AN INPUT-OUTPUT STUDY OF THE UPPER COLORADO MAIN STEM REGION OF WESTERN COLORADO

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CHAPTER 1

INTRODUCTION

The purpose of this report is to provide a description and analysis of a regional economy within the State of Colorado. The intent of the researchers is to provide policy makers with specific information contributing to the decision-making and planning processes and to provide a planning tool having the capability of analyzing a number of alternative development scenarios in the study region.

THE REGION UNDER STUDY

Five counties in Western Colorado make up the study area. Commonly the area is known as the Upper Main Stem region. The counties are Eagle, Garfield, Mesa, Pitkin, and Summit. These counties comprise parts of Colorado State Planning Regions XI and XII. The land area contained in the region consists of approximately 9,611 square miles and is some 9.22 percent of the state total. The federal government owns 6,998 square miles or 72.81 percent of the region's total land area.[1] Federal ownership is represented in a national monument, parts of five national forests, and holdings of the Bureau of Land Management and the Bureau of Reclamation. Federal payments in lieu of taxes were $1.682 million in fiscal 1977.[2]

The region's 1977 population is estimated at 113,200 inhabitants with an adjusted gross income (state definition) of some $521 million in fiscal 1977. As a percentage of the state totals in these categories, the region's population is approximately 4.29 percent of the total while personal adjusted gross income is some 4.14 percent.[3]

On balance, the region is a net importing region (where imports/exports are defined in terms of deliveries of goods and services inside/outside the region's boundaries). Net imports are estimated at $215.6 million. The major exporting activities are the extractive industries, light industry, and recreation-oriented activities. A small percentage of the state's total production of extractive goods comes from the Upper Main Stem region of Western Colorado. Some 2.9 percent of the value of crop production in the state is produced in the region as is 3 percent of the state's natural gas production. The region's coal output is 10.9 percent of the total Colorado tonnage.[4] Union, Colony, and Occidental Oil Shale properties lie witnin the study region and the Anvil Point experimental oil shale facility is also in the region.

The relative abundance of amenity resources has encouraged outdoor recreation activities of all kinds. Major ski areas are found in Eagle, Pitkin, and Summit Counties. Big game hunting is an important activity with 24.6 percent and 17.3 percent, respectively, of the state's 1977 total rifle deer and elk harvest occurring in the region.[5]

The regional economy is also characterized by a small but continually expanding base in the "light" industries sector. Firms in this segment of the economy produce largely for export markets. Significant export activity also occurs in the transportation, trade, and a number of service sectors. However, the economy imports nearly all finished consumer products, heavy industry products, and ingredient materials such as cement and lumber.

STATEMENT OF THE PROBLEM

The natural resource base in the region, while relatively abundant in terms of the capability to satisfy local demands, is nonetheless the focal point for regional and extra-regional economic conflict. Ownership of the

large deposits of exploitable resources is vested largely with the federal government and corporations headquartered out of state. Water use is governed by state water law, interstate compacts, and international treaty. Thus, from a regional perspective, policies affecting the disposition of the regional resource base are largely determined outside of the region. From this same perspective, there is a need to develop a detailed description of the economy as it presently exists and an analytical framework which is capable of assessing the direct and indirect consequences of alternative scenarios for resource exploitation proposed by the public and private sectors of the economy. This description and analysis constitutes the major thrust of the research reported here.

THE MODEL USED

A tool particularly adapted to these questions is the comprehensive interindustry production model developed by W.W. Leontief. The strength of this model (often termed the input-output model) lies in its capability not only to describe the interdependence existing among sectors of an economy but also in the capacity to demonstrate, sector by sector, the total consequences of any number of development scenarios. The model is thus both descriptive and analytical. The descriptive components are accommodated through the collection of extensive primary data, from firms within the region, and subsequent tabulation of the data in a form consistent with the interindustry framework. The analytical phase consists of the impact analysis, development of the various multipliers, and consistent forecasting under alternative resource development scenarios.

OUTLINE OF THE REPORT

The remainder of the report consists of a description of the method of the study which is presented in Chapter 2; the analysis of the regional

economy, which is the concern of Chapter 3; and an extension of the basic model to include an analysis of water use and employment induced population effects which is contained in Chapter 4.

In addition to the main text of the report, there are several appendices. These contain the input-output tables, the sector identification used in the analysis, and a detailed critique of the data sources used in constructing the model.

NOTES

[1]Colorado State Planning Division, Colorado Year Book, 1962-64, pp. 492-509.

[2]Community Services Aministration, Geographic Distribution of Federal Funds in Colorado: Fiscal Year 1977.

[3]Colorado State Planning Office and Colorado Department of Revenue, Annual Report, Fiscal Year Ending June 30, 1977.

[4]Colorado Department of Agriculture, Colorado Crop, and Livestock Reporting Service, Colorado Agricultural Statistics - 1978, July, 1978. Colorado Department of Natural Resources, Division of Mines, A Summary of Mineral Industry Activities in Colorado - 1976, June, 1977. Colorado Department of Natural Resources, Division of Mines, Coal - 1976, April, 1977.

[5]Colorado Department of Natural Resources, Division of Wildlife, 1977 Colorado Big Game Harvest.

CHAPTER 2

THE METHODOLOGY OF THE STUDY

INTRODUCTION

The national energy situation has focused an increasing attention on the coal, oil shale, and oil and gas reserves in the Upper Main Stem region of Western Colorado. Evidence of this fact is the intensive efforts on fee oil shale lands and the Paraho demonstration facility. Additional evidence is found in the increased production of coal from existing operations and proposals for additional leases on federal coal lands.[1]

These activities have generally been viewed as isolated from, or independent of, the remainder of the economic environment. In those cases where an impact statement has been filed,[2] more concern has been given to physical impacts than to social and economic impacts.[3] As a result, the total consequences of such developments have not been thoroughly analyzed.[4] While it is not proposed to perform an ex-post evaluation of the impacts of existing developments, a major product of this research is the provision of the analytical capability for assessing the regional impacts of continued developments.

The interindustry model identifies the interdependent structure of an economy. No producing sector is autonomous (independent of the other sectors); rather, each sector interacts with other sectors (industrial, commercial, labor, government) through the purchases of goods and services and the sale of outputs. Structural interdependence means, quite simply, that the activities of one sector have impacts on others. The identification of the nature and magnitude of this interdependence is one of the most useful results of the interindustry model.

The model is driven by what are termed final demands.[5] Final demands (as

opposed to intermediate demands) reflect the demand for goods and services in final form. Thus, final demand sectors use or consume a finished good. Intermediate demands, on the other hand, reflect the demand for goods and services which are processed before becoming available for final consumption. Thus, changes in final demands result in changes in the processing (or intermediate) sectors of the economy. The primary purpose of the interindustry model is to trace these impacts throughout the economy. Tracing these direct and indirect impacts allows the derivation of the multiplier effects on production, income, employment, or water use, and also allows the use of the model in providing consistent forecasts of economic activity.[6]

PROCEDURES FOLLOWED

The discussion of procedures followed in conducting the research may be conveniently condensed into several categories including: the definition of the region, delineation of economic sectors, the data collection effort, selection of the base year, and data processing. Each is discussed, as briefly as possible, in the following pages.

DEFINITION OF THE REGION

The Upper Main Stem region of Western Colorado, for purposes of this study, was defined as Eagle, Garfield, Mesa, Pitkin, and Summit Counties. This regional definition allows for an analysis of an area most immediately impacted by potential coal and oil shale development and an area that provides for over one-half of the state's developed ski activities?

SECTOR DELINEATIONS

The interindustry model requires the separation of the economy into various economic entities or "sectors." Total output, by interindustry accounting procedures, is the aggregate value of all sales or purchases

that take place, i.e., the total sales or purchases during a year. This total output must be divided up into sectors in order to assess the interindustry structural dependence that prevails. The model structures economic activity into two major components, suppliers (or sellers) and purchasers (or users). Each of these is further subdivided according to the following scheme: Suppliers include: 1) intermediate or processing suppliers who are producers who must purchase inputs to be processed into output which they sell to final users or as inputs to other processors; and 2) primary suppliers whose output is not directly dependent on purchased inputs. This latter category includes non-local suppliers (or imports). Purchasers include: 1) intermediate or processing purchasers who buy the outputs of suppliers for use as inputs for further processing; and 2) final purchasers who buy the outputs of suppliers in their final form and for final use. This latter category includes purchases by non-local users (or sales to exports). The level of demand by final purchasers, and it composition, are determined outside the processing sector. Production to meet the exogenously determined final demands generates intermediate purchases and sales. Primary suppliers and final purchasers may or may not be one and the same. However, in the interindustry model, their activities are treated as if they were completely independent of one another.

In summary, the two major divisions of suppliers are the intermediate suppliers, which are called the processing sector, and the primary suppliers, which are referred to as the final payments sector. (The suppliers are conventionally shown along the left border of an interindustry table.) The two major divisions of the purchasers are the intermediate purchasers, which are labeled as the processing sector (just as with the intermediate suppliers) and the final purchasers which are labeled final demand. (The purchasers are

conventionally shown along the top of an interindustry or input-output table.) It is within this general framework that a further sector disaggregation must be accomplished.

The ideal sector delineation would allow unique recognition of industries or producer groups which provide a homogenous good or service. This ideal is very difficult to achieve because of the large amounts of time and finances required for detailed disaggregation, disclosure problems, and lack of data. Any of these factors or a combination of them lead to a violation of the homogenous product ideal.[8]

Sector selection, in addition to dependence upon financing, time, and data availability, is determined to a large extent by the objectives of the study. Research objectives can often be achieved without detailed disaggregation in all sectors. Since the purpose here is largely to determine the impacts of coal and oil shale development and other sectors such as ski tows, agriculture, and local government, economic sectors such as trade and services do not require detailed disaggregation. The final delineation of the sectoring plan adopted for this study is shown in Table 2-1. A discussion of the two non-conventional accounting device sectors and how they are used follows. These sectors are the local and county taxes account and the transfer account. There is also an explanation of the profit and depreciation sectors.

The local and county government tax sector is employed as an accounting device, including all building permit fees, franchise taxes, local and county liquor license fees, charges for services, intergovernmental transfers, and fines and forfeitures. All revenues (basically property and sales taxes, though also general occupation license fees) accruing to local and county government entities are shown as being paid to this account (sector). In turn the account distributes the tax monies to the appropriate agencies.

Thus the entries in the row for the local and county government tax sector show the amounts of local sales and property taxes and other charges paid by each respective sector in the Upper Main Stem economy. In turn, the column entries in the local tax account distribute monies for health, education, social services, roads and bridges operation and maintenance, other general government activities, and otherwise unallocated bond indenture sinking funds.

Another accounting device employed in the Upper Main Stem interindustry model is the transfer sector. This accounting device allows for two unique and distinctive characteristics that are not usually found in other regional interindustry studies. First, the assumption that transfer payments cancel in the net is dropped. Second, the model handles financial balances in such a manner as to give rise to a definition of regional income more analogous to the definition of national income. There are several reasons for this. (The reader is referred to the gross flows in the appendix for the positioning of the transfer sector and the relative magnitudes of its row and column values.) A schedule explaining the components of row and column cells also appears in the appendix.

First, insurance premiums were divided so that a value equal to loss experiences ($37,092,061) was separated from other revenues ($32,559,872). This value equal to loss experiences was the prorated among the various sectors in accordance with their premium payments and directly charged into the transfer row. Thus, the $37,092,061 loss experience is not part of the total gross output of the insurance and real estate sector. The transfer column in turn is shown as making the claim payments to the various sectors, construction ($1,669,203), wholesale ($124,638), automobile dealers ($233,534), retail trade ($137,708), insurance and real estate ($175,698), health medical care services

($12,381,828), services N.E.C. ($9,225,160), households ($7,368,860), imports from Colorado other than the Upper Main Stem region ($954,224), and imports from the rest of the world ($5,042,025).

Second, the State of Colorado generated revenues in the Upper Main Stem region of Western Colorado that exceeded the value of the state's expenditures in the region. This financial surplus is shown as an outlay by the state sector to the transfer account row. The transfer column then shows the State of Colorado's financial surplus ($10,318,636) as an import from Colorado other than the Upper Main Stem region. To the contrary, the federal government incurred a deficit of $53,079,646 in the Upper Main Stem region. The accounting for this was to have the transfer row export the federal deficit to the rest of the world. In turn, the transfer column distributes the amount of the deficit to the federal government row. Thus the federal government is given sufficient revenues to match its expenditures.

Third, transfer payments to households are handled through the transfer account.[9] Taxes collected in the region are always shown as being paid to the respective government accounts, i.e., local and county tax accounts, State of Colorado, or federal government. Any inter-governmental transfer is shown as a sale by the recipient and a purchase by the grantor. In turn, the account that grants the transfer payment(s) to the household sector is shown as making a purchase from the transfer account row in the amount of the transfer payment(s).[10] The transfer account column then makes the payment to the household account.

Fourth, financial capital finds its way into the Upper Main Stem region by means other than local financial institutions.[11] When interest payments are made on this outside finance, the dollars involved leave the region; a lower bound estimate for this phenomenon was $5,998,248 for interest paid to private accounts. To account for this, the total gross output of the regional

financial institutions was increased by $5,998,248 so that all interest payments in the region could be shown as being made to the finance sector. The finance sector then charged the transfer row with the amount of the increase and the transfer column charged the same to the imports from Colorado other than the Upper Main Stem region.

Fifth, interest paid by local financial institutions ($20,504,160) on savings accounts and certificates of deposit was charged against the transfer account row. The transfer account column distributed this interest to the profit and rents row entry.

The transfer account was used to close profits, interest, rents, and the like into the household sector. To accomplish this, the transfer account column was given a $266,416,315 credit at the intersection with the profit sector while the same amount is charged at the intersection with the household row.

Finally, the transfer account row was used to export the region's capital shortage ($118,771,485), mineral research and development ($54,116,442), and dividends paid to area residents by out-of-the-region firms ($17,132,992). The transfer account row in turn charged these amounts to the profits row.

Where enterprise accounting was employed, the profit sector includes after-tax profits, charges to reserves for bad debts, capital loss amortization, and outlays for rents and royalties.[12] Where government fund accounting was employed, the profit sector includes surplus of current revenues over current[13] expenditures,[14] the value of capital expenditures appropriated out of current revenues, contributions to bond indenture sinking funds out of current revenues, net charges out of current revenues to any other reserve fund (e.g., contingency funds), and rent payments.

The depreciation sector includes both depreciation and net inventory

depletions. Inventory depletions are, relatively speaking, insignificant and are placed with depreciation charges. Similarly, the net inventory accumulation values were incorporated in the investment sector.

With the exception of the intersection of the household row and the transfer column and the household on household cell, the household row represents wages and salaries paid subject to withholding. In the absence of an adequate source for domestic employment earnings, 447 employees[15] are assumed to be full-time equivalents at $2.75 an hour for 2,000 hours.

QUESTIONNAIRE DESIGN AND USE

Previous experience with questionnaires employed to obtain primary information for interindustry models suggested that a questionnaire, as such, should not be used in the pursuit of the primary data. The reason behind this is that no firm accounts for expenditure and revenue patterns on an SIC basis, the language ultimately employed in an interindustry model. Rather, a firm's books are designed around process or product activities. The use of a questionnaire, either by mail or by interview, presupposes adequate translation from a firm's accounting language into SIC codes. The typical entrepreneur or manager does not ordinarily work with SIC descriptions, a rather precise and technical language.

