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SMALL AREA APPLICATIONS OF INPUT-OUTPUT

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SMALL AREA APPLICATIONS OF
INPUT/OUTPUT^{1/}

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Small-area input-output studies show the internal economic linkages within a county or a multi-county area. If an area is small enough, its internal linkages are very few indeed, and far weaker than its external linkages. But an area that corresponds roughly to the commuting zone of an urban center of 25,000 or more people is an increasingly interdependent economy, both internally and externally.^{3/} Because of these linkages, the current national input-output table is being used as a source of data and a framework for a regional system of local input-output studies.^{4/}

Small area applications of input-output are of concern to some of us for several reasons. First, we need to know more about total system performance -- the interactions of several sectors of an area economy and the effects of each on total area income and well-being. We see the total area systems as something more than collections of spatially disaggregated national industries.

Second, we are interested in developing informational bases for public and private sector planning on a subnational scale. Because the information needs of regional industries and state governments are being slighted in nationally-oriented input-output studies, the state universities particularly can serve in developing state-level and substate input-output studies.

Finally, we're concerned about the high cost of small-area, input-

output studies based wholly on primary data. A comprehensive one-county study may cost \$50,000 or more while a single state-level study may cost five times as much. A multi-area state-level input-output study can easily exceed \$1 million in total cost. Obviously we must seek ways of more economically (1) establishing priority sectors for comprehensive local industry and household surveys and (2) providing preliminary estimates of small-area input-output relations.

In this paper, small-area applications of input-output are illustrated by four studies: one for Itasca County in northern Minnesota; ^{5/} another covering a 14-county environmental planning area in West Minnesota; ^{6/} a third covering a seven-county area in southwest North Dakota; ^{7/} and a fourth for Audrian county in north central Missouri. ^{8/} The one-county and the seven-county studies are based wholly on local survey data while the 14-county study is based partly on primary and partly on secondary data. Only manufacturing enterprises in the 14-county area were interviewed. Most of the structural estimates are based on national and state census data and the results of other input-output studies of dominantly rural-agricultural economies.

Finally a multi-state regional input-output framework is presented for the upper Midwest. In the large region, small-area studies have an important part to play in the analysis of the spatial differentiation of economic activity with reference to both private sector and public sector planning.

Study objectives

Generally, we're interested in measurement and prediction in the small-area studies. We emphasize improvements in capabilities in formulating feasible area development alternatives. We're interested, also,

in assessing the implications of each alternative for current planning and policy-making, particularly with reference to program implementation. We want additional capabilities to accurately identify and delineate area development problems and potentials. We want, also, to relate these potentials and problems to specific procedures for effectively dealing with them.^{9/}

For example, in West Minnesota (delineated in Figure 1), we intend to measure the key economic linkages within the area economic base and its infrastructure, and between the area and the larger metropolitan region of which the 14-county area is a part.^{9/} Given the structural relationships for the 1967 base-year, we intend to show alternative levels of area economic activity associated with alternative urban development policy assumptions. Finally, we intend to illustrate small-area planning implications of the projected levels of economic activity.

Study areas

Some illustrative background, first, on the West Minnesota study area -- an area marked by low per capita incomes, poor access to essential services, and high population out-migration. Migration is mostly to the Twin Cities Metropolitan Area, which provides the area's principal opportunities for upward social and economic mobility.

If population out-migration were to continue along current trends for the next 15 years, nearly two-thirds of the Minnesota population would reside in the seven-county Twin Cities core area by 1985. While an additional million people would reside in the core area, the out-state population would decline by nearly one-half million. Thus, western Minnesota would experience de-population (from its current population level of 240,000), with substantial residential redistribution occurring

between area and subarea growth centers and smaller places.

Besides the historically-based alternative of metropolitan concentration, two additional settlement alternatives are proposed for development planning in western Minnesota. One of the two alternatives envisions deliberate decentralization of industry and population to the first-ring of free-standing satellite cities surrounding the core area (shown in Figure 1) and to the regional growth poles -- one being Fargo-Moorhead. The third alternative envisions a strategy of local mergers and functional consolidation of essential social services, in which case other free-standing area growth centers, like Fergus Falls in western Minnesota, would become focal areas for public investments in new urban infrastructure.

