, also identified earlier in this report, is that particleboard and waferboard are included in a miscellaneous category in the industry scheme currently in SIMLAB. These problems suggest the next steps to be taken in the on-going research design.

The first step will be to separate the particleboard industry from the Other Wood Products industrial sector. Particleboard will be used as a general term, rather than as a specific reference to what is more commonly identified as a single product.

As such, it will at least include waferboard and may contain some other categories of wood products yet to be identified. The costs of data acquisition would outweigh the benefits from a further industrial specification. However, the new industry will be much more specific than the miscellaneous category and will be much more useful as a result.

Next will come a more complete analysis of the information currently available for these two industries. If the problems with the data cannot be dealt with in an effective manner, primary data collection will be undertaken and incorporated into the model. The data collection will concentrate on information required for parameter modification, and the search will include at least a general review of all 65 parameter possibilities.

The final step will involve a series of baseline and revised runs, of the types shown in this report, utilizing the collected information and the new industrial classification. The results should indicate, in the clearest manner possible, the impact of this important industry in the region, the industry's future prospects in the nation and in the region, and the future of the region as it relates to these prospects for one of its very important industries.

Incidentally, SIMLAB will also be updated to the year 1980 during this period of analysis and will be applied to at least one other set of forest product development possibilities dealing with the provision of wood as an energy source for the region. Other plans for SIMLAB involve the inclusion of a housing module, as mentioned previously, and possibly, the inclusion of an expanded investment module. Once the basic SIMLAB system is constructed, there is great potential for future development of the system along lines most needed by planners, government officials, and related individuals in the region. These modifications make up the future work design for this research effort.

APPENDIX I: WHAT IS INPUT OUTPUT ANALYSIS?

An input output table represents a still picture of economic relationships between all producers and consumers of goods and services in an economic region. It demonstrates interaction between these industries in terms of their sales to and purchases from one another. It also shows the complicated relationship between goods consumed and the amount and mix of goods produced in the region. A change in the consumption for the output of one firm will be reflected, for example, in changes in that firm's demand for the intermediate products produced by other firms as well as changes in that firm's demand for labor, capital equipment and other resource inputs. This point can be clarified by means of a simple example of a hypothetical input ouput table.

Suppose that there are but three industrial sectors in the economy: (1) Agriculture; (2) Entertainment; and (3) Home Furnishings. These three industries buy intermediate products from one another for use in their own production and they sell some of their output as intermediate products to other firms and some as final products to consumers, governmental units, investment, or exports. In order to produce this output, each industry utilizes inputs of labor, capital equipment and land as well as inputs from other regions through imports. These sales and purchases are summarized in Table I-1.

Many of the complications have been removed from this example, but the basic structure is that of the most sophisticated of actual tables. Notice that the inputs (represented by the columns of the table) total for each industry equals the output (represented by the rows of the table) totals for each industry. This is an accounting type of identity which states that all outputs must be made of materials, resources and profits.

Table I-1 can be interpreted as follows: Agriculture, in order to produce a total output of $5,424, must utilize $100 of its own output, $50 of the output from

entertainment, $75 worth of the output of home furnishings, $5,000 worth of labor and other resources of production and $200 worth of imports from outside of the region. Agriculture sells $100 to itself, $700 to the entertainment industry, $000 to the home furnishings industry, and $4,625 to final sales. This interpretation can be similarly applied to the other industrial sectors.

Another table (Table I-2) can be derived from this Table I-1 if each entry in any given industry's column of the transactions table is divided by the total for the row of that same industry. The resulting number represents the dollar value of inputs required from the various industries to produce $1 worth of goods and services. All other entries may be read in the same way. This type of a table is described by the term "Direct Requirements" and it represents a production recipe for the various industries because it shows exactly what input configuration each industry requires to produce a dollar's worth of output.

There is one more table that is generally associated with an interindustry study. This table is an extension of Table I-2 in that it shows the total effect on all other regional industries resulting from an expansion or contraction in the demand for any reference producer's output. For example, if the final demand for home furnishings increases by $1, that sector would require (from Table I-2) $.009 worth of input from the entertainment industry, $.014 worth of input from the home furnishings industry, and so on.

The analysis does not end with these direct requirements, however. The $.009 increase in the home furnishings industry's purchases from the entertainment industry represents an increase in the demand for entertainment. In order to provide that $.009 worth of output, the entertainment industry must purchase resources from other industries. Each of the other industries will need, in turn, to expand their input purchases in order to fill their increased demand, and so it goes.

The composite of all of these rounds of effects can be obtained through the use

of computer technology and is presented for this example in Table I-3. The totals at the bottom of each column represent the interindustry multipliers discussed earlier in the paper. Each element of the column represents the direct and indirect effect that the industry at the head of the column exerts on the industries for each row.

For example, for every $1,000 of final sales by the home furnishings industry, agriculture will find its direct and indirect sales increasing by $1.00, entertainment will find its direct and indirect sales increasing by $10.00 and home furnishings will find its output increasing by that $1,000 plus an additional $15, for a total interindustry impact of $1,026.

For a more complete exposition on input output analysis and its uses, see Emerson and Lamphear.

TABLE I-1

	Agriculture	Entertainment	Home Furnishings	Final Sales	Total
Agriculture	100	700	000	4,625	5,425
Entertainment	50	200	50	6,400	6,700
Home Furnishings	75	300	75	4,905	5,355
Resource Inputs	5,000	5,500	230	18,000	28,730
Imports	200	000	5,000	000	5,200
Total Inputs	5,425	6,700	5,355	33,930	51,410

TABLE I-2

	Agriculture	Entertainment	Home Furnishings
Agriculture	.018	.104	.000
Entertainment	.009	.030	.009
Home Furnishings	.014	.045	.014
Resource Inputs	.922	.821	.043
Imports	.037	.000	.934
Total	1.000	1.000	1.000

TABLE I-3

	Agriculture	Entertainment	Home Furnishings
Agriculture	1.019	.109	.001
Entertainment	.010	1.032	.010
Home Furnishings	.015	.049	1.015
Total Inputs	1.044	1.190	1.026

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