Accordingly, a determination was made to conduct all interviews in a basic accounting language tailored to the individual firms involved and for the researcher to make the translation to SIC classification. Thus, the questionnaire form which appears in the appendix represents the format for the final translation by the researcher. A large majority of the primary data were originally collected in field notes that described the detail behind profit and loss statements for the firms interviewed.

Not all interviews could, however, be conducted as planned. It was

found, for example, that some firms would have to refer for legal advice while others did not want to reveal information in the form desired. Even though it was established that the research should not solicit primary data through the mail, it was necessary to design a questionnaire for use both as an interview focal point and as an item that could be left with an interviewed firm.

The questionnaire was designed to fit three sheets of paper. A cover sheet was used to briefly explain the nature of the research and to solicit information on the nature of the firm's product lines, the number of employees, water use, and level of capacity utilization. Outlay patterns, both of a cash flow and a non-cash flow nature, were the concern of the second sheet; information on sales distribution was solicited on the third. Both sales and outlay patterns were disaggregated by Upper Main Stem interindustry study sector descriptions and regionalized according to (a) Upper Main Stem, (b) Colorado other than the Upper Main Stem region, and (c) activity outside Colorado. A question on water use was included to provide information on sector-by-sector water withdrawals. The level of production capacity utilization question was used to provide general background information.

SELECTION OF THE BASE YEAR

Other than a consumer price index for the Denver metropolitcan area,[16] there is no price index constructed specifically for Colorado. This effectively removes one criterion (relatively stable prices) from consideration when selecting a base year for Colorado economic studies. The 1974 base was selected for the initial survey for the following two reasons.

Interviewing for the Northwestern Colorado interindustry study began in February 1975.[17] Calendar 1974 was the most recently completed accounting cycle for most firms; it was anticipated that the information from this cycle

would be, qualitatively speaking, foremost in the command of the interviewees. Also, activities of relatively new firms were automatically incorporated in the primary data base by soliciting what was then the most current information. Later surveying and secondary data sources have been used to adjust the data to a 1977 base.

CONDUCT OF THE SURVEY

Interview schedules were arranged by telephone between three days and a week in advance. Every effort was made to gain an interview with the person who would have immediate authority to release information. The length of time spent on an individual interview varied from firm to firm. Several were conducted in less than an hour; some took place over several days. The interviews were conducted over a fifteen month period.

PROCESSING THE DATA

Information gathered on the outlay and sales patterns for any given enterprise was tabulated to conform to the sector delineations and regional descriptions as defined in Table 2-1. Care was exercised at this step to assure a balance between outlays and sales. Any anomalies were checked and corrected before proceeding further.

The next step was to aggregate questionnaire forms within a sector and to expand the information to represent gross flows. An iterative process was used to accomplish this so that the relative composition of a given sector delineated for the Upper Main Stem interindustry model would be more truly reflected.[18] The final iteration produced gross flow patterns for the respective sectors delineated in the model.[19] The gross flows identified in this manner provide the border totals for the initial transactions statement.

Reconciling discrepancies in any given transaction cell is to be expected; only if the research yielded perfect knowledge about outlays and sales would this be avoided. A discrepancy can emanate from one of several sources or a combination thereof. The sales or purchases of one industry to or from another industry can be misrepresented, or the total gross output value for individual sectors can be in error. In the former case other rows and columns are affected by the error. In the latter, there is an aggregate distribution error in both outlays and sales for the sector. Each discrepancy is examined individually and reconciled on a case-by-case basis. Fortunately, the sources of relatively large discrepancies could be isolated and remedied through additional examination. Small discrepancies were reconciled by using imports from and exports to the world other than Colorado as residual accounts.

DATA SOURCES BY SECTOR

Agricultural Production SIC 01,02,07

Colorado. Department of Agriculture. Colorado Crop and Livestock Reporting Service. Colorado Agricultural Statistics. Annual.

Colorado State University. Cooperative Extension Service Data. Department of Economics.

Industry survey data.

U.S. Department of Commerce. Bureau of the Census. Census of Agriculture: 1974. Volume 1, Area Reports, part 41, Colorado, Section 2, County Data. Washington, D.C.: Government Printing Office, 1972.

Colorado Agricultural Statistics reports crops on a production and market value basis. By contrast the total gross output in the inter-industry model is reported on a market receipts basis. The implication of this difference is not too critical when virtually all production is marketed; this is not the case with hay, however, a major crop in the

five counties. Thus, to obtain an estimate of the market receipts from hay, the ratio of hay marketings reported in the 1974 Federal Census of Agriculture to the 1974 market value of hay reported in Colorado Agricultural Statistics was applied to the latter's 1977 report.

Data on the value of marketings of livestock are not published on a county basis in Colorado. Thus, the value of the total gross output of the livestock sector in the five counties was determined from information secured from the Cooperative Extension Service. The value of output by agricultural services was estimated by using information gained in surveys conducted during 1975.

Coal Production SIC 12

Colorado. Department of Natural Resources. Division of Mines. A Summary of Mineral Industry Activities in Colorado. Part I: Coal. Annual.

Colorado. Public Utilities Commission. Files.

Hebb, D.H., and Curtin, M.S., "Colorado Coal: A Production and Shipment Directory." (U.S. Department of Interior, Bureau of Mines.) Golden, Colorado: Colorado School of Mines Mineral Economics Institute, 1977. (Photocopy reproduction.)

Industry survey data.

Data on tonnage and labor days are available in the Division of Mines publication on a mine by mine basis. The PUC files, the Hebb-Curtin study, and survey information provided the data used in estimating price.

Metal Mining, Oil and Natural Gas Production, and Nonmetal Mining SIC 10,13,14

Colorado. Department of Natural Resources. Division of Mines. A Summary of Mineral Industry Activities in Colorado. Part II. Metal-Nonmetal. Annual.

Colorado. Department of Natural Resources. Oil and Gas Conservation Commission. Oil and Gas Statistics. Annual.

Industry survey data.

Pederson, John A., and Rudawsky, Oded, "The Role of Minerals and Energy in the Colorado Economy." (U.S. Bureau of Mines Grant No. G-0122090.) Golden, Colorado: Department of Mineral Economics, Colorado School of Mines, 1974. (Photocopy reproduction.)

Total gross output values for metal mining, oil and natural gas production, and nonmetal mining, were taken from the State of Colorado publications. Interindustry flows were estimated by using the Pederson-Rudawsky study adjusted and updated with information gained in independent surveys and using both Nelson and Wholesale Price Indices. It should be noted that the intrasector transaction estimate (essentially operators purchasing from related services) causes the total gross output value of the sectors to be greater than the output value of minerals and fuels.

Also, the market value of stripper wells and natural gas production increased at a greater rate than did input prices from the time of the Pederson-Rudawsky study to 1976. After accounting for increased royalty values (an estimate based on the United States Government's royalty revenues) and increased input prices, there was still a considerable portion of the regional oil and gas dollar that was unaccounted for. That residual was charged to profits and the imputed federal and state corporate income taxes.

Construction SIC 15,16,17

Colorado. Department of Labor and Employment. Files.

Industry survey data.

Information gained by interviews with contractors was used to calculate a ratio between contract value and outlay for labor on a two-digit SIC level. This ratio was then applied to the annualized

employment and wage data for 1977 provided by the Colorado Department of Labor and Employment to estimate total gross output.

Manufacturing SIC 20,24,25,27,28,29,32,33,34,35,38,39

Colorado. Department of Labor and Employment. Colorado Manpower Review. Monthly.

Colorado. Department of Labor and Employment. Files.

Industry survey data.

Information gained by interviews, conducted for the year 1974 in northwestern Colorado, was used to calculate a ratio between total gross output value and outlay for labor on a two-digit SIC level. This ratio was then applied to the 1974 annualized employment and wage data provided for the five study counties by the Colorado Department of Labor and Employment to estimate total gross output at the two-digit level. The change in wages per employee per two-digit SIC classification in the State of Colorado, as reported in the Colorado Manpower Review, from 1974 to 1977, was used as a proxy to initially boost the 1974 output values to 1977 dollars. Select manufacturers were contacted to gain information necessary for further refinement of changes in both real and dollar values.

About half of the manufacturers in the five-county region were included in the initial surveys; these were originally part of another study concerning nine counties in northwestern Colorado. For those firms not directly surveyed in the five counties, the survey results from the nine county study were used as a proxy. It is unlikely that this method seriously biases the results as the firms involved rely on rather standardized technology, e.g., dairy manufacturing.

Transportation and Communication SIC 40,41,42,45,47,48

Colorado. Department of Labor and Employment. Files.

Colorado. Public Utilities Commission. Files.

Colorado. State Auditor. Files.

Industry survey data.

Information pertinent to railroad and telephone communications was gained from filed PUC reports and survey. Because of the nature of the accounting systems employed by the firms involved, a significant amount of prorating was required to scale the data to approximate the five county conditions. The methods of prorating, originally developed for 1974 conditions in nine northwestern Colorado counties, were applied to reported 1977 data.

Where the airports are operated by local public authorities, the relevant information was obtained from reports filed with the Colorado State Auditor.

Data on employment and earnings for components other than rail and air transportation sectors were obtained for the year 1974 from the Colorado Department of Labor and Employment, and the 1974 nine county survey provided an estimation for the output level. For a first approximation of 1977 conditions, the output index value of the trade sectors (for the index method see the section on trade) was used as a proxy for real growth. A tariff increase of twenty-two percent was used to represent price changes.

Electric and Natural Gas Utilities SIC 491,492,493

Colorado. Department of Labor and Employment. Files.

Colorado. Public Utilities Commission. Files.

Colorado. State Auditor. Files.

Industry survey data.

A certain amount of prorating and imputation was involved in this sector because of geographic location of activity. This was especially

true for activities of the Public Service Company of Colorado and Western Slope Gas as their 1977 PUC reports were used extensively. Electric activities under the control of local public authorities were identified by examining 1977 reports filed with the State Auditor. Finally, information gained from the Colorado Department of Labor and Employment and from interviews provided cross checks throughout the estimation of the activities of this sector.

Wholesale Trade SIC 50,51; also

Retail Trade SIC 52,53,54,55,56,57,58,59

Colorado. Department of Labor and Employment. Colorado Manpower Review. Monthly.

Colorado. Department of Labor and Employment. Files.

Colorado. Department of Revenue. Annual Report. Annual.

Industry survey data.

Interviews conducted for the nine county study in northwestern Colorado with a 1974 base year were used to determine the basic outlay patterns for the trade sectors for the 1977 Upper Main Stem model. Modifications from the 1974 data file were made as follows: sales data, as reported in the Colorado Department of Revenue's Annual Report were annualized and extrapolated to cover the six months beyond the published fiscal 1977 information. By using information reported in the Colorado Manpower Review with respect to state-wide employment and earnings in the trade sectors and the Department of Revenue's state-wide information on trade sector sales, an index was constructed to facilitate establishing the dichotomy between output changes and price level changes in Colorado between 1974 and 1977. The output ratio was used to boost the 1974 employment as determined from data provided by the Colorado Department of Labor and Employment. The 1974 survey information was modified to allow

for relative price changes in select inputs, specifically newspaper advertising, transportation, communications, electric and gas utilities, payrolls, and local taxes. Finally, the restaurant industry was re-surveyed for 1977.

Mention is made here of the practice of "margining" the trade account sectors. With rare exception, convention dictates that the trade sectors are entered in the interindustry model at the level of gross margins. The reasoning behind this is to facilitate showing the direct economic links between producers and users. The absence of margining would interject the huge trade sector dollar turnover between producers and consumers. The Upper Main Stem model was margined. The output of local producers was distributed to the various sectors in accordance with survey findings. Where the output, e.g., milk products, ordinarily goes first to trade sector, e.g., grocery stores, before going to a regional user, e.g., households in the model, the sale was made directly. A margin on the sale is attributed to the trade sector. Merchandise imports by the trade sectors were prorated and assigned to the various regional sectors based on the relative volumes of purchases from the trade sectors.

Finance, Insurance, and Real Estate SIC 60,61,62,63,64,65,66

Colorado. Department of Labor and Employment. Colorado Manpower Review. Monthly.

Colorado. Department of Labor and Employment. Files.

Colorado. Department of Regulatory Agencies. Division of Insurance. Insurance Industry in Colorado: Statistical Report. Annual.

Colorado. Department of Revenue. Annual Report. Annual.

County Clerk Office, respective counties. Files.

Federal Credit Banks of Wichita. Files.

Federal Home Loan Bank Board. Combined Financial Statements - Member Savings and Loan Associations of the Federal Home Loan Bank System. Annual.

Industry survey data.

Sheshunoff & Company, Inc. The Banks of Colorado. (A private publication.) Annual.

The output value of the finance sector was entered in the five county interindustry model as the estimated value of interest charges incurred within the region. Interest earnings by commercial banks were readily identified in the Sheshunoff publication; likewise, the Federal Credit Banks of Wichita provided data relevant to the operations of the Production Credit Association and Federal Land Bank Association. Regional information on the activities of savings and loan associations is not readily available so the data published for Colorado in the Federal Home Loan Bank Board's Combined Financial Statements were prorated by a wage and salary formula for the Upper Main Stem region. Survey data were used both as a cross check to published data and to estimate financing from outside the region, e.g., certain school bonds, Rural Electrification Association loans, insurance company loans, and so forth.

Information gained in interviews with several major insurance companies in the 1974 nine county interindustry study suggested that a precise accounting for insurance premiums paid on per county basis was a near impossibility. Another difficulty observed was with respect to loss claims; specifically, in a small region the losses incurred by any one economic sector cannot be predicted with any certainty. Thus, for the Upper Main Stem interindustry model, the insurance sector was handled as follows.

Gross insurance premiums paid in the Upper Main Stem region were approximated by prorating premiums paid in the State of Colorado by a

personal adjusted gross income figure. Premiums paid in Colorado are reported in the State Division of Insurance's Statistical Report; personal income is reported in the Department of Revenue's Annual Report. The state loss experience ratio was then used to split gross premiums paid; the loss portion was charged to the transfer account in the Upper Main Stem interindustry model and the balance was charged as gross output of the insurance sector. Accordingly, the transfer row collects the portion of premiums paid that subsequently reimburses for losses and the transfer account column distributes the same to contractors, auto dealers, health practitioners, and so forth. (The reader is alerted to the fact that the transfer account is also used for other purposes in the model; see the section on transfer account.)

Information on documentary fees paid for real estate transactions was secured from the county clerks in the respective counties. The fee information was used to estimate the gross value of transactions, and survey information provided a means to estimate the commissions which make up the gross output of the real estate sector.

Survey information collected for the 1974 nine counties in northwestern Colorado provided the means to make a first approximation distribution of the total gross outlays in the finance, insurance, and real estate sector. Select adjustments were then made to accommodate certain relative price changes such as for utilities, taxes, and wages.

Services SIC 70,72,73,74,75,76,78,79,81,86,89

Colorado. Department of Labor and Employment. Colorado Manpower Review. Monthly.

Colorado. Department of Labor and Employment. Files.

Colorado. Department of Revenue. Annual Report. Annual.

Industry survey data.

U.S. Department of Commerce. Bureau of the Census. Census of Selected Service Industries, 1972: Area Series, Colorado, 72-A-6. Washington, D.C.: Government Printing Office, 1974.