Each of the two additional settlement alternatives is based on state and federal intervention in business and residential location processes. Use of more complete sets of social accounts are envisioned, therefore, as a means of showing the full costs of metropolitan concentration and the incidence of these costs among business, household and government sectors in the entire metropolitan region. Economies and diseconomies of industry and population redistribution would be assessed in the light of the alternative input-output structures projected for western Minnesota (as well as Itasca County and the Dickinson Area) and their implications for the quality of life in the area as shown by the spatial-economic analyses within the context of the area and regional social accounts.

The other two study areas in the Upper Midwest -- Itasca County, Minnesota and Southwest North Dakota -- and Andrian County, Missouri have experienced similar effects of economic and demographic change.

FIG. 1. METROPOLITAN REGIONS AND PLANNING AREAS

Itasca County, however, is characterized by economic development based primarily upon mining and secondarily upon trade (with a subarea growth center -- Grand Rapids -- located in the county, attracting many shoppers and commuters from outside the county). On the other hand, the seven-county Dickinson area is entirely agricultural, except for the related service activities catering to agricultural businesses and resident population.

To compare the interindustry structures of small-area economies, considerable industry aggregation is necessary. Among the four studies cited in this discussion, the aggregation problem is extremely critical because of the diversity of the local economies (see table 1). Unfortunately, the sectoral aggregation results in a loss of essential detail and, hence, the inter-area comparisons are of limited use. Nonetheless, the comparison serves as a starting point in assessing the effects of spatial position upon interindustry flows and inter-area product and money flows.

One additional item of information is included as an aid in inter-area comparisons, namely, county and area employment levels reported in 1960 (Table 2). The input-output data described next can be related to the employment categories (which are shown in somewhat more detail than the output levels in the inter-area comparisons).

Inter-area comparisons

Interindustry transactions tables were summarized for each of the four areas in the Upper Midwest according to the 15-sector breakdown described in Tables 3 and 4. Output-wise, the western Minnesota economy is roughly five times the size of either the Itasca County or the Dickinson area economy.^{10/} Because of inter-area differences in the

Table 1. Sectoral classification for selected small-area input-output studies in North Central States.

Producing Sector	SIC Number	Audrian County, Missouri	Itasca County, Minn.	Dickinson area N. D.	West Central Minnesota
Agriculture	Div A (exc 07,08,09)	1-6	4	1,2	1,2
Ag. services and forestry	07,08,09	--	1	--	3
Mining, Mfg., and construction	Div B,C,D,	7,8,14,15	2,3,5-8	11,12	4-12
Transportation	40-47	17	9	9	13
Communication and utilities	48,49	16	22,23	15,17	14
Wholesale and retail ag. equip.	50,55,5252	9 ^a / ₂ , 11,12	11-13,24	3-7	15,16,19,21
Retail food and drug	54,59	9P,10,13P ₂ / ₂	16	20,26	17,23
Retail eating and drinking	58	13P ₂ / ₂	10	21	18
Retail building materials	52(exc 5252)	13P ₂ / ₂	15	10	20
Retail gen. merchandise	53,56,57	13P ₂ / ₂	14,17	22,23	22
Finance, ins., real estate	Div G	b/ ₂	20	13,14	24
Hotels and personal services	70,77,88	b/ ₂	21,25	16,29	25
Business and repair services	73,75,76	b/ ₂	19	8	26
Entertainment and recreation	78,79	b/ ₂	26	27	27
Professional services	80-89	b/ ₂	18,27-29	18,24,25,28	28

a/ Includes 505 and 5962.

b/ Not available.

c/ Includes all other industry groups except 5053, 5054, 5059, rest of 503, 5962 and 5969.

Table 2. Employment in specified industry groups in selected input-output studies in the North Central States, 1960.

Producing Sector	SIC Number	Audrian County, Missouri	Itasca County, Minnesota	Dickinson Area, N. D.	West Central Minnesota
Agriculture	Div A(exc 08,09)	1,613	675	5,574	30,721
Ag. services and forestry	08,09	0	115	4	77
Mining, Mfg., and construction	Div B,C,D	3,294	4,569	1,088	10,597
Transportation	40-47	230	392	395	3,343
Communication	48,49	313	302	213	1,815
Wholesale and retail trade	50-57,59	1,719	1,638	2,335	15,334
Retail eating and drinking	58	312	395	524	2,845
Finance, ins., real estate	Div G	242	151	285	1,938
Hotels and personal services	70,72,88	273	336	331	2,389
Business and repair services	73,75,76	155	146	260	1,727
Entertainment and recreation	78,79	24	57	65	448
Professional services	80-89	1,282	1,781	2,172	11,802
Military	--	0	121	159	222
Industry not reported	--	24	180	186	1,594
Total		9,681	10,858	13,592	84,852

Table 3. Intersectoral transfers in West Central Minnesota, 1967.^{a/}

Producing Sector	SIC Number	West Central Minnesota					
		Local sales			Exports	Total output	
		Business	Govern-ment	House-holds			
Agriculture	Div A (exc 07, 08, 09)	186,520	4,328	926	191,774	48,666	240,440
Ag. services and forestry	07, 08, 09	11,318	0	152	11,470	3,558	15,028
Mining, mfg., and construction	Div B,C,D,	121,107 ^{b/}	7,889	32,330	161,326	167,134	328,460
Transportation	40-47	3,002	2,626	2,747	8,375	28,936	37,305
Communication and utilities	48,49	4,582	713	10,655	15,950	13,828	29,778
Wholesale and retail ag. equip.	50,55,5252	19,277	1,507	10,246	31,530	6,140	37,670
Retail food and drug	54,59	45	137	12,612	12,794	2,316	15,110
Retail eating and drinking	58	243	328	10,230	10,800	12,283	23,083
Retail building materials	52 (exc 5252)	7	22	1,821	1,851	3,159	5,010
Retail gen. merchandise	53, 56, 57	25	78	4,995	5,098	1,124	6,222
Finance, ins., real estate	Div G	4,894	6,972	31,130	42,996	5,586	48,592
Hotels and personal services	70,77,88	456	253	5,661	6,371	15,874	22,245
Business and repair services	73,75,76	1,405	33	5,206	6,644	3,909	10,553
Entertainment and recreation	78,79	162	3	2,398	2,563	1,799	4,362
Professional services	80-89	1,084	56,507	20,172	77,763	8,367	86,130
Total		354,027	81,396	151,782	587,305	422,672	1,009,977

^{a/} Gross output is used to indicate levels of commodity producing activities, i.e., agriculture, forestry, mining and manufacturing; gross margins are used for noncommodity-producing activities.

^{b/} Includes an estimated \$61,044,000 in private capital formation.

Table 4. Intersectoral transfers in Itasca County, Minnesota and Dickinson Area, North Dakota.

Producing Sector	SIC Number	Itasca County, Minn.			Dickinson Area, N.D.		
		Local sales	Exports	Total Output (\$1,000)	Local sales ^{a/}	Exports	Total Output
Agriculture							
Ag. services and forestry	Div A (exc 07,08,09)	253	4,136	4,389	34,311	24,628	58,939
Mining mfg., construction	07,08,09	335	345	680	--	--	--
	Div B,C,D	12,513	62,998	75,511	7,401	-876	6,525
Transportation	40-47	3,063	503	3,566	975	399	1,374
Communication and utilities	48,49	4,506	534	5,040	6,620	-4,024	2,596
Wholesale and retail ag. equip.	50,55,5252	23,099	7,098	30,197	39,367	15,008	54,375
Retail food and drug	54,59	18,181	2,374	20,555	17,719	3,114	20,833
Retail eating and drinking	58	2,635	1,538	4,173	1,558	3,250	4,808
Retail building materials	52(exc 5252)	2,629	595	3,224	4,037	2,936	6,973
Retail gen. merchandise	53,56,57	5,763	2,199	7,962	8,299	1,795	10,094
Finance, ins., real estate	Div G	9,398	1,819	11,217	10,566	-6,879	3,687
Hotels and personal services	70,72,88	285	2,380	2,665	2,050	-84	1,966
Business and repair services	73,75,76	1,181	113	1,294	5,677	-2,047	3,635
Entertainment and recreation	78,79	1,150	1,319	2,469	453	5	458
Professional services	80-89	11,665	3,794	15,459	5,217	430	5,647
Total		96,656	91,745	188,401	144,250	37,660	181,910