Sales by the hotels and other lodging facilities sector were estimated by annualizing the pertinent information reported in the Department of Revenue's Annual Report; as with the trade sectors, an extrapolation factor was used to cover the last six months of 1977. Also analogous to the treatment of the trade sectors, an index was built to separate real from money growth in this sector in the State of Colorado. Employment from 1974 to 1977 was allowed to grow in accordance with the real growth index as applied to the three county region's situation. Wage rates in the lodging sector were allowed to rise in accordance with the Colorado experience as determined from the Manpower Review. Survey information from the 1974 interviews was further modified to account for relative price changes. Additional surveys were conducted for 1977.

Estimation of the output value of the other service sectors was accomplished as follows. The Census of Selected Service Industries provided certain information on output and employment in the study counties and the entire state for 1972. Census disclosure requirements cause a considerable amount of data aggregation to take place at the county level. Thus, by using Department of Labor and Employment data for the respective counties in 1972 and Colorado productivity ratios, calculated from the Census, the reported county output data were disaggregated on a three-digit SIC basis.

Real output changes from 1972 to 1974 were then accounted for by using employment and earnings data provided by the Department of Labor and Employment. Output changes from 1974 to 1977 and price changes from 1972 to 1977 were approximated by utilizing an index analogous to the

index described in the trade sectors. Outlay distributions were estimated from information gained by interviews, and select adjustments were made to accommodate relative price changes.

The ski industry was surveyed for the 1977-78 season and a separate sector designed accordingly.

Health SIC 80

Colorado. Department of Labor and Employment. Files.

Colorado. Department of Revenue. Annual Report. Annual.

Colorado. State Auditor. Files.

Industry survey data.

Health facilities owned by local public authorities had current financial statements on file with the State Auditor. The deliveries of services in nursing home situations were used as they appeared in the 1974 nine county study. Other components of the health/medical care sector were increased from the estimated 1974 conditions in accordance with population increases as reported in the Department of Revenue's Annual Reports. Further adjustments were made for relative price changes. Information was not available to estimate changes in wage rates from 1974 to 1977 for this sector so the state change in the retail trade sectors was arbitrarily used as a proxy.

Education SIC 82

Colorado. Department of Education. Files.

Colorado. Department of Education. Revenues and Expenditures: Colorado School Districts. Annual.

Industry survey data.

Information on public school districts is published on an annual basis in Revenues and Expenditures. Information on the Colorado Mountain College, the Colorado State Extension Service, and Mesa College

was secured directly. All data were annualized and distributed on the basis of survey information.

Water, Sewer, and Trash SIC 494,495,496,497; also

Local and County Roads; also

Local and County Government; also

Local and County Taxes

Colorado. State Auditor. Files.

Industry survey data.

The 1977 audit reports for all local and county government authorities were examined and the data contained therein were aggregated. Information gained in select interviews facilitated the distribution of the various sectors' outlays.

Mention is made of an accounting device in the Upper Main Stem model, namely the tax account. Conventional interindustry transactions tables charge the local and county government cells in respective columns with the value of taxes paid. The subtle assumption in such a procedure is to the effect that respective sectors "buy" a service from the local and county government authorities. The disaggregation of the local and county government functions in the five county model, if convention were followed, would have required prorating taxes paid by any one economic sector. The procedure would produce rather untenable results, e.g., the agriculture sector would be shown as purchasing from health/medical care, education, and so forth. To avoid this dilemma, the tax account row collects all local and county property, specific ownership, and sales taxes, and the tax account column distributes these monies to the various agencies.

Households

Colorado. Department of Labor and Employment. Files.

Colorado. Department of Revenue. Annual Report. Annual.

Colorado. Public Employees Retirement Association. Files.

Community Services Administration. Federal Outlays in Colorado. Annual. (Prior to fiscal 1975 published by Office of Economic Opportunity)

Industry survey data.

U.S. Department of Commerce. Bureau of the Census. Census of the Population, 1970: General Social and Economic Characteristics, Final Report, Colorado, PC (1)-C7. Washington, D.C.: Government Printing Office, 1972.

U.S. Department of the Treasury. Internal Revenue Service. Statistics of Income 1969, ZIP Code Area Data from Individual Income Tax Returns. Washington, D.C.: Government Printing Office, 1972.

Household income in the Upper Main Stem interindustry model is shown as emanating from wages and salaries subject to withholding, proprietorship, partnership, and Sub-Chapter S Corporation income, interest, rent, and dividend income, and transfer payments.

The Department of Revenue's Annual Report publishes, on a county basis, personal adjusted gross income figures. Because the latest published Annual Report covered through fiscal 1977 (largely covering calendar 1976 returns), the first approximation of the 1977 personal adjusted gross income was made by extrapolating from the previous several years' trend. The Statistics of Income publication of the IRS was set against the Department of Revenue's report for the corresponding year, and the ratio used to approximate what federal adjusted gross income was for 1977. Likewise the ratios of dividends and interest to adjusted gross income as reported in Statistics of Income were used. A word of caution is exercised on two accounts: first, the IRS publication was 1969; and second, the ZIP Code areas on the Western Slope do not fit

county lines. It is not felt that either of these seriously affect the estimations because the relative amounts involved are rather small.

Audit reports for the respective counties provided information on the level of payments made to households by the five counties' departments of social services. An estimate of payments by the Colorado Public Employees Retirement Association was made based on information provided by the Association. The value of transfer payments made by the U.S. Government was approximated by the reported information in Federal Outlays. Life insurance distributions were estimated in accordance with the procedure described in the insurance section of this writing.

Payments made to the household account by the respective regional economic sectors reflect an estimate of wages paid subject to withholding. For most of the private enterprise portion of the economy, this estimate reflects the place of work data base provided by the Colorado Department of Labor and Employment files. Estimates on the earnings of agricultural, railroad, and government employees reflect the information sources peculiar to those sectors. The household-on-household cell was imputed by taking the domestic employment figure from the Census of Population and annualizing a $2.75 wage rate. The transfer column entry for households is a closing entry that is described in detail in the transfer account section. Essentially it is an entry that brings non-wage and salary income to the household sector.

Households were not surveyed to gain information on their outlay patterns. Rather, there was a reliance on the sales information provided by regional producers. Accordingly, the import figure aside from the post marginal trade sector merchandise, for households is largely a residual value.

State Government; also

Federal Government

Colorado. Department of Education. Revenues and Expenditures: Colorado School Districts. Annual.

Colorado. Department of Highways. Colorado's Annual Highway Report. Annual.

Colorado. Department of Natural Resources. Division of Wildlife. Colorado Big Game Harvest. Annual.

Colorado. Department of Natural Resources. State Board of Land Commissioners. Summary of Transactions. Annual.

Colorado. Department of Planning and Budget. Files.

Colorado. Department of Revenue. Annual Report. Annual.

Colorado. State Auditor. Files.

Colorado. Public Employees Retirement Association. Files.

Colorado. Public Utilities Commission. Files.

Community Services Administration. Federal Outlays in Colorado. Annual. (Prior to fiscal 1975 published by Office of Economic Opportunity)

Industry survey data.

Sheshunoff & Company, Inc. The Banks of Colorado. (A private publication.) Annual.

U.S. Department of the Treasury. Bureau of Government Financial Operations. Combined Statement of Receipts, Expenditures, and Balances of the United States Government. Washington, D.C.: Government Printing Office. Annual

U.S. Department of the Treasury. Internal Revenue Service. Statistics of Income 1969, ZIP Code Area Data from Individual Income Tax Returns. Washington, D.C.: Government Printing Office, 1972.

Total gross output for the government sectors is defined in terms of the estimate of revenues from all sources. For private enterprise in the endogenous portion of the model, an estimate was made of income and payroll tax liabilities and fees and royalties paid by each respective sector. There is no real cross check against these estimates because neither Colorado nor the U.S. Government reports business tax liabilities

on a county basis. Further, previous research experience has demonstrated that prorating the reported state level of collections (reported in the Treasury's Combined Statement of Receipts, Expenditures, and Balances and the Department of Revenue's Annual Report) by such factors as population or personal income produces questionable results.

Personal tax and fee liabilities were much more readily estimated by using such publications as the Department of Revenue's Annual Report, the Division of Wildlife's Big Game Harvest, and the IRS's ZIP Code Area Data. The exports by the State of Colorado include estimates of sales taxes.

All estimates of government revenues were annualized and put on a 1977 basis. Expenditures were likewise adjusted.

For the U.S. Government, the publication Federal Outlays was used as a first approximation of expenditures. Select interviews with the larger agencies, such as the U.S. Forest Service, Bureau of Land Management, and U.S. Postal Service, provided the information to estimate agency operating expenditure patterns. Information on direct payments for such things as schools, interest on government securities held by commercial banks, highways, and local government activities was taken from the Colorado Department of Education's Revenues and Expenditures, Sheshunoff's The Banks of Colorado, Colorado's Annual Highway Report, and files in the Colorado State Auditor's.

State of Colorado Expenditures were first approximated by information contained in regionalized budgets provided by the Department of Planning and Budget. This information was on a state planning region basis and was designed for State analysis for the fiscal 1976 budget so modification was necessary on an agency by agency basis. Contacts were

made with the larger agencies such as the Division of Wildlife and the State Department of Highways to accommodate this requirement.

The estimate for revenues for the State of Colorado exceeds the estimate of its outlays. This difference was charged to the transfer account and the transfer account treats it as an import to the five county region. To the contrary, the estimate of outlays by the federal government exceeded the revenue estimate. Accordingly, the transfer account row exports this deficit. In turn, the transfer account column distributes it to the federal government row.

Transfer Account

The transfer account is an accounting device that allows for two unique and distinctive characteristics that are not found in conventional regional interindustry studies. First, the assumption that transfer payments cancel in the net is dropped. Second, the model handles financial balances in such a manner as to give rise to a definition of regional income more analogous to the definition of national income. A schedule of the transfer account as it appears in the initial transaction is shown in the appendix.

Entrepreneurial earnings and rents were charged to the profit row. The profit row entries for the various local and county government columns account for funds set aside for capital expenditures and bond principal repayments and the surplus of revenues over commitments. The profit row entry for the household column largely represents the estimate of household saving.

Many organizations and business firms have funds in interest earning deposits. No satisfactory method was discovered to assign these interest earnings to the various sectors. Thus, the transfer column delivers these interest earnings to the profits row.

Survey information was used to estimate the investment column and mineral research and development column. The value of these investments was then set against the value of the profit and depreciation rows. Out of the net difference, the estimate of entrepreneurial income was taken and closed to households; the residual after accounting for entrepreneurial income was treated as a regional capital shortage.

Imports - Colorado; also

Exports - Colorado; also

Imports - World; also

Exports - World

Imports and exports in the Upper Main Stem interindustry model were estimated by using survey information. Also, in the process of reconciling and balancing the transactions table, the entries in these rows and columns were used as the adjustment mechanism.

Labor

Colorado. Department of Labor and Employment. Colorado Manpower Review. Monthly.

Colorado. Department of Labor and Employment. Files.

Industry survey data.

U.S. Department of Commerce. Bureau of the Census. Census of Population, 1970: General Social and Economic Characteristics, Final Report, Colorado, PC (1) - C7. Washington, D.C.: Government Printing Office, 1972.

The labor estimates are annualized full-time equivalents of wage and salaried employees. Further, the estimates refer to work performed within the Upper Main Stem. The private sector of the economy, with the exception of agriculture, was estimated by using the quarterly report information by place of work submitted to the Colorado Department of Labor and Employment. This information was secured for 1972, 1973, and 1974

on a four-digit SIC basis. These data points were adjusted on a sector by sector basis to approximate 1977 conditions. The securing of usable data from the 1977 quarterly reports would have been an extremely expensive and time consuming process which could not be justified for the Upper Main Stem study.

No single source or agency seems to be able to provide an adequate estimate of annualized full-time equivalent employment in agriculture. Consequently, using Colorado State University farm and ranch survey data and wage rates published in the Colorado Agricultural Statistics, full-time employment equivalents were imputed. Employment by government agencies was estimated by using survey information.

Caution is exercised to the fact that employment levels as defined in the Upper Main Stem interindustry model do not approximate employment levels as defined in some commonly distributed publications. The Colorado Manpower Review, for example, publishes county estimates on the resident adjusted labor force. Aside from the definitional difference, and the fact that employment by industry is not reported for low population counties, the current method used to estimate the resident adjusted labor force is extremely questionable. The reader is referred to the January 1977 Manpower Review for a complete discussion on this matter.

NOTES

[1]Colorado Department of Natural Resources, Division of Mines, A Summary of Mineral Industry Activities in Colorado - 1977 (June 1978); and Colorado Department of Natural Resources, Division of Mines, State Coal Mine Inspection, Monthly Report; and Colorado Department of Natural Resources; Oil and Gas Conservation Commission, Oil and Gas Statistics 1977 (1977); and Colorado School of Mines Mineral Industries Bulletin, March 1975; and U.S. Department of the Interior, Bureau of Mines, Subcommittee to Expedite Energy Development. Also, U.S. Environmental Protection Agency, Socio-economic Impacts of Natural Resource Development Committee, "A Listing of Proposed, Planned, or Under Construction energy Projects in Federal Region VIII" (a joint report prepared to the Committee on Energy and Environment of the Denver Federal Executive Board and the Mountain Plains Federal Regional Council, August 1975), (photocopy reproduction).

[2]U.S. Department of the Interior, Bureau of Land Management, Final West-Central Colorado Coal Environmental Statement, 3 volumes (1979); and U.S. Department of the Interior, Bureau of Land Management, Final Environmental Statement, Federal Coal Management Program (Washington, D.C.: Government Printing Office, April 1979; and U.S. Department of the Interior, Bureau of Land Management, Final Environmental Impact Statement, Proposed Federal Coal Leasing Programs (Washington, D.C.: Government Printing Office, 1975); and U.S. department of the Interior, Office of the Secretary, Final Environmental Statement for the Prototype Oil Shale Leasing Program. 6 volumes (Washington, D.C.: Government Printing Office, 1973).

[3]Environmental Impact Assessment Project of the Institute of Ecology. A Scientific and Policy Review of the Final Environmental Impact Statement for the Prototype Oil Shale Leasing Program of the Department of the Interior. Edited by Katherine Fletcher and Malcolm F. Baldwin (Washington, D.C.: Environmental Impact Assessment Project, 1973). Researcher's assessment.

[4]Colorado General Assembly, Final Report of the Committee on Oil Shale, Coal, and Related Minerals, Legislative Council Research Publication No. 208, often referred to as the Michael L. Strang Committee Report (December 1974); and Colorado Office of the Governor, Oil Shale Planning and Coordination, Impact: an Assessment of the Impact of Oil Shale Development - Colorado Planning and Management Region II, 5 volumes, often referred to as the Donald A. Rapp Report (December 1974); and U.S. Department of the Interior, Oil Shale Environmental Advisory Panel, First Annual Report (Denver, Colorado: U.S. Department of the Interior, June 1975).

[5]See Chapter 3 for a more complete explanation of the interindustry model.

[6]The projections are consistent but the underlying assumption in the model of fixed production coefficients qualify the results unless some dynamic adjustment of technology is explicitly involved.

[7]1977 estimated population 113,200: Colorado State Planning Office.

[8]Information obtained from the Colorado Department of Labor and Employment cannot be published unless there are at least three firms in a given sector and no two firms account for more than 80 percent of the total employment. Ethical considerations also dictate that the operations of any single enterprise can never be divulged.