^{a/} Includes out-of-area purchases of local residents.

economic base, per capita output levels are higher in Itasca County and lower in the Dickinson area than in western Minnesota. When corrected for differences in reporting local household purchases, area exports total 40 to 50 percent of area gross output.

Inter-area differences shown in Tables 2 and 3 occur because of definitional differences and, also, because of size of area population. Local inter-industry transactions increase proportionately with total population. Inter-industry linkages multiply rapidly as the local economy reaches the threshold levels for new business and governmental functions.

Size of area and its functional position in an urban-regional system thus account for the large area differences in local sales profiles. Location of area, however, affects the distribution of industry sales to households, with the core-area county showing a disproportionate share of retail sales because of the multi-county trading area supported by the core county businesses and other institutions.

Levels of local industry sales to and purchases from other sectors in the area vary greatly (Tables 5 and 6). In Itasca County, for example sales to households totaled more than \$60 million, while purchases from households (i.e., labor services) totaled less than \$52 million. Moreover, food and drug stores, among others, reported substantially more income received from customers than paid out in salary and wages to workers. Understandably, the wage component of retail activity would be substantially lower than the total value of retail sales. But substantial shopping by out-of-county residents is indicated.

Similarly, professional services, though concentrated in the principal urban center, also are produced for a larger population than residing in Itasca county. In addition, substantial numbers of people

Table 5. Local intersectoral transfers in Itasca County, Minnesota, 1966.

Producing or purchasing sector	Local					
	Sales (and receipts)			Purchases (and payments)		
	Business	Government	Households	Business	Government	Total
Agriculture	253	0	0	1,750	134	3,330
Ag. services and forestry	335	0	0	34	146	611
Mining, Mfg., construction	9,386	908	2,219	10,193	1,980	29,553
Transportation	2,823	24	216	118	38	1,110
Communication and utilities	1,762	86	2,658	1,178	448	2,814
Wholesale and retail ag. equip.	10,563	444	12,092	6,165	176	9,851
Retail food and drug	2,066	75	16,040	1,253	112	2,812
Retail eating and drinking	10	2	2,623	2,066	46	3,200
Retail building materials	1,226	46	1,357	554	60	951
Retail general merchandise	589	43	5,131	776	109	1,966
Finance, ins., real estate	3,844	306	5,248	1,052	154	7,871
Hotels and personal income	154	6	125	1,569	240	2,174
Business and repair services	571	12	598	815	47	1,119
Entertainment and recreation	63	12	1,075	480	56	1,576
Professional services	903	7,772	2,990	4,280	85	13,058
Government	3,831	1,694	4,607	9,882	1,694	17,142
Households	45,882	5,566	193	55,213	4,607	60,013
Overflow	860	146	2,841	3,125	0	3,125
Total	85,121	17,142	60,013	100,503	10,132	162,276

residing outside the county commute to jobs in Grand Rapids and other centers in Itasca County.

Because a large proportion of all shopping and commuting trips in the Grand Rapids trade and service area originate outside the county, the core county economy is characterized as open. Much of the local economy is directly dependent upon jobs and residents outside the county, while conversely, jobs and residents in the economic community outside the county are highly dependent upon core county businesses and institutions. A one-county input-output table fails to show all the important linkages between the public and private service activities concentrated in the core county and the commodity-producing activities dispersed widely within the entire service area.

Export sales of goods and services are analyzed in Table 6. While mining and manufacturing may be the export base for the larger area of which Itasca County is a part, the two activities, plus construction, account for over one-half of the total export sales. Because of transfer payments from state and federal governments, substantial additional income flows into the county -- \$7,222,000, which is nearly \$200 per person.

Because the Dickinson area is a relatively self-enclosed area, with much inter-county shopping and commuting being internalized, local sales and income payments to households are more nearly balanced than in Itasca County. However, local sales still exceed local income payments to households, which, again points to the existence of substantial out-of-area income sources for residents in the Dickinson area.

The Dickinson area is dominantly agricultural -- a fact partially obscured by the summary input-output data (see Table 7). For the most

Table 7. Intersectoral transfers in Dickinson area, North Dakota, 1964.

Producing or purchasing sector	Local				External					
	Sales (and receipts)		Purchases (and payments)		Sales		Pur- chases			
	Business	House- holds	Total	Business	House- holds	Business	House- holds			
					(1,000)					
Agriculture	24,392	9,147	772	34,311	34,166	797	21,454	56,417	24,628	2,522
Mining, mfg., and construction	1,753	1,668	3,980	7,401	1,329	46	2,184	3,559	-876	2,966
Transportation	856	45	74	975	344	266	562	1,172	399	202
Communication and utilities	2,896	220	3,504	6,620	367	103	1,156	1,626	-4,024	970
Wholesale and retail ag. equip.	30,673	1,056	7,638	39,367	24,827	200	5,177	30,204	15,008	24,170
Retail food and drug	3,051	43	14,625	17,719	6,010	82	3,256	9,348	3,138	11,485
Retail eating and drinking	244	17	1,297	1,558	1,611	88	1,525	3,224	3,250	1,584
Retail building materials	2,299	109	1,629	4,037	915	76	1,590	2,581	2,936	4,392
Retail general merchandise	593	130	7,576	8,299	699	81	1,984	2,734	1,795	7,361
Finance, ins., real estate	2,933	35	7,598	10,566	751	67	2,524	3,342	-6,879	344
Hotels and personal services	144	2	1,904	2,050	714	85	956	1,755	-84	211
Business and repair services	3,526	1,117	1,034	5,677	600	30	1,048	1,678	-2,042	1,956
Entertainment and recreation	16	0	437	453	130	11	166	307	5	151
Professional services	500	26	4,691	5,217	1,483	58	3,184	4,725	430	923
Government	1,981	164	4,579	6,724	13,615	164	5,283	19,062	13,168	840
Households	46,767	5,283	5,404	57,454	56,758	4,579	5,404	66,741	22,353	13,065
Totals	122,625	19,062	66,741	208,428	144,289	6,733	57,455	208,475	73,181	74,142

(1,000)

part, all wholesale exports (i.e., external sales) are agriculture-related, and so is a substantial fraction of government "exports", i.e., receipts from state and federal agencies. Thus, a much larger fraction of the total export sales are agriculturally-related than indicated by the agricultural sales data.

Area projection and impact analysis

The inter-area comparisons lead to questions about small-area projections and impact analysis. Needed, however, are two sets of input-output data to prepare alternative series of area projections. We need the small-area input studies and we, also, need regional input-output studies. To effectively utilize the results of the three Upper Midwest studies, a regional input-output table must be available, not only for the base year, but also, for the target year, say 1985.

Regional development alternatives are represented by alternative input-output structures and output demands in the regional input-output studies. We already have a program written at the University of Minnesota for transforming the national input-output table into a corresponding two-region input-output table. In the transformation process, the national technical coefficients are reduced in magnitude because of regional output specialization and inter-regional trade. We do have a capability, therefore, that makes possible the use of a hierarchical input-output framework in which the national input-output data are employed in the preparation of preliminary regional and subregional input-output tables. Thus, small-area studies would fit into a regional system of small-area studies, which, in turn fit into a national input-output framework.