[9]At the county level these transfer payments are monies distributed by the various departments of social services. The State of Colorado transfer payments are confined largely to unemployment compensation insurance claims and distribution of funds from the Public Employees Retirement Association account. Federal government transfer payments include bonus payments under the food stamp program, direct payments to households under the social security program, such as disability, retirement, and survivor benefits, railroad retirement benefits, black lung benefits, veterans and military pensions, federal employee retirement benefits, medicare payments, and payments to farm operators under the agricultural stabilization and conservation program and the sugar program.

[10]Respectively, for the accounts social services, State of Colorado, and federal government these charges are $3,923,143, $4,196,822, and $56,310,000.

[11]An example would be the sale of bonds in an open market by a school district.

[12]Except in the case where rents (e.g., agricultural land leases) and royalties (e.g., oil and gas) were paid to the Colorado and federal governments. In these instances the amounts are shown as being paid directly to the respective governments.

[13]Current in the sense that it occurred in 1977.

[14]An exception to this is in the Colorado and Federal Government sectors; see the explanation of the transfer section in the appendix.

[15]U.S. Department of Commerce, Bureau of the Census, Census of Population, 1970: General Social and Economic Characteristics, Final Report, Colorado, PC (1) - C7, Washington, D.C.: Government Printing Office, Table 123.

[16]Colorado Department of Labor and Employment, Division of Employment and Training, Colorado Manpower Review, Monthly.

[17]Gray, S. Lee; McKean, John R.; and Weber, Joseph C., The Economy of Northwestern Colorado: Description and Analysis. (Bureau of Land Management Contract No. 52500-CTS01019.) Fort Collins, Colorado: Department of Economics, Colorado State University, March 1977. This is often referred to as the nine county study and many of its surveys were used in this study.

[18]For example: There were three two-digit SIC classifications incorporated in the sector delineation for construction. Accordingly the questionnaire forms were first aggregated on the basis of the two-digit categories. Regional payroll data from the Colorado Department of Labor and Employment was then aggregated on the same basis. The payroll values on the aggregated questionnaire forms represented a given proportion of the regional payroll in

each respective SIC classification; based on this ratio the information on the aggregated two-digit level questionnaire sheets was blown up to represent the total pattern for the two-digit delineation. Subsequently, the computed totals at the two-digit level were aggregated to represent the construction sector in the Upper Main Stem Colorado interindustry model.

[19]The gross flow patterns were arrived at in either one of two ways. First there was a method that used payroll data (described in the preceeding footnote) when an adequate total gross output value had not been identified. The second method distributed gross flows within the bounds of a total gross output value based on the relative allocation of the flows identified on initially aggregated questionnaire forms.

CHAPTER 3

ANALYSIS OF THE UPPER COLORADO MAIN STEM REGION OF WESTERN COLORADO

INTRODUCTION

The results of the descriptive analysis of the Upper Colorado Main Stem economy are presented in this chapter. The discussion contained in the chapter includes: the description of the economy; an analysis of the nature and magnitude of economic interdependence among processing sectors; the various business activity and income multipliers; and an analysis of employment in the region.

The description and analysis of the economy hinges on three major components of the interindustry model. These are: the gross flows or transactions table; the table of direct production requirements; and the table of direct plus indirect production requirements. These tables are discussed and interpreted in turn. Because of the size of the tables, they are presented in the appendix.

THE TRANSACTION TABLE

The first essential component of any interindustry study is the collection and tabulation of data which serve to describe the flows of commodities from each supplying sector to each purchasing sector. These flows are typically expressed in terms of the dollar value of transactions occurring in a specific period of time, normally one year. The information is arrayed in tabular form with the suppliers (selling sectors) listed at the left of the table and the purchasing sectors listed at the top. The information in this table, termed the transactions table, does two things simultaneously: it identifies

the estimated dollar value of sales by each sector to each of the other sectors (thus, the distribution of each sector's output), and it identifies the purchases of ingredients of production by each sector from each of the other sectors (the distribution of purchases). In essence, the material contained in the transactions table represents a double-entry system of bookkeeping in which every sale is simultaneously described as a purchase. Thus, the system deliberately double counts. The transactions table for the Upper Main Stem economy is found in the appendix. A description of the sector identification labels used throughout the appendix and in the tables of this chapter is also shown in the appendix.

The rows and columns of Table B-1 which are numbered 1-36, identify the processing, or intermediate demand, sectors. Row and column 38 represent subtotals of activities within the processing sector. This portion of the table describes, in dollar terms, the flow of goods and services necessary to satisfy intermediate demands. Final demands, i.e., demands for goods and services that will not be further processed within the region, are identified in columns 39-43 and 45-46. Rows 39-43 and 45-46 identify the final payments sector. Final payments include, then, federal and state taxes, wages, profits, rents, losses, net inventory depletions, and payments for goods and services imported from outside the region. The rows and columns numbered 37 and 44 (the local and county government tax account and the transfer account) are accounting devices as described previously. The last row and column of Table B-1 contain, respectively, total outlay (purchases) and total output (sales) for each sector of the regional economy.

The total distribution of total output of each sector, according to the sectors in which the output is sold, may be readily discerned by reading across the rows of Table B-1. The bill of purchases by each sector is

found by reading down any column of the table. These column entries show the allocation of purchases by cost component.

For example, consider sector 7, coal mines. Reading across row 7 of Table B-1 shows that the toal output of coal mines was distributed in the following way: $1,413 worth of output was sold to metal mining; $3,826,145 to coal mines; and $532 to other manufacturing. Total sales by coal mines to the processing sector of the economy thus amounted to $3,828,090. The remaining sales were to the final demand sectors consisting of household purchases of $43,000; exports to Colorado $15,134,000; and exports to the rest of the world $6,450,165. Total sales to final demand thus amounted to $21,627,165. The total gross output of the coal mines sector is the sum of these individual sales or $25,455,255.

The distribution of purchases by coal mines by cost category are shown in column 7 of Table B-1. Purchases by coal mines from coal mines were estimated at $3,826,145; from non-metal mining at $175,647; from food processing, $147,613; from fabricated metals, $498,196; from other manufacturing, $33,027; from transport, $2,845,991; from postal service, $1,525; from communications, $40,741; from utilities, $472,946; from water and sanitation, $13,680; from wholesale, $72,268; from gas and auto dealers, $9,620; from other trade $167; from insurance and real estate, $364,217; from medical services, $20,113; from other services, $73,807; and property and sales taxes of $147,078. Total purchases by coal mines from the processing sector are thus estimated at $8,742,781 for 1977. Final payments made by coal mines were estimated at $16,712,474. Final payments were distributed as follows: wages subject to withholding, $7,927,596; taxes and charges of the State of Colorado, $109,467; taxes and charges of the federal government, $1,626,613; profits, royalties, and rents, $1,076,414; depreciation, $1,785,586;

insurance loss pool (transfer account), $414,896; imports from Colorado, $868,116; and imports from the rest of the world, $2,903,786. Total purchases thus amount to $25,455,255 and, as required by the accounting format, equal the value of output.

Other information can be obtained directly from the transactions table. The household row, with the exception of the sale by households to the transfer account represents wages paid subject to withholding. This row shows household income. The ten leading contributors to household income in descending order are: construction, other trade, education, medical services, other services, transportation, eating and drinking es-blishments, wholesale trade, hotel and motel, and ski tows. Similarly, sector by sector contributions to taxes may be directly obtained from Table B-1. The ten sectors showing the greatest dollar outlay for local and county taxes in descending order are: households, federal government, other trade, electric utilities, communication, other services, eating and drinking establishments, wholesale trade, transportation, and gas and auto dealers.

Estimates of gross regional income and gross regional product may be obtained from the final payments and final demands portion of tne table. Gross regional product is defined as the sum of deliveries to final demand, net of imports. Traditionally, local and county government activities are included as part of final demand. Because this model treats these accounts as part of the processing sector, an adjustment is required. Also, the transfer and tax accounts cannot be counted in final demand, for to do so would be double counting. Thus, the sum of postal services, social services; education; water, sewerage, and sanitation; local roads; local government; households; state government; federal government; investment and inventory

accumulation; mining R and D; and exports from the upper main stem region, less regional imports, yields the estimated gross regional product of 1,415,120,948. Gross regional income (which must equal gross regional product) is computed as the sum of final payments less imports. Again, the local and county tax account and the transfer account must be excluded to avoid double counting.

While these items, obtained directly from the transactions table, are useful as initial indicators of the relative importance of each sector in the regional economy, the important question of interdependence is not addressed. In order to do so, it is first necessary to isolate the direct production relationships existing in the economy.

DIRECT PRODUCTION REQUIREMENTS

The direct production requirements, or coefficients, represent the second major component of the interindustry analysis. These direct requirements are presented in the appendix. Computation of the direct production requirements is quite simple, given the transactions table, and requires only that each column entry of the transactions table be divided by the respective column total. The resulting coefficients describe the direct purchases necessary from each supplier (at the left of the table) in order for the purchasing sector (at the head of the column) to produce one dollar's worth of output. The coefficients, then, are interpreted as the direct requirements per dollar of output produced by each sector.

As an example consider the coal mining sector, sector 7 (column 7 of the direct requirements table). For every dollar's worth of output produced by coal mines in the region, $.1503 worth of inputs are required from the coal mining and related services sector; $.0069 from non-metal mining;

$.0058 from food processing; $.0196 from fabricated metals; and so on down the column. It is obvious from the table that far and away the largest direct purchases made by the coal mining sector are those for labor inputs, with a direct outlay of over 31 cents per each dollar of output produced. This says that a dollar's worth of production in coal requires an input of labor services valued at 31 cents. Each column of the direct requirements table is interpreted in this manner.

These direct impacts identify only a portion of the total economic impacts that would accompany a change in final demands for the output of a given sector. There are additional, or indirect, impacts which can be quite important. Assessment of all direct and indirect impacts of these exogenous (final demand) changes is made possible through the third analytical component of interindustry analysis. This component is the table of direct plus indirect production requirements.

DIRECT PLUS INDIRECT IMPACTS

The concept of interdependence can be fairly easily established with a brief example. Suppose that the export demand for coal production increases. There will be immediate, or direct, responses of the following type: Coal production will have to increase. In order for coal production to increase, inputs must be obtained from sectors such as transportation, utilities for power, and labor. These are direct impacts. As transportation and utilities increase their output to meet the increasing requirements in the coal sector, their own requirements for productive ingredients increase, e.g. services, labor, petroleum and natural gas, and coal. The chain of events goes on. The total impacts are readily estimated through the input-output framework and are presented in the appendix.

Before proceeding to a discussion of the table, a few comments regarding the treatment of households are in order. Households may be treated as either a part of the processing sector of the economy or as a part of the final demand component. In the first instance, households are treated in precisely the same manner as any other production sector. The estimate of the direct and indirect production impacts of a change in final demand include the induced production impacts which derive from increased household incomes and increased consumption. In the latter, with households a component in final demand, the induced impacts of successive rounds of consumer spending are omitted. For purposes of this report, the discussion of economic interdependencies and the subsequent business and income multiplier analysis is based upon the model which includes households both as a member of the processing sector of the economy and as a final demand sector.

The direct plus indirect coefficients are interpreted as the production required or generated in all sectors of the economy in order to sustain the delivery of one dollar's worth of output to final demand by any single sector. It should be carefully noted that these coefficients reflect production generated per dollar of final demand as opposed to requirements per dollar of output. This, of course, reflects the fact that the model is driven by changes in final demand.

For purposes of interpretation, consider the coal mining sector. Suppose that the export demand for mined coal increases by $1 million. What is the estimated impact that this increase will have on the entire Upper Main Stem region of the Western Colorado economy? The answer to this question may be obtained directly by reading down column 7 of the table and summing the individual sector impacts. Thus, the increase of

$1 million in the final demand for coal generates a direct plus indirect production valued at $2,300 in crop agriculture ($1 million x .0023); $1,200 in the cattle industry; $400 both in dairy and in agricultural services; $1,176,900 in the coal mining sector itself, and so on down the column. Any column of this table is interpreted in this same manner. The sum of the entries in column 7 show the total production generated locally as a result of the increase in export demands for mined coal. Thus, the total business activity generated per dollar increase in final demand for coal is $2.30 or, in our example assuming a $1 million increase, $2.3 million worth of business activity results. These column sums are one of the various multipliers concepts which are derived from input-output analysis.

BUSINESS MULTIPLIERS

The column sums of the direct plus indirect requirements table are termed business activity (or production) multipliers. They identify the total value of production in the region which results from a dollar's worth of output delivered to final demand. Table 3-1 presents the business multipliers. These estimates indicate that the greatest business activity generated per dollar of delivery to final demand is the local tax account. The business multiplier for this sector is 3.27 which indicates that, as the "final demand" for local sales and property taxes increases by $1, a total production of $3.27 is generated in the Upper Main Stem economy. Other sectors of the economy which have relatively large business multipliers are: postal services, 2.54; construction, 2.53; education, 2.41; water and sanitation, 2.33; and coal mining, 2.30. These sectors show the greatest degree of interdependence with other sectors of the regional economy. At

the margin, these sectors generate the greatest business activity per dollar of output delivered to final demand. The phrase, "at the margin," is important as a qualification in the use of these multipliers. It implies a word of caution concerning the implications of the multipliers. In using the business multipliers, the argument should be stated in terms of the impacts of an equal dollar increase in final demands. That is, for an equal increase (in dollar terms) in final demands, local taxes will generate more business activity in the local economy than will any other private sector. However, a large exogenous increase in local taxes is less likely to occur than is a large increase in coal export (which indirectly changes local tax collections). The first column of Table 3-1 shows the business multipliers with households in final demand; the second column shows the business multipliers with households endogenous (part of the processing sector).

INCOME MULTIPLIERS

Other multiplier effects can also be estimated from the interindustry model. For example, there are income multipliers which relate to changes in income paid to the household sector. The following discussion presents what are termed the Type I and Type II income multipliers.

The Type I and Type II income multipliers are estimated ratios: Type I is the ratio of the direct plus indirect income to the direct income paid households; Type II is the ratio of direct plus indirect plus induced income to direct income. Thus, while the business activity multipliers are related to changes in sales to final demand, the income multipliers are related to changes in income paid to the household sector. The Type I multiplier describes the direct plus indirect income increases emanating

TABLE 3-1

BUSINESS ACTIVITY MULTIPLIERS
UPPER COLORADO MAIN STEM REGION OF WESTERN COLORADO
BY SECTOR, 1977

(In dollars of business activity generated in the upper main stem region of Western Colorado per dollar delivered to final demand.)