Analysis of development alternatives involves evaluation of the

impacts of alternative futures on current planning. As a first modest step in the direction of impact analysis in a futuristic and pluralistic context, we have derived output multipliers from the small-area input-output tables (Table 8). Correct interpretation of the multipliers obviously is fraught with uncertainties regarding the interaction of time and place. We need clarification of at least the following questions:

1. What is the effect of the spatial position of an area in a regional system on income linkages and levels of output multipliers?
2. What is the effect of external market conditions upon the economic base of the area, its earning potentials and its income relationships with the rest of the area economy?
3. What is the effect of population size and density upon the spatial organization of area economic activity and the range of social and economic opportunity for area residents?
4. What is the effect of an area's infrastructure and amenities upon location choices of businessmen and plant operators?
5. What is the effect of territorial jurisdiction on the evaluation of the costs and benefits of public investments?

Depending upon the answers to the questions asked, we can exercise options in the interpretation of output multipliers. For example, multipliers for hotels and personal services are useful in development planning in Itasca County because resorts are part of the local economic base. For the Dickinson area, of course, the service output multipliers have minor policy and causal implications, unless the availability of these services is a primary factor influencing the growth and decline

Table 8. Derived output multipliers for Itasca County, Minnesota and Dickinson Area, North Dakota. ^{a/}

Sector and industry	Itasca County, Minn.	Dickinson Area, N.D.	
		Average	Marginal
Agriculture:			
Crop	2.77	3.56	3.02
Livestock		4.16	3.27
Ag. services and forestry:			
Total	3.45	--	--
Mining, mfg. and construction:			
Timber operators	3.00	--	--
Sawmills	3.11	--	--
Food processing	2.89	--	--
Stone, clay, glass and concrete	2.76	2.99	2.53
Other manufacturing and mining	1.71	--	--
Construction	3.15	2.46	1.43
Transportation:			
Total	1.79	3.00	1.00
Utilities and Communications:			
Utilities	1.98	2.30	1.28
Communications	2.89	3.38	3.07
Wholesale and retail ag. equipment:			
Auto and trucks	}	1.63	1.36
Machinery and equipment		1.69	1.23
Gas and service stations		1.72	1.33
Auto and machinery repair and supplies		--	--
Wholesale and distributing		--	--
Elevators: feed, seed, fertilizer		4.24	3.92
Livestock marketing		3.63	1.00
Retail food and drug:			
Food and kindred products	}	2.92	1.95
Drugs and medicines		2.31	1.00
Eating and drinking places:			
Restaurants and bars		2.96	2.23
Retail building materials:			
Lumber and hardware		2.07	1.65
Retail general merchandise:			
General merchandise	}	1.80	1.45
Furniture and appliances		1.89	1.44
Fur., ins., real estate:			
Insurance	}	3.72	2.24
Legal and financial		2.30	2.85
Hotels and personal services:			
Hotels, motels and rentals		3.53	2.68
Resorts		--	--
Personal services		3.28	2.73
Business and repair services:			
Total	3.20	2.32	1.53

Table 8. Continued

Sector and industry	Itasca County, Minn.	Dickinson Area, N.D.	
		Average	Marginal
Entertainment and recreation:			
Total	2.59	2.90	2.48
Professional services:			
Medical services	3.22	3.41	3.04
Medical facilities		3.58	3.04
Education	2.59	--	--
Public schools	3.05	--	--
Churches	3.24	3.17	2.69
Non-profit organizations		3.66	2.73
Government:			
Local	2.40	1.00	1.00
County	3.40		
State	2.70		
Federal	2.55		
Households:			
Total	2.53	3.13	2.37

a/ Output multiplier is an interdependency coefficient that shows the total output increase in the local economy associated with an additional 1-unit increase in final demand for the specified output; hence, the multiplier concept incorporates the direct and indirect effects of exogeneous market expansion on the local economy.

of the Dickinson area economic base. Of critical importance for policy purposes is the spatial incidence of the costs and benefits of a particular unit which has a great deal to do with the assessment of the costs and benefits of investments in particular local activities.