Sector	Business Multiplier I	Business Multiplier II
1 AG CROPS	1.448	1.713
2 CATTLE	1.787	2.164
3 SHEEP	1.642	2.091
4 DAIRY	1.782	2.106
5 AG SER, FOR	1.117	1.466
6 METAL MIN	1.239	2.067
7 COAL MINES	1.461	2.302
8 OIL/GAS PR	1.220	1.335
9 NONMET MIN	1.382	2 020
10 CONSTRUCTN	1.809	2.533
11 FOOD PROC	1.471	2.023
12 WOOD PROD	1.396	1.998
13 PRINT/PUB	1.243	1.991
14 CONCRETE	1.214	1.640
15 FAB METALS	1.163	1.677
16 ELEC MACH	1.093	1.820
17 MFG NEC	1.113	1.303
18 TRANSPORT	1.141	1.865
19 POSTAL SER	1.059	2.537
20 COMMUNICAT	1.310	2.019
21 ELEC/GS UT	1.634	2.119
22 WATER/SAN	1.604	2.327
23 WHOLESALE	1.262	1.760
24 GS/AUT DLR	1.312	2.244
25 EAT/DR	1.272	2.092
26 TRADE NEC	1.355	2.097
27 FINANCE	1.080	1.377
28 INS/R E	1.181	1.662
29 HOTEL/MOT	1.494	2.221
30 SKI TOWS	1.256	1.824
31 MEDICAL	1.150	1.860
32 EDUCATION	1.144	2.410
33 SOCIAL SER	1.036	1.363
34 SOCIAL NEC	1.208	1.831
35 LOC GOV	1.194	2.144
36 LOC ROADS	1.282	2.186
37 LOC TAXES	2.174	3.269
38 HOUSEHOLDS	-----	1.889

TABLE 3-2

INCOME MULTIPLIERS
UPPER COLORADO MAIN STEM REGION OF WESTERN COLORADO
BY SECTOR, 1977

(In dollars of income generated per dollar of direct income paid to households.)

Sector	Income Multipliers	
	Type I	Type II
1 AG CROPS	2.696181	3.202642
2 CATTLE	3.450823	4.099038
3 SHEEP	2.042057	2.425644
4 DAIRY	2.782516	3.305194
5 AG SER, FOR	1.153209	1.369832
6 METAL MIN	1.187994	1.411151
7 COAL MINES	1.430693	1.699440
8 OIL/GAS PR	1.519025	1.804365
9 NONMET MIN	1.298236	1.542101
10 CONSTRUCTN	1.848971	2.196288
11 FOOD PROC	1.286821	1.528542
12 WOOD PROD	1.347335	1.600424
13 PRINT/PUB	1.179018	1.400489
14 CONCRETE	1.283084	1.524103
15 FAB METALS	1.171956	1.392100
16 ELEC MACH	1.084391	1.288087
17 MFG NEC	1.378558	1.637511
18 TRANSPORT	1.105237	1.312849
19 POSTAL SER	1.016406	1.207332
20 COMMUNICAT	1.213036	1.440897
21 ELEC/GS UT	1.795307	2.132544
22 WATER/SAN	1.481930	1.760301
23 WHOLESALE	1.362287	1.618184
24 GS/AUT DLR	1.206375	1.432985
25 EAT/DR	1.143447	1.358237
26 TRADE NEC	1.302205	1.546816
27 FINANCE	1.169984	1.389758
28 INS/R E	1.222655	1.452323
29 HOTEL/MOT	1.356936	1.611828
30 SKI TOWS	1.231828	1.463219
31 MEDICAL	1.124010	1.335148
32 EDUCATION	1.047945	1.244795
33 SOCIAL SER	1.063971	1.263831
34 SERVICE NEC	1.184539	1.407047
35 LOC GOV	1.116691	1.326455
36 LOC ROADS	1.146226	1.361537

from an additional dollar of direct income paid to households. The Type II multiplier takes into account not only the direct plus indirect changes in income, but also the induced income increases generated by additional consumer spending. Accordingly, the Type II income multiplier identifies the direct plus indirect plus induced income generated by an additional dollar of income paid directly to households.

Attention is drawn to the comparatively higher income multiplier value estimates for the agricultural sectors. The reason for this relatively high value is straightforward. The Upper Main Stem interindustry study allocated proprietorship and partnership net incomes to the profit account. As a result, labor inputs (household account) for agriculture and livestock, are somewhat understated because this sector is characterized by a relatively high incidence of proprietorship and partnership enterprises with relatively little hired help. By understating the value (contribution) of labor inputs for this sector, the value (contribution) of other inputs, relative to labor, became larger. And, with direct income being the denominator of the Type I and Type II income multiplier ratios, the multiplier estimate for this sector is of the relatively high magnitude observed. By contrast, the relatively high multiplier values for the construction and electric and gas utilities sectors exist because these sectors exhibit greater interdependence in the Upper Main Stem economy.

EMPLOYMENT ANALYSIS

Direct employment requirements as is the case with direct business activity and direct income payments are, by themselves, of limited use for assessing the impacts of various changes in economic activity in the Upper Main Stem region. This limitation arises because direct requirements

differ from total requirements, the difference being indirect requirements that emanate from sectoral interdependence. The interindustry model provides a framework within which both direct and indirect employment requirements can be addressed. Basic to the analysis are data on employment levels in the respective sectors and the table of direct plus indirect requirements per dollar of output delivered to final demand.

Before proceeding with the analysis some discussion on the table of direct and indirect requirements per dollar of delivery to final demand is warranted. When the household sector is included as a processing sector in the interindustry model it becomes simply another producer. To treat households in this manner is consistent within the interindustry framework, but it imposes a critical assumption on household purchase patterns. Specifically, household purchases are expressed as a linear function of income; the marginal and the average propensities to consume are assumed to be one and the same. To change this limiting assumption, the household sector has to be treated as a part of final demand.

Treating the household sector in this manner removes the assumption that household purchases are a linear function of income. Specifically, because the interindustry model is a final demand driven model, treating the household sector as any other producing sector implies the level of employment was dependent only on the level of state and federal government expenditures, investment expenditures, inventory accumulation, and exports. By treating households exogenously, this assumption is expanded to include a dependency on the level of household expenditures. Direct and indirect requirements per dollar of delivery to final demand, households exogenous, which are used in the employment analysis for the Upper Main Stem region of Western Colorado are shown in the appendix. The estimated employment levels and corresponding employment coefficients (expressed as the number

of employees per dollar of total gross output) used in the analysis are presented in Table 3-3.

To assess the total employment impacts of exogenous changes in final demand, the respective tables of direct and indirect requirements per dollar of delivery to final demand, households exogenous, was pre-multiplied by a diagonal matrix of direct labor use requirements (where the elements of the diagonal were the employment coefficients shown in Table 3-3). Summing down the respective columns of the resulting matrix yielded the estimates of the direct and indirect labor requirements per dollar delivered to final demand. Table 3-4 presents the estimates.

The interpretation of the entries in Table 3-4 is demonstrated by an example from the coal mining sector. As the final demand for the output of coal expands by $1, there will be a direct expansion of employment in that sector as well as those sectors responsible for supplying production ingredients to the mining of coal sector. The sectors supplying ingredients to the mining of coal sector will in turn require production ingredients from others and this will further expand indirect employment impacts; and so forth. The magnitude of the direct and indirect employment impacts, .01831, shows the total employment generated in the entire Upper Main Stem economy as this single sector, coal mining, increases by $1,000, its deliveries to final demand. That is to say that an increase of $1 million in the final demands, e.g., exports to the Front Range or out of state, for coal would result in an estimated additional employment of 18.3 persons in the Upper Main Stem region. All remaining entries in Table 3-4 have analogous interpretations for their respective sectors. Thus, the leading sectors in terms of direct and indirect employment generation in the Upper Main Stem economy

TABLE 3-3

TOTAL EMPLOYMENT AND EMPLOYMENT COEFFICIENTS
UPPER COLORADO MAIN STEM REGION OF WESTERN COLORADO
BY SECTOR, 1977

(In number of workers in the upper main stem region of Western Colorado and workers per thousand dollars of output)

Sector	Total Employment	Workers Per Thousand $ Total Output
1 AG CROPS	134	.00912
2 CATTLE	187	.01075
3 SHEEP	269	.02167
4 DAIRY	41	.01141
5 AG SER, FOR	125	.02608
6 METAL MIN	133	.03194
7 COAL MINES	466	.01831
8 OIL/GAS PR	8	.00200
9 NONMET MIN	97	.01340
10 CONSTRUCTN	4,298	.01641
11 FOOD PROC	352	.02380
12 WOOD PROD	187	.02608
13 PRINT/PUB	226	.03866
14 CONCRETE	227	.01637
15 FAB METALS	199	.02468
16 ELEC MACH	1,449	.04843
17 MFG NEC	269	.00762
18 TRANSPORT	1,358	.02283
19 POSTAL SER	278	.04348
20 COMMUNICAT	753	.02634
21 ELEC/GS UT	366	.00867
22 WATER/SAN	257	.02564
23 WHOLESALE	1,617	.01990
24 GS/AUT DLR	1,333	.04841
25 EAT/DR	4,686	.10630
26 TRADE NEC	5,196	.03990
27 FINANCE	766	.01222
28 INS/R E	1,304	.02466
29 HOTEL/MOT	2,876	.06102
30 SKI TOWS	2,318	.04462
31 MEDICAL	2,929	.03904
32 EDUCATION	3,660	.06316
33 SOCIAL SER	104	.02088
34 SERVICE NEC	2,815	.03444
35 LOC GOV	1,018	.05383
36 LOC ROADS	338	.05110
37 LOC TAXES	--	
38 HOUSEHOLDS	392	
39 STATE GOV	605	
40 FED GOV	586	
41 INVESTMENT	--	
42 MIN R+D	523	

TABLE 3-4

DIRECT PLUS INDIRECT LABOR REQUIREMENTS PER THOUSAND DOLLARS DELIVERED TO FINAL DEMAND AND PER ADDED WORKER HIRED UPPER COLORADO MAIN STEM REGION OF WESTERN COLORADO BY SECTOR, 1977

Sector	Direct + Indirect Labor Requirement Per Thousand $ of Final Demand	Direct + Indirect Labor Requirement Per Added Worker Hired
1 AG CROPS	.01939	2.126
2 CATTLE	.02650	2.465
3 SHEEP	.03616	1.669
4 DAIRY	.02529	2.216
5 AG SER, FOR	.02863	1.098
6 METAL MIN	.03848	1.205
7 COAL MINES	.02781	1.519
8 OIL/GAS PR	.00358	1.790
9 NONMET MIN	.02179	1.626
10 CONSTRUCT	.03177	1.936
11 FOOD PROC	.03176	1.334
12 WOOD PROD	.03531	1.354
13 PRINT/PUB	.04475	1.158
14 CONCRETE	.02087	1.275
15 FAB METALS	.02805	1.137
16 ELEC MACH	.05102	1.053
17 MFG NEC	.01010	1.325
18 TRANSPORT	.02664	1.167
19 POSTAL SER	.04480	1.030
20 COMMUNICAT	.03310	1.257
21 ELEC/GS UT	.01865	2.151
22 WATER/SAN	.03820	1.490
23 WHOLESALE	.02603	1.308
24 GS/AUT DLR	.05599	1.157
25 EAT/DR	.11150	1.049
26 TRADE NEC	.04847	1.215
27 FINANCE	.01462	1.196
28 INS/R E	.03006	1.219
29 HOTEL/MOT	.07052	1.156
30 SKI TOWS	.05027	1.127
31 MEDICAL	.04336	1.111
32 EDUCATION	.06617	1.048
33 SOCIAL SER	.02192	1.050
34 SERVICE NEC	.03981	1.156
35 LOC GOV	.05930	1.102
36 LOC ROADS	.05681	1.112

are eating and drinking establishments, and hotels and motels. Table 3-4 also shows the total employment impact of exogenous changes in workers hired. This information is found simply by dividing the direct plus indirect labor requirements per thousand dollars of final demand (in Table 3-4) by the workers per thousand dollars of final demand shown in Table 3-3. The workers added per worker hired column shows that for each worker hired by coal mining, 1.52 workers are hired throughout the region's economy. Thus, the multiplier for exogenous changes in coal mine employment is 1.52.

CHAPTER 4

EXTENSIONS OF THE BASIC ANALYSIS: REGIONAL WATER REQUIREMENTS AND ANALYSIS OF EMPLOYMENT RELATED POPULATION EFFECTS

INTRODUCTION

The previous chapter presented what may be appropriately called the results of traditional applications of the Leontief interindustry model. In addition to the descriptive analysis and the attendant development of various multipliers, application of the model can be extended to other questions. The I-O technique, because of the detailed analysis of interdependence among economic sectors, is readily adaptable to an examination of, for example, resource use associated with economic activity in the region. We proceed, first, with an examination of water withdrawal and consumptive use in the regional economy. Subsequent to the water use analysis, we apply the model to the analysis of population change related to the regional economy through the sector-by-sector employment requirements. Other resource impacts, e.g., water and air quality impacts, land use, and growth of various types of energy consumption, could also be studied, providing adequate data are available.

WATER USE ANALYSIS

The water use analysis requires data pertaining to water withdrawals and consumptive use on a sector-by-sector basis. It is further required that these data be related to economic activity on a per dollar sales basis. These data, particularly for consumptive use, are difficult to obtain on a sector-by-sector basis and for a rather small regional economy. The problem

for the Upper Main Stem region of Western Colorado is narrowed somewhat simply because the most intensive water use is found in the agricultural sectors. Nonagricultural water use is quite small in relation to water use in agriculture.

Water withdrawal and consumption data for irrigated agriculture production were computed from several sources. The USDA-SCS, Special Projects Division, Denver, Colorado, has published Annual Irrigation Water Use Coefficients, 1975 National Water Assessment. This report provides, for each state, a subregional breakdown of gross diversion requirements and net depletions by crop. These estimates are in terms of acre-feet per acre of irrigated crop. We have used these requirements per acre and the estimated 1974 irrigated acreage for each crop as stated in the 1976 Colorado Agricultural Statistics[1] in order to obtain the total estimated withdrawal and consumptive use of water in irrigated agriculture. The totals were then divided by the estimated total value of output by sector in 1974 in order to obtain water use per dollar of output.

Water use in the manufacturing sectors was estimated from the four digit SIC water use data presented in the U.S. Census of Manufacturers, Water Use in Manufacturing, 1972. These data were weighted by employment share in the four digit SIC listings for the regional economy and then converted to withdrawal and consumptive use requirements per dollar output in each sector. Water use in the mining sectors was estimated from personal interview and questionnaire responses. Water use in the ski tow sector was based on a single large ski area which manufactured snow on about the average number of acres for ski tows in the region. Amounts of water used in this sector vary widely depending on location, the weather, and the technology used by the particular ski tow.

Table 4-1 presents the withdrawal and consumptive use coefficients per dollar of output for each of the processing sectors of the regional economy. These estimates may vary depending upon sources of information, particularly within certain manufacturing sectors. However, alternative water use estimates may be employed quickly and inexpensively within the analytical framework and thus, disagreement with the coefficients does not pose a serious shortcoming of the analysis. In addition, water use in irrigated agriculture and related sectors constitutes far and away the greatest pressure on the region's water supply. The detailed estimates of diversion and consumption per crop and per irrigated acre appear to be as accurate as any estimates currently available. Thus, discrepancies in the minor water using sectors will have very little impact on aggregate water use in the region. Table 4-2 presents the estimated withdrawals and consumptive use for each of the processing sectors of the regional economy in acre-feet. The agricultural crops sector accounts for some 94.8 percent of withdrawals and 98.2 percent of consumptive use by processing in the region. For the region as a whole, consumptive use by processing represents 38.1 percent of total processing withdrawals.

It should be noted that the estimates presented in Tables 4-1 and 4-2 do not include water use in the final demand/final payments sectors. In order to assess total water use, it is necessary to have some indication of requirements in the final demand sectors, e.g., households, governments, mining R and D, etc. Aggregated data generally show depletions for irrigation as a separate category of water use and a second category consisting of municipal and industrial and domestic water use. Since industrial (manufacturing) water use has been disaggregated above, as has agricultural use, the final demand use of water could be computed as a residual if estimates of total withdrawal and consumption were available.

TABLE 4-1

ESTIMATED WITHDRAWAL AND CONSUMPTIVE USE REQUIREMENTS BY SECTOR, UPPER COLORADO MAIN STEM REGION OF WESTERN COLORADO

(In Gallons Per Dollar of Output)

Sector	Withdrawal	Consumptive Use
1 AG CROPS	24,790.0	9,798.0
2 CATTLE	30.0	30.0
3 SHEEP	30.0	30.0
4 DAIRY	16.0	16.0
5 AG SER, FOR	8.0	0.8
6 METAL MIN	108.0	32.4
7 COAL MINES	1.0	0.0
8 OIL/GAS PR	27.0	6.2
9 NONMET MIN	137.0	4.8
10 CONSTRUCTN	4.0	0.4
11 FOOD PROC	6.0	0.4
12 WOOD PROD	27.0	6.2
13 PRINT/PUB	2.0	0.2
14 CONCRETE	52.0	13.0
15 FAB METALS	7.0	1.7
16 ELEC MACH	2.0	0.4
17 MFG NEC	20.0	2.6
18 TRANSPORT	2.0	0.1
19 POSTAL SER	1.0	0.1
20 COMMUNICAT	2.3	0.2
21 ELEC/GS UT	267.0	13.4
22 WATER/SAN	---	---
23 WHOLESALE	2.3	0.2
24 GS/AUT DLR	2.3	0.2
25 EAT/DR	7.0	2.1
26 TRADE NEC	4.0	0.4
27 FINANCE	2.3	0.2
28 INS/R E	8.0	0.8
29 HOTEL/MOT	2.8	0.8
30 SKI TOWS	5.6	0.3
31 MEDICAL	5.1	0.5
32 EDUCATION	6.3	3.2
33 SOCIAL SER	---	---
34 SERVICE NEC	2.3	0.2
35 LOC GOV	---	---
36 LOC ROADS	---	---
37 LOC TAXES	n.a.	n.a.

TABLE 4-2

TOTAL WATER USE BY PROCESSING SECTORS
UPPER COLORADO MAIN STEM REGION OF WESTERN COLORADO, 1977

(In Acre Feet)

Sector	Withdrawal	Consumptive Use
1 AG CROPS	1,118,000	441,878
2 CATTLE	1,602	1,602
3 SHEEP	1,143	1,143
4 DAIRY	176	176
5 AG SER, FOR	118	12
6 METAL MIN	1,380	414
7 COAL MINES	78	0
8 OIL/GAS PR	331	76
9 NONMET MIN	3,043	107
10 CONSTRUCTN	3,215	321
11 FOOD PROC	272	18
12 WOOD PROD	594	136
13 PRINT/PUB	36	4
14 CONCRETE	2,214	553
15 FAB METALS	173	42
16 ELEC MACH	184	37
17 MFG NEC	2,166	282
18 TRANSPORT	365	18
19 POSTAL SER	20	2
20 COMMUNICAT	202	18
21 ELEC/GS UT	34,574	1,735
22 WATER/SAN	0	0
23 WHOLESALE	574	50
24 GS/AUT DLR	194	17
25 EAT/DR	947	284
26 TRADE NEC	1,599	160
27 FINANCE	442	38
28 INS/R E	1,298	130
29 HOTEL/MOT	405	116
30 SKI TOWS	893	48
31 MEDICAL	1,174	115
32 EDUCATION	1,120	569
33 SOCIAL SER	0	0
34 SERVICE NEC	577	50

Estimates of total withdrawal and total consumptive use of water are useful from a purely descriptive point of view. However, the model allows also the analysis of direct and indirect water use which parallels the previous discussion of direct and indirect production. The purpose of such analysis is to isolate the effect of economic interdependence on water requirements. The specific question to be addressed is that of determining the likely impact of expanding final demand in any or all processing sectors on the regional water requirements. The key element in the assessment is the derivation of the direct plus indirect water requirements per dollar of output delivered to final demand.

The procedure is really quite simple once the direct water requirements and the table of direct plus indirect production requirements have been obtained. The matrix of direct and indirect production coefficients is premultiplied by a diagonal matrix consisting of the direct water requirements per dollar of output delivered to final demand by each sector. These requirements for the Upper Main Stem economy are shown in Table 4-3. The importance of considering indirect as well as direct water requirements in the planning perspective can be readily seen by comparing Table 4-1 and Table 4-3. Consider, for example, the direct withdrawal and consumptive use requirements for coal in Table 4-1. The direct requirements are 1.0 and 0.0 gallons for each dollar of output. However, as the final demand for the output of the coal sector expands by one dollar, there is a total direct plus indirect water requirement of 18.8 gallons (withdrawal) and 3.7 gallons (consumptive) generated throughout the economy. The indirect impacts, because of the significant interdependencies within and between coal and other sectors are far more important than the direct requirements. Applying only the direct water requirements to assumed increases in deliveries to final demand can obviously result in an understatement of water use.

TABLE 4-3

DIRECT PLUS INDIRECT WATER REQUIREMENTS,
UPPER COLORADO MAIN STEM REGION OF WESTERN COLORADO, 1977

(In Gallons Per Dollar of Output Delivered to Final Demand)

Sector	Withdrawal	Consumptive Use
1 AG CROPS	24,823.2	9,809.8
2 CATTLE	1,442.3	586.1
3 SHEEP	1,760.4	712.5
4 DAIRY	7,202.2	2,854.3
5 AG SER, FOR	145.3	53.6
6 METAL MIN	123.6	35.9
7 COAL MINES	18.8	3.7
8 OIL/GAS PR	38.9	7.6
9 NONMET MIN	145.7	5.4
10 CONSTRUCTN	17.2	2.0
11 FOOD PROC	1,147.2	452.7
12 WOOD PROD	57.0	14.7
13 PRINT/PUB	6.3	0.5
14 CONCRETE	61.3	13.5
15 FAB METALS	10.8	2.0
16 ELEC MACH	4.6	0.6
17 MFG NEC	26.4	3.0
18 TRANSPORT	3.7	0.3
19 POSTAL SER	3.6	0.3
20 COMMUNICAT	5.9	0.8
21 ELEC/GS UT	337.6	17.7
22 WATER/SAN	10.1	0.9
23 WHOLESALE	6.2	0.5
24 GS/AUT DLR	7.7	0.7
25 EAT/DR	23.9	3.2
26 TRADE NEC	15.4	1.3
27 FINANCE	4.0	0.3
28 INS/R E	11.4	1.1
29 HOTEL/MOT	22.4	2.0
30 SKI TOWS	14.0	0.9
31 MEDICAL	16.6	4.3
32 EDUCATION	28.1	9.6
33 SOCIAL SER	0.8	0.1
34 SERVICE NEC	8.3	0.7
35 LOC GOV	5.5	0.7
36 LOC ROADS	13.7	0.9
37 LOC TAXES	19.3	5.9

POPULATION ANALYSIS

A procedure to estimate population effects which accompany projections of economic growth is developed below. The essence of the method is to utilize the employment projections and/or employment multipliers discussed earlier to forecast employment change. The employment change is first converted into an age-sex distribution of immigrant workers. A labor force participation rate schedule is then used to convert the immigrant employment distribution into an immigrant employment induced population distribution. Several rather severe assumptions are required in order to make use of available historical data. First, it is assumed that unemployment in the region is initially small so that all of the employment effect is attributed to immigrant labor and population change. Second, the estimates of the labor force participation rates for the state from the 1970 Census (as reported by the Colorado Division of Planning) are assumed to apply to the immigrant population entering the region. Third, the distribution of employment related immigrants to counties averaged across counties, as estimated by Monarchi for the Colorado Division of Planning, is assumed to apply to immigrants to the region. For lack of alternative information, it is also assumed that these distributions remain constant over time. Additionally, the relative expansion among industries is assumed to have no effect on the age-sex distribution of employment generated.

The practical application of the technique is as follows: Assume, for expository purposes, that an employment change of 1,000 added workers has been projected for the region at a certain point in time. The distribution labeled S_{ij} is used to allocate this added labor force to age and sex classifications. For example, the number of added workers in the male age 15 to 19 classification would be 43.3 while 158.4 workers would be added

to the male age 20 to 24 classification and so on. Once the entire distribution of the 1,000 immigrant workers among the various age classes for both male and female workers is accomplished, this employment distribution can be converted into an employment-related immigrant population distribution. Each cell entry in this employment distribution can be converted into an induced population change by dividing it by the corresponding entry in the P_{ij} distribution. Thus, the entry for male age 15 to 19 classification which contains 43.3 workers would be divided by .436 to obtain 99.3 additional males of age 15 to 19 as part of the population change accompanying the 1,000 worker increase projected by the input-output model. Similar calculations would result in a complete distribution of the added population by sex and age classification.

The rationale for the tabulations presented below is based upon data estimated in Colorado Population Estimates--1970 to 1980: Methods and Results for the Colorado Division of Planning and the Business Research Division of the Graduate School of Business Administration, University of Colorado by David E. Monarchi. Essentially, one critical distribution is used from the Monarchi study. This is the distribution of employment-related migrants for 1970-1980. These data are estimated by utilizing a county-by-county cohort-survival model to separate population changes into natural change and change due to migration. Migration of those over 65 years of age is assumed to be unrelated to employment. (See page 25 and Appendix A of the Monarchi study.) The migration distribution is labeled M_{ij} for purposes of this discussion. Labor force participation rates are also taken from the Monarchi study, but they are essentially the same as could be found by manipulating data presented in the Census publication "Detailed Characteristics for Colorado, 1970." Three of the rates have been adjusted

TABLE 4-4

ASSUMED DISTRIBUTION OF EMPLOYMENT-RELATED MIGRANTS
(WHITE MIGRANTS) AND LABOR FORCE PARTICIPATION RATES

Age	R_{ij} Male	R_{ij} Female	S_{ij} Male	S_{ij} Female
0-4	.0124	.0129	-0-	-0-
5-9	.0348	.0349	-0-	-0-
10-14	.0568	.0523	-0-	-0-
15-19	.0533	.0539	.436	.496
20-24	.0943	.0948	.900	.544
25-29	.0577	.0851	.940	.451
30-34	.0597	.0602	.940	.451
35-39	.0455	.0398	.957	.511
40-44	.0320	.0316	.957	.511
45-49	.0187	.0187	.935	.530
50-54	.0172	.0111	.935	.530
55-59	.0060	.0063	.880	.482
60-64	.0050	.0050	.700	.368
65+	-0-	-0-	-0-	-0-
	.4934	.5066		

SOURCE: Colorado County Population Estimates -- 1970 to 1980: Methods and Results, David E. Monarchi, Business Research Division, Graduate School of Business Administration, University of Colorado, Boulder, Colorado; and Colorado Division of Planning, 617 State Services Bldg., Denver, Colorado.

TABLE 4-5

DISTRIBUTION OF EMPLOYED MIGRANTS AS A PERCENT OF TOTAL MIGRANTS AND AS A PERCENT OF EMPLOYED MIGRANTS

Age	R_{ij} Male	R_{ij} Female	S_{ij} Male	S_{ij} Female
0-4	-0-	-0-	-0-	-0-
5-9	-0-	-0-	-0-	-0-
10-14	-0-	-0-	-0-	-0-
15-19	.0232	.0267	.0433	.0498
20-24	.0849	.0516	.1584	.0963
25-29	.0542	.0384	.1012	.0717
30-34	.0561	.0272	.1047	.0508
35-39	.0435	.0203	.0812	.0379
40-44	.0306	.0161	.0571	.0300
45-49	.0175	.0099	.0327	.0185
50-54	.0161	.0059	.0300	.0110
55-59	.0053	.0030	.0099	.0056
60-64	.0035	.0018	.0065	.0034
65+	-0-	-0-	-0-	-0-
	.3349	.2009	.6250	.3750

SOURCE: See Text.

by Monarchi to account for declining college enrollments, the discharge of men from the military, and the assumption of increasingly early retirement age. The labor force participation rates are labeled P_{ij} in this discussion. Both the R_{ij} and the S_{ij} distributions are derived from the M_{ij} and P_{ij} distributions. The R_{ij} distribution is found by simply multiplying cells of the M_{ij} distribution times the corresponding cells of the P_{ij} distribution. M_{ij} is the migrant population of age i and sex j divided by the total migrant population, while P_{ij} is the number of workers of age i and sex j divided by the population of age i and sex j. The product $R_{ij} = M_{ij}P_{ij}$ is the number of workers of age i and sex j divided by the total population of migrants. The R_{ij} distribution is then converted into the S_{ij} population by defining $\sum\sum_{ij} S_{ij} = 1.0$ and noting that the number of immigrant workers is equal to (k)x(immigrant population) where $k < 1$. By summing all the entries in the $R_{i,j}$ distribution, we obtain $k = .5358$. Each entry in the R_{ij} distribution is now divided by .5358 so that the distribution is adjusted to sum to one. This implies that the original distribution of employment by age and sex as a percent of the migrant population has been converted into a distribution of workers by age and sex as a percent of migrant employment. Thus, the S_{ij} distribution is a distribution of migrant workers by age and sex as a percent of the total migrant work force.

The technique presented earlier to estimate the employment-related population change required first converting the input-output projection of total employment change into a distribution of migrant workers by age and sex. The previous discussion shows that S_{ij} is the appropriate prorating distribution to allocate migrant employment by age and sex. Once we have calculated the number of workers by age and sex (information which by itself may be useful) this distribution is converted into a population distribution

by dividing each element by the corresponding element of the P_{ij} distribution, the labor force participation rates. The result is a population distribution of employment-induced migrants.

One essential element of the population is not included in the projections discussed above; that is the age brackets too young to work, ages 1-14. These latter elements of the population of migrants can now be estimated making use of the estimated work-age population of migrants and data from table M_{ij}. Total migrant population (TMP) can be defined as TMP = work age migrants + young migrants. Work-age migrants have been estimated and can be defined as $\Sigma\Sigma_{ij} E_{ij}/P_{ij}$ where E_{ij} is the estimated workers by age and sex distribution and the P_{ij} is the labor force participation rates. The M_{ij} data shows the percentage of the TMP in each age-sex classification. The M_{ij} data for young migrants multiplied times TMP will provide the actual numbers of young migrants. We then have

$$TMP = \Sigma\Sigma E_{ij}/P_{ij} + (TMP)(.0124 + .0348 + .0568 + .0129 + .0349 + .0523),$$

where the numbers multiplied times TMP are the percentages for young migrants ages 1-14 from the M_{ij} distribution. Solving for TMP, we have

$$TMP = \frac{\Sigma\Sigma(E_{ij}/P_{ij})}{1 - .2041} = \frac{\text{(work age migrant population)}}{0.7959},$$

and once the total migrant population (TMP) is calculated, each of the age-sex entries for young migrants can be found by multiplying the appropriate M_{ij} times TMP. For example, males age 0-4 would be (.0124)(TMP) and so forth.

NOTES

[1]The exceptions are fruit agriculture and irrigated pasture. Data on acreages in fruit production and irrigated pasture were obtained from 1974 Census of Agriculture Preliminary Reports and from unpublished sources.