Another source of uncertainty in the interpretation of small-area input-output data arises from the treatment of excess capacity and changing input mix. The Dickinson area study deals with these two questions by providing both average and marginal coefficients. The average coefficient is based on total outputs and total inputs, while the marginal coefficient is based on the additional inputs required to produce additional unit of output. The marginal coefficients always are smaller than the average coefficient for the two reasons cited earlier -- excess capacity and changing input mix.

For area planning purposes, the marginal input-output coefficients yield more realistic levels of resource input requirements than the average input-output coefficients. Both price and technological changes would affect input levels and input mix. Substantial excess capacity also exists in many sectors in the area which accounts for below-average increases in resource requirements associated with a given increase in output demands. Hence, technical coefficients from the national input-output tables are adjusted downward for small-area studies. Not only shifts in import-export balances cited earlier, but also shifts in input mix modify the pattern of inter-industry transactions in a local economy. Both the levels of inputs from some sectors and the variety of inputs in total are less in small-area economic growth than regional and national growth.

Export market parameters in the small area studies can be derived

from the regional input-output tables. A single county or multi-county area is not studied in isolation but as part of a regional system that accounts for the impact of changes in regional and national markets on specific sectors of the regional economy. Importance of internal intra-regional factors as compared with external national market and policy factors can be assessed, therefore, in the context of the entire ecological situation in which a small area seeks a particular functional role in overall regional development.

If the Itasca County economy were to shift substantially from mining to recreation, for example, the magnitude and timing of change would depend upon comparable shifts occurring elsewhere in the Upper Midwest, especially in areas competitive with Itasca County. If the shift were from mining to manufacturing, again the change would depend upon locational preferences of manufacturers and the locational advantages of alternative sites in the metropolitan core area, subregional growth poles, area growth centers and other places in the Upper Midwest. Thus, multi-county development in spatial isolation is highly unlikely. Hence, for informational relevancy, small-area studies must become part of a larger framework that includes the small-area as part of the appropriate regional system (identified tentatively in Figure 1).

Public/private information systems

Given the need to organize small-area input-output studies in a regional framework, what are the means? How is the small-area data organized regionally and for what purposes?

We visualize a variety of potential uses for small-area input-output data in federal-state relations, state-local programs, and private business planning as follows:

1. River-basin planning (federal-state): Information on the interdependence of core area and peripheral area activities in a multi-state metropolitan region and the impacts of peripheral area resource development on the core area economy, and vice versa.
2. Rural development (federal-state): Information in the interdependence of area resource base and area infrastructure and the relation of core area infrastructure to resource development in each peripheral area in a multi-state metropolitan region.
3. Environmental planning (state-local): Information on the economic interdependence of communities within a multi-county planning area and the impact of specific environmental programs on area economic base and projected income levels and quality-of-life indicators.
4. Rural-urban balance (state-local): Information on the economic interdependence of rural and urban areas and the impact of rural-to-urban migration on the costs and benefits of regional economic growth, including the distribution of these costs between rural and urban areas.
5. Capital budgeting (private business): Information on the functional interdependence of businesses and the impact of area and regional growth on business location and profit potentials.
6. Market development (private business): Information on the functional interdependence of production and consumption activities and the impacts of technological and income changes on market shares of export-producing enterprises.

While the illustrative uses of small-area input-data studies emphasize the importance of existing regional and area structure and the

processes of growth within projected alternative structures, what we really focus on is information for public intervention in area growth processes. Public intervention is primarily in terms of location inducements, both business and household. Information concerning business location and private investment potentials is initially commodity and export-market oriented. Information concerning household location and quality-of-life potentials is essentially non-commodity and residential-market oriented.