APPENDICES

Appendix

APPENDIX A

SECTOR IDENTIFICATION, UPPER COLORADO MAIN STEM REGION OF WESTERN COLORADO, 1977

Sector	1972 SIC Codes
1 AG CROPS	01
2 CATTLE	02 (part)
3 SHEEP	02 (part)
4 DAIRY	02 (part)
5 AG SER, FOR	07
6 METAL MIN	10
7 COAL MINES	12
8 OIL/GAS PR	13
9 NONMET MIN	14
10 CONSTRUCTN	15,16,17
11 FOOD PROC	20
12 WOOD PROD	24,25
13 PRINT/PUB	27
14 CONCRETE	32
15 FAB METALS	34,35
16 ELEC MACH	36.37,38
17 MFG NEC	22,23,29,30,31,33,39
18 TRANSPORT	40,41,42,44,45,47
19 POSTAL SER	43
20 COMMUNICAT	48
21 ELEC/GS UT	491,492,493
22 WATER/SAN	494,495,496,497
23 WHOLESALE	50,51
24 GS/AUT DLR	55
25 EAT/DR	58
26 TRADE NEC	52,53,54,56,57,59
27 FINANCE	60,61,62
28 INS/R E	63,64,65,66,67
29 HOTEL/MOT	70
30 SKI TOWS	79 (part)
31 MEDICAL	80
32 EDUCATION	82
33 SOCIAL SER	83
34 SERVICE NEC	72,73,75,76,78,81,84,86,89
35 LOC GOV	91,92,93,94,95,96
36 LOC ROADS	--
37 LOC TAXES	--
FINAL PAYMENTS SECTORS	
38 HOUSEHOLDS	
39 STATE GOV	91,92,93,94,95,96,97
40 FED GOV	91,92,93,94,95,96,97
41 PROFITS AND RENTS	
42 DEPRECIATION	
43 TRANSFER ACCOUNT	

APPENDIX A (Continued)

Sector	1972 SIC Codes
44 IMPORTS FROM COLORADO OTHER THAN THE UPPER MAIN STEM REGION	
45 IMPORTS FROM THE REST OF THE WORLD	
FINAL DEMAND SECTORS	
38 HOUSEHOLDS	
39 STATE GOV	
40 FED GOV	
41 ECONOMIC INVESTMENT	
42 MINERAL RESEARCH AND DEVELOPMENT	
43 TRANSFER ACCOUNT	
44 EXPORTS TO COLORADO OTHER THAN THE UPPER MAIN STEM REGION	
45 EXPORTS TO THE REST OF THE WORLD	

APPENDIX B

INPUT-OUTPUT TABLES FOR THE UPPER COLORADO MAIN STEM REGION OF WESTERN COLORADO, 1977

B-1 - Upper Colorado Main Stem Region of Western Colorado, Gross Flows Table, 1977 Dollars

B-2 - Upper Colorado Main Stem Region of Western Colorado, Direct Requirements Per Dollar of Output, 1977

B-3 - Upper Colorado Main Stem Region of Western Colorado, Direct and Indirect Requirements Per Dollar Delivered to Final Demand, (Households in Processing Sector), 1977

B-4 - Upper Colorado Main Stem Region of Western Colorado, Colorado Direct and Indirect Requirements Per Dollar Delivered to Final Demand, 1977 (Households in Final Demand)

APPENDIX B-1

UPPER COLORADO MAIN STEM REGION OF WESTERN COLORADO
(1977 dollars)

GROSS FLOWS TABLE (last rows show resource inputs)

		1 ag/crops	2 cattle	3 sheep	4 dairy	5 ag-ser/for	6 metal-min	7 coal/mines	8 oil/gas-pr	9 nonmet/min	10 constructn
1	ag/crops	0.	920385.	755362.	959800.	25666.	0.	0.	0.	0.	2057.
2	cattle	112632.	723057.	0.	0.	0.	0.	0.	0.	0.	0.
3	sheep	0.	0.	1109814.	0.	0.	0.	0.	0.	0.	0.
4	dairy	0.	0.	0.	268985.	0.	0.	0.	0.	0.	0.
5	ag-ser/for	1924995.	597746.	406072.	24973.	0.	0.	0.	0.	0.	0.
6	metal-min	0.	0.	0.	0.	0.	346910.	0.	0.	0.	0.
7	coal/mines	0.	0.	0.	0.	0.	1413.	3826145.	0.	0.	0.
8	oil/gas-pr	0.	0.	0.	0.	0.	0.	0.	512941.	0.	0.
9	nonmet/min	0.	0.	0.	0.	0.	0.	175647.	0.	0.	5833526.
10	constructn	29038.	0.	0.	0.	0.	0.	0.	0.	83610.	88362041.
11	food/proc	0.	388895.	529098.	26477.	0.	0.	147613.	0.	0.	0.
12	wood/prod	0.	0.	0.	0.	0.	55029.	0.	2672.	1672.	18508.
13	print/pub	0.	0.	0.	0.	4394.	146.	0.	504.	4180.	156158.
14	concrete	0.	0.	0.	0.	0.	708.	0.	0.	0.	10987532.
15	fab/metals	48266.	0.	0.	0.	0.	27679.	498196.	20038.	167220.	5070412.
16	elec/mach	0.	0.	0.	0.	0.	0.	0.	0.	83610.	0.
17	mfg/nec	62505.	744068.	498070.	52831.	51168.	40222.	33027.	18092.	79787.	1692346.
18	transport	0.	125311.	186690.	0.	10063.	63472.	2845991.	31254.	3344.	2225499.
19	postal-ser	3960.	0.	0.	0.	2625.	144.	1525.	0.	5853.	11460.
20	communicat	31478.	0.	0.	0.	18632.	1347.	40741.	0.	25083.	638779.
21	elec/gs-ut	62107.	210291.	204756.	46335.	51250.	44532.	472946.	75046.	125415.	215914.
22	water/san	712012.	0.	0.	0.	3136.	1197.	13680.	0.	1254.	17274.
23	wholesale	618636.	338408.	183661.	65712.	85548.	30554.	72268.	0.	12447.	2041213.
24	gs/aut-dlr	18206.	216730.	145076.	15388.	14904.	10964.	9620.	0.	23240.	492942.
25	eat/dr	0.	0.	0.	0.	2045.	0.	0.	0.	13114.	2150.
26	trade/nec	17242.	1284644.	637293.	307707.	3040.	69749.	167.	0.	8500.	6490903.
27	finance	843891.	3956649.	137651.	145625.	35466.	0.	0.	0.	668880.	286054.
28	ins/re	71025.	128601.	78021.	18988.	22801.	28044.	364217.	0.	879093.	1805367.
29	hotel/mot	0.	0.	0.	0.	0.	0.	0.	0.	0.	705737.
30	ski-tows	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
31	medical	0.	0.	0.	0.	2723.	3214.	20113.	0.	0.	78047.
32	education	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
33	social-ser	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
34	servic/nec	273501.	409060.	224544.	33097.	86081.	28344.	73807.	22474.	100332.	1595577.
35	loc-gov	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
36	loc-roads	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
37	loc-taxes	281414.	521408.	242999.	0.	12528.	19508.	147078.	7158.	12541.	573138.
38	subtotal	5110908.	10565253.	5339107.	1965918.	432070.	773176.	8742781.	690179.	2299175.	129302634.
39	households	763889.	1006806.	1445340.	221446.	769065.	1535958.	7927596.	160159.	1881224.	54331078.
40	state-gov	81592.	59054.	62803.	49946.	27021.	11944.	109467.	131274.	96151.	400357.
41	fed-gov	38195.	249181.	286487.	0.	236272.	236555.	1626613.	1376397.	775901.	6865112.
42	profit/rnt	5453838.	229621.	2184312.	584222.	478784.	725888.	1076414.	1472547.	1705643.	9328859.
43	deprec	938632.	2762415.	1623341.	200385.	183206.	424550.	1785586.	80287.	334440.	2928835.
44	transfers	80911.	146501.	88881.	21630.	25974.	31147.	414896.	0.	48978.	2056666.
45	imp/colo	869341.	304183.	71143.	150394.	2319558.	146841.	868116.	19763.	20582.	26742385.
46	imp/world	1338309.	2072546.	1128311.	399059.	321098.	277562.	2903786.	64608.	75855.	29927258.
47	total	14695615.	17395560.	12229725.	3593000.	4793048.	4163621.	25455255.	3995214.	7237949.	261883188.

1	EMPLOYMENT	0.1340E 03	0.1870E 03	0.2650E 03	0.4100E 02	0.1250E 03	0.1330E 03	0.4661E 03	0.7990E 01	0.9699E 02	0.4298E 04
2	WITHDRAWAL	0.3643E 12	0.5219E 09	0.3669E 09	0.5749E 08	0.3834E 08	0.4497E 09	0.2546E 08	0.1079E 09	0.9916E 09	0.1048E 10
3	CONSUMP.	0.1440E 12	0.5219E 09	0.3669E 09	0.5749E 08	0.3834E 07	0.1349E 09	0.	0.2477E 08	0.3474E 08	0.1048E 09

APPENDIX B-1 (continued)

GROSS FLOWS TABLE (last rows show resource inputs)

		11 food/proc	12 wood/prod	13 print/pub	14 concrete	15 fab/metals	16 elec/mach	17 mfg/nec	18 transport	19 postal-ser	20 communicat
1	ag/crops	377105.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2	cattle	1915126.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	sheep	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4	dairy	632141.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	ag-ser/for	6281.	1060949.	0.	0.	0.	0.	0.	0.	0.	0.
6	metal-min	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	coal/mines	0.	0.	0.	0.	0.	0.	532.	0.	0.	0.
8	oil/gas-pr	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
9	nonmet/min	507.	0.	0.	537959.	0.	0.	1269.	0.	0.	0.
10	constructn	107244.	447410.	36717.	72356.	280174.	115759.	0.	28646.	11739.	20285.
11	food/proc	128238.	0.	0.	0.	0.	0.	0.	0.	0.	0.
12	wood/prod	0.	0.	0.	2994.	3736.	0.	0.	2108.	0.	0.
13	print/pub	15627.	101.	0.	17430.	5603.	2339.	1526.	50049.	0.	24994.
14	concrete	0.	0.	0.	18057.	0.	0.	0.	0.	0.	0.
15	fab/metals	4903.	0.	0.	0.	0.	0.	380685.	2108.	0.	0.
16	elec/mach	0.	118184.	0.	0.	0.	0.	0.	1054.	0.	0.
17	mfg/nec	105601.	0.	82181.	289062.	4911.	59507.	10444.	639648.	84009.	202249.
18	transport	54082.	158218.	64721.	198101.	284221.	146198.	698219.	828965.	0.	6492.
19	postal-ser	1241.	1182.	40659.	4766.	4234.	402341.	2876.	7094.	0.	8569.
20	communicat	101844.	13777.	74850.	80041.	19425.	148621.	44379.	202718.	23133.	12497.
21	elec/gs-ut	119000.	147598.	44257.	88139.	65200.	176260.	608110.	88181.	39168.	118768.
22	water/san	10316.	0.	3194.	9835.	3412.	14530.	1385.	3786.	2258.	7790.
23	wholesale	156454.	36271.	474.	105759.	11653.	52123.	107807.	178376.	10473.	35432.
24	gs/aut-dlr	29867.	0.	23938.	84197.	1431.	17333.	3042.	185394.	24470.	76292.
25	eat/dr	23657.	0.	2318.	5218.	0.	0.	0.	13779.	0.	2036.
26	trade/nec	72968.	0.	14821.	170739.	295.	232888.	21257.	516163.	994.	16692.
27	finance	139417.	0.	243827.	227058.	91125.	50747.	73948.	154247.	0.	2931934.
28	ins/re	64494.	0.	25328.	74126.	51883.	219839.	135076.	282214.	0.	712652.
29	hotel/mot	0.	0.	5000.	0.	0.	0.	0.	0.	0.	6492.
30	ski-tows	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
31	medical	0.	101.	0.	0.	0.	0.	1523.	3163.	0.	0.
32	education	4247.	1621.	0.	0.	7471.	21749.	0.	1054.	0.	0.
33	social-ser	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
34	servic/nec	176319.	130151.	415386.	121391.	92395.	339592.	59786.	1406978.	99770.	2527.
35	loc-gov	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
36	loc-roads	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
37	loc-taxes	56904.	30865.	50641.	122581.	10888.	109913.	550608.	1279182.	0.	1900003.
38	subtotal	4303583.	2146428.	1128312.	2229809.	938057.	2109739.	2702472.	5874907.	296014.	6085704.
39	households	3359705.	1697805.	1964350.	2440488.	1874137.	10627675.	2570000.	20633653.	4920401.	8853656.
40	state-gov	37743.	33250.	78089.	141783.	18069.	155052.	76530.	1431545.	0.	337666.
41	fed-gov	331659.	506923.	172342.	796132.	158457.	1973393.	797240.	2851252.	443779.	2198320.
42	profit/rnt	381294.	271433.	489465.	1699144.	578790.	1884609.	1244648.	5300616.	202477.	3672511.
43	deprec	366172.	401533.	607911.	566836.	136169.	716153.	1051870.	3079064.	82165.	4094547.
44	transfers	72530.	0.	28854.	84443.	37828.	241116.	144931.	236229.	0.	811850.
45	imp/colo	3821477.	1113913.	444698.	4308662.	925045.	1841503.	1123793.	17322164.	300601.	2132241.
46	imp/world	2114058.	999351.	932261.	1603708.	3395838.	10372560.	25574580.	2745766.	148563.	397325.
47	total	14788221.	7170636.	5846282.	13871005.	8062390.	29921800.	35286064.	59475196.	6394000.	28583820.