For example, the future of Itasca County is dependent in substantial part on the future of forest products manufacturing and mining. Both industries are dominated by external market and supply conditions. County-level decision making obviously is not geared to intervene effectively in the county's economic base. County-level decisions are not made in an informational vacuum, however, inasmuch as the external environment shapes the county's future. Hence, the input-output information provides the constraints for county-level decision making. The direction of influence is from the future external market and supply conditions to the present local decisions.

Successful future shifts in the county's economic base from a mining-and-timber dependency to manufacturing and outdoor recreation will depend partly on the quality of services in Grand Rapids and the productivity of labor in the future environmental setting. Whether or not redistribution of basic economic activities is likely depends upon steps taken by local and area governments in strengthening local service systems, especially education, health, housing and recreation. Again, expected external conditions will influence local decisions but local initiative also will influence the future economic alternatives

for the county. What is critical in the evaluation, therefore, is the way in which information is organized to show the linkages between the future and the present, and between the future economic base and the present service systems.

Critical evaluation

My concluding remarks pertain to the quality of information derived from small-area input-output studies. Information quality, of course, is confounded by other questions, such as credibility. Nonetheless, small-area input-output studies are providing a rapidly improving capability in the formulation of area development alternatives and the preparation of criteria and programs for implementing one or more of these alternatives. We lack specificity, however, particularly with reference to private business planning and development. Perhaps the most promising extensions of input-output studies are in the private sector.

While input-output studies are extremely useful for impact analysis in both the public and private sectors, only the larger organizations can justify the relatively high costs of implementing a full-scale study (see Table 9). Single-county studies are almost as costly as multi-county studies. Primary data are expensive to collect and process, while even secondary data involves substantial professional inputs in making them useful in small-area studies. Interstate cooperation may be one means, therefore, of spreading the high professional input costs among a number of states while at the same time making use of the small-area studies on a multi-state scale.

Before we should worry too much about extending small-area input-output studies, we face a few housekeeping chores, such as standard-

ization of small-area industry classifications and identification of the spatial and functional position of an area in an urban-regional settlement system. Nor can we ignore the question of dynamics and the proper role of input-output tables in a social accounting framework. Finally, estimates of both private sector and public sector development costs must be obtained, along with estimates of the social incidence of these costs in growing and declining areas. Clearly, we have a long way to go from where we are now to where we think we should be if we are to be especially helpful in creating alternative futures for public and private choice.

1/ Prepared for Input/Output Conference co-sponsored by the Institute for Interindustry Data and the U. S. Department of Commerce, Hilton Hotel, New York, September 16, 1970

2/ Professor of Agricultural and Applied Economics and Research Coordinator, Center for Urban and Regional Affairs, University of Minnesota, St. Paul.

3/ Criteria for delineating the commuting areas in a national system of functional economic areas is discussed by Brian Berry in: U.S. Bureau of the Census, Metropolitan Area Definition: A Re-evaluation of Concept and Statistical Practice, Bureau of the Census Working Paper No. 28, Washington, D.C., 1968.

4/ Philip J. Bourque and Gerald Hansen, An Inventory of Regional Input-Output Studies in the United States, Occasional Paper No. 17, Graduate School of Business Administration, University of Washington, Seattle, Washington, 1967.

5/ Jay Hughes, "Itasca County Input-Output Study." (Forthcoming) Minn. Agr. Exp. Sta., 1970.

6/ Martin A. Ulrich, Public Economy of West Central Minnesota, (Forthcoming), Minn. Agr. Exp. Sta., 1970.

7/ Thor Hertsgaard, "Input-Output Research in North Dakota."

8/ Curtis Braschler, "Input-Output Analysis of Audrian County, Missouri."

9/ Criteria used in delineating the regional system of multi-county core and peripheral areas are discussed briefly in: Wilbur R. Maki, "Regional Economic Development and Water," Opportunities for Regional Research on Water Resources Problems, Monograph No. 10, Agricultural Law Center, The University of Iowa, Iowa City, September 1968, p. 84-104.

10/ Output is the all but the West Central Minnesota study is measured by gross sales. In the West Central Minnesota study, all non-commodity producing activities, including contract construction, are represented by gross margins rather than gross sales.