1	EMPLOYMENT	0.3520E 03	0.1870E 03	0.2260E 03	0.2271E 03	0.1990E 03	0.1449E 04	0.2689E 03	0.1358E 04	0.2780E 03	0.7529E 03
2	WITHDRAWAL	0.8873E 08	0.1936E 09	0.1169E 08	0.7213E 09	0.5644E 08	0.5984E 08	0.7057E 09	0.1190E 09	0.6394E 07	0.6574E 08
3	CONSUMP.	0.5915E 07	0.4446E 08	0.1169E 07	0.1803E 09	0.1371E 08	0.1197E 08	0.9174E 08	0.5948E 07	0.6394E 06	0.5717E 07

APPENDIX B-1 (continued)

GROSS FLOWS TABLE (last rows show resource inputs)

		21 elec/gs-ut	22 water/san	23 wholesale	24 gs/aut-dlr	25 eat/dr	26 trade/nec	27 finance	28 ins/re	29 hotel/mot	30 ski-tows
1	ag/crops	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2	cattle	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	sheep	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4	dairy	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	ag-ser/for	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	metal-min	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	coal/mines	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
8	oil/gas-pr	1756037.	0.	0.	0.	0.	0.	0.	0.	0.	0.
9	nonmet/min	0.	1301.	0.	0.	0.	0.	0.	0.	0.	0.
10	constructn	36254.	121510.	740056.	100844.	384214.	536709.	31709.	270705.	1566660.	733016.
11	food/proc	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
12	wood/prod	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
13	print/pub	37843.	10268.	118168.	318361.	108582.	1325746.	550781.	667183.	222319.	232458.
14	concrete	7730.	0.	0.	0.	0.	0.	0.	0.	0.	0.
15	fab/metals	10781.	0.	0.	0.	0.	0.	0.	0.	0.	0.
16	elec/mach	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
17	mfg/nec	74663.	50869.	679082.	114362.	79708.	1026817.	24899.	407476.	120511.	205601.
18	transport	65751.	1097.	6783385.	2431894.	26728.	6806490.	34373.	84859.	17815.	90818.
19	postal-ser	33034.	10005.	112642.	25934.	13364.	252089.	189788.	18277.	27852.	0.
20	communicat	133993.	25921.	959082.	461277.	121946.	3503987.	522112.	725562.	2125184.	1353040.
21	elec/gs-ut	8383834.	192136.	571337.	295872.	2023608.	3544083.	219314.	312177.	2380699.	1065693.
22	water/san	12538.	344904.	27470.	62243.	33410.	211217.	14507.	40517.	762854.	0.
23	wholesale	59065.	130702.	167697.	23255.	171168.	150215.	18707.	116627.	1286485.	558128.
24	gs/aut-dlr	21739.	14817.	197801.	33311.	23217.	299089.	7252.	118689.	35102.	59887.
25	eat/dr	10896.	2424.	98066.	7324.	0.	26716.	23142.	356343.	6202.	47480.
26	trade/nec	19097.	74953.	76046.	29534.	28304.	116431.	59671.	162643.	665641.	12938.
27	finance	2868404.	2263695.	2404409.	769395.	2672879.	1936756.	60178.	519979.	6094660.	2325203.
28	ins/re	31409.	80554.	406053.	394387.	698105.	3270524.	297769.	216190.	433255.	633095.
29	hotel/mot	3679.	0.	0.	0.	33410.	5268.	0.	35873.	0.	0.
30	ski-tows	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
31	medical	1897.	0.	4038.	0.	0.	0.	0.	0.	0.	0.
32	education	0.	1248.	3654.	0.	0.	0.	0.	0.	0.	0.
33	social-ser	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
34	servic/nec	117473.	473551.	1868751.	750766.	190437.	2993539.	1660985.	2396205.	542099.	1777721.
35	loc-gov	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
36	loc-roads	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
37	loc-taxes	3199402.	667340.	1340732.	717185.	1486742.	6142681.	178030.	650068.	810932.	709271.
38	subtotal	16885519.	4467295.	16558469.	6535944.	8095822.	32148557.	3893217.	7099373.	17098270.	9804349.
39	households	6033112.	2589773.	15730621.	11262292.	16729687.	39308230.	8421048.	11006127.	13362518.	12680476.
40	state-gov	133462.	1132.	823440.	115792.	300188.	1066930.	296959.	100631.	117775.	992397.
41	fed-gov	739172.	286891.	7798544.	1617534.	6233794.	10081119.	3383099.	1590144.	1035337.	10756818.
42	profit/rnt	4366371.	542663.	24958965.	5474220.	6849121.	33688172.	8096106.	9406273.	3995990.	8929375.
43	deprec	2731346.	110494.	2665046.	923082.	2338696.	4315649.	441090.	1092527.	5390552.	4173351.
44	transfers	35498.	88773.	462574.	449284.	796190.	2039786.	26693394.	133233.	493562.	721219.
45	imp/colo	11080877.	455311.	3170585.	592845.	1307205.	5028980.	3432015.	21708505.	2494608.	2577587.
46	imp/world	188975.	402769.	9099153.	563789.	1430719.	2549804.	8011261.	740867.	3142555.	1304607.
47	total	42194332.	8945101.	81267397.	27534782.	44081422.	130227227.	62668189.	52877680.	47131167.	51940179.

1	EMPLOYMENT	0.3658E 03	0.2294E 03	0.1617E 04	0.1333E 04	0.4686E 04	0.5196E 04	0.7658E 03	0.1304E 04	0.2876E 04	0.2318E 04
2	WITHDRAWAL	0.1127E 11	0.	0.1869E 09	0.6333E 08	0.3086E 09	0.5209E 09	0.1441E 09	0.4230E 09	0.1320E 09	0.2909E 09
3	CONSUMP.	0.5654E 09	0.	0.1625E 08	0.5507E 07	0.9257E 08	0.5209E 08	0.1253E 08	0.4230E 08	0.3770E 08	0.1558E 08

GROSS FLOWS TABLE (last rows show resource inputs)

		31 medical	32 education	33 social-ser	34 servic/nec	35 loc-gov	36 loc-roads	37 loc-taxes	38 subtotal	39 households	40 state-gov
1	ag/crops	0.	0.	0.	0.	0.	0.	0.	3040375.	2658000.	0.
2	cattle	51899.	0.	0.	0.	0.	0.	0.	2802714.	0.	0.
3	sheep	0.	0.	0.	0.	0.	0.	0.	1109814.	0.	0.
4	dairy	0.	0.	0.	0.	0.	0.	0.	901126.	0.	0.
5	ag-ser/for	0.	0.	0.	0.	1359.	0.	0.	4022375.	105146.	2184.
6	metal-min	0.	0.	0.	0.	0.	0.	0.	346910.	0.	0.
7	coal/mines	0.	0.	0.	0.	0.	0.	0.	3828090.	43000.	0.
8	oil/gas-pr	0.	0.	0.	0.	0.	0.	0.	2268978.	0.	0.
9	nonmet/min	0.	0.	0.	2796.	2169.	124952.	0.	6680126.	425882.	131941.
10	constructn	221859.	22617.	0.	345282.	113288.	126993.	0.	94946735.	2871801.	64309287.
11	food/proc	513209.	762330.	0.	0.	16149.	0.	0.	2512009.	1682336.	0.
12	wood/prod	0.	0.	0.	0.	0.	0.	0.	86719.	0.	0.
13	print/pub	240463.	28682.	3758.	438546.	145281.	5222.	0.	4736712.	1049817.	13809.
14	concrete	0.	0.	0.	0.	7728.	7703.	0.	11029458.	2549791.	257256.
15	fab/metals	0.	0.	0.	122296.	14336.	44237.	0.	6411157.	32858.	1923.
16	elec/mach	0.	0.	0.	0.	0.	0.	0.	202848.	0.	0.
17	mfg/nec	245879.	174944.	10783.	197450.	112142.	52419.	0.	8327333.	10357971.	223668.
18	transport	77006.	95024.	3664.	625546.	18869.	2181.	0.	25096341.	5936736.	62233.
19	postal-ser	370179.	81509.	8286.	104019.	98157.	773.	0.	1844437.	2740343.	13758.
20	communicat	480653.	216096.	9300.	624109.	158859.	9353.	0.	12907819.	14015365.	53560.
21	elec/gs-ut	293134.	1026807.	7322.	1118476.	175628.	179340.	0.	24792733.	16914824.	114370.
22	water/san	70280.	186571.	242.	124822.	138625.	5450.	2693062.	5533771.	4416133.	2740.
23	wholesale	265907.	250943.	2232.	1029719.	66222.	245426.	0.	8685767.	21196686.	165955.
24	gs/aut-dlr	71619.	50957.	3127.	57513.	32644.	5555.	0.	2425353.	12296831.	63667.
25	eat/dr	652.	11279.	30.	81406.	2514.	508.	0.	739299.	12763247.	3284.
26	trade/nec	274414.	169299.	4760.	862830.	89164.	9101.	0.	12520888.	77973677.	147849.
27	finance	332299.	1897160.	0.	961503.	481431.	108978.	0.	35683448.	26984741.	0.
28	ins/re	954868.	678854.	8761.	836030.	177698.	47132.	0.	14126453.	29668737.	122181.
29	hotel/mot	0.	0.	0.	0.	0.	0.	0.	795459.	820631.	0.
30	ski-tows	0.	0.	0.	0.	0.	0.	0.	0.	9642999.	0.
31	medical	2570467.	25340.	28987.	0.	199718.	0.	426331.	3365662.	34128099.	10630052.
32	education	0.	288696.	0.	9087.	3894.	131.	28152885.	28495737.	4619853.	19632971.
33	social-ser	0.	0.	0.	0.	6484.	0.	690107.	696591.	0.	4284247.
34	servic/nec	863030.	338368.	9407.	2811563.	456866.	40731.	0.	22982604.	24812819.	1051118.
35	loc-gov	0.	0.	0.	0.	413192.	0.	13204436.	13617628.	0.	638372.
36	loc-roads	0.	0.	0.	0.	0.	0.	2861540.	2861540.	0.	3753360.
37	loc-taxes	662392.	120087.	27080.	1694455.	0.	215557.	0.	24551511.	10425885.	0.
38	subtotal	8560209.	6425563.	127739.	12047448.	2932417.	1231742.	48028361.	394976536.	331134212.	105679785.
39	households	25087404.	37086642.	810680.	22789000.	8513812.	2762017.	0.	363157876.	2458500.	7914927.
40	state-gov	488561.	4068836.	0.	257682.	214790.	20.	0.	12317931.	42378777.	799680.
41	fed-gov	1250680.	11599.	29688.	4055726.	361173.	160458.	0.	71311986.	87667141.	341532.
42	profit/rnt	30457766.	4886016.	8769.	11461715.	5705660.	1336706.	645797.	199774804.	27287036.	824106.
43	deprec	1259805.	0.	0.	3554537.	0.	0.	0.	51360272.	0.	0.
44	transfers	1087781.	773347.	3993124.	762073.	200830.	53692.	0.	43357725.	23977820.	14652937.
45	imp/colo	3392195.	1716089.	4163.	5847120.	239194.	435623.	0.	128349305.	77149358.	991779.
46	imp/world	3433694.	3005752.	6675.	20962718.	745124.	634635.	0.	143015500.	137555370.	938219.
47	total	75018095.	57973844.	4960838.	81738019.	18913000.	6614893.	48674158.	1407621952.	729608208.	132142965.

1	EMPLOYMENT	0.2929E 04	0.3662E 04	0.1040E 03	0.2815E 04	0.1018E 04	0.3380E 03	0.	0.	0.	0.
2	WITHDRAWAL	0.3826E 09	0.3652E 09	0.	0.1880E 09	0.	0.	0.	0.	0.	0.
3	CONSUMP.	0.3751E 08	0.1855E 09	0.	0.1635E 08	0.	0.	0.	0.	0.	0.

GROSS FLOWS TABLE (last rows show resource inputs)

APPENDIX B-1 (continued)

		41	42	43	44	45	46	47
		fed-gov	investment	min/r&d	transfers	exp/colo	exp/world	total
1	ag/crops	0.	0.	0.	0.	3664882.	5332358.	14695615.
2	cattle	0.	0.	0.	0.	13894350.	698496.	17395560.
3	sheep	0.	0.	0.	0.	11301911.	0.	12411725.
4	dairy	0.	0.	0.	0.	1803556.	888318.	3593000.
5	ag-ser/for	0.	0.	0.	0.	663343.	0.	4793048.
6	metal-min	0.	0.	0.	0.	2534320.	1282391.	4163621.
7	coal/mines	0.	0.	0.	0.	15134000.	6450165.	25455255.
8	oil/gas-pr	0.	0.	66369.	0.	1662867.	0.	3998214.
9	nonmet/min	0.	0.	0.	0.	0.	0.	7237949.
10	constructn	16713531.	78191670.	3175957.	1669203.	0.	0.	261878188.
11	food/proc	0.	0.	34329.	0.	4690622.	5868925.	14788221.
12	wood/prod	0.	1594253.	6866.	0.	1507498.	3975300.	7170636.
13	print/pub	2269.	0.	36617.	0.	7058.	0.	5846282.
14	concrete	11609.	0.	22886.	0.	0.	0.	13871000.
15	fab/metals	0.	0.	1616452.	0.	0.	0.	8062390.
16	elec/mach	1182000.	0.	276919.	0.	755559.	27504474.	29921800.
17	mfg/nec	359757.	0.	431691.	0.	8052420.	7533224.	35286064.
18	transport	2929984.	0.	140968.	0.	18674683.	6635251.	59476196.
19	postal-ser	1809982.	0.	3060.	0.	2420.	0.	6414000.
20	communicat	126520.	0.	164507.	0.	334752.	981297.	28583820.
21	elec/gs-ut	209907.	0.	159498.	0.	0.	0.	42191332.
22	water/san	1012.	0.	71445.	0.	0.	0.	10025101.
23	wholesale	168592.	12708216.	188172.	124638.	20374841.	17654528.	81267395.
24	gs/aut-dlr	11207.	10441755.	113743.	233534.	1750608.	198084.	27534782.
25	eat/dr	20341.	0.	4318.	0.	8768118.	21782815.	44081422.
26	trade/nec	72148.	0.	95383.	137708.	11273238.	28006336.	130227227.
27	finance	0.	0.	0.	0.	0.	0.	62668189.
28	ins/re	10887.	6599214.	2174510.	175698.	0.	0.	52877680.
29	hotel/mot	30000.	0.	8495.	0.	13051779.	32424803.	47131167.
30	ski-tows	0.	0.	0.	0.	12142030.	30160150.	51945179.
31	medical	6613000.	0.	16443.	12381828.	7488861.	394150.	75018095.
32	education	3386000.	0.	0.	0.	1152430.	666853.	57953844.
33	social-ser	0.	0.	0.	0.	0.	0.	4980838.
34	servic/nec	2420467.	0.	481274.	9225160.	16611662.	4152915.	81738019.
35	loc-gov	4657000.	0.	0.	0.	0.	0.	18913000.
36	loc-roads	0.	0.	0.	0.	0.	0.	6614900.
37	loc-taxes	7258000.	0.	60597.	0.	1778342.	4417823.	48492158.
38	subtotal	47994213.	109535108.	9350499.	23947769.	179076152.	207008660.	1408702928.
39	households	8657564.	0.	9143209.	338275140.	0.	0.	729607216.
40	state-gov	70250695.	0.	41221.	0.	1823831.	4530830.	132142965.
41	fed-gov	1615885.	0.	692487.	53079646.	0.	0.	214708680.
42	profit/rnt	8078842.	0.	255976.	-56182383.	0.	0.	180038382.
43	deprec	0.	0.	1383764.	0.	0.	0.	52744036.
44	transfers	56310000.	0.	34298.	0.	0.	243100564.	381433344.
45	imp/colo	2061448.	24948749.	26822880.	17271148.	36923396.	42890742.	357408812.
46	imp/world	19740030.	45182148.	6392074.	5042025.	55413042.	61475681.	474754096.
47	total	214708678.	179666006.	54116408.	381433344.	273236424.	559006480.	3931540480.
1	EMPLOYMENT	0.	0.	0.	0.	0.	0.	0.
2	WITHDRAWAL	0.	0.	0.	0.	0.	0.	0.
3	CONSUMP.	0.	0.	0.	0.	0.	0.	0.

APPENDIX B-2

(10)

UPPER COLORADO MAIN STEM REGION OF WESTERN COLORADO

Direct Requirements Per Dollar of Output (1977)

		1	2	3	4	5	6	7	8	9	10
		ag/crops	cattle	sheep	dairy	ag-ser/for	metal-min	coal/mines	oil/gas-pr	nonmet/min	constructn
1	ag/crops	0.	0.052909	0.061764	0.267131	0.005355	0.	0.	0.	0.	0.000008
2	cattle	0.007664	0.041566	0.	0.	0.	0.	0.	0.	0.	0.
3	sheep	0.	0.	0.090747	0.	0.	0.	0.	0.	0.	0.
4	dairy	0.	0.	0.	0.074864	0.	0.	0.	0.	0.	0.
5	ag-ser/for	0.130991	0.034362	0.033204	0.006950	0.	0.	0.	0.	0.	0.
6	metal-min	0.	0.	0.	0.	0.	0.083319	0.	0.	0.	0.
7	coal/mines	0.	0.	0.	0.	0.	0.000339	0.150309	0.	0.	0.
8	oil/gas-pr	0.	0.	0.	0.	0.	0.	0.	0.128389	0.	0.
9	nonmet/min	0.	0.	0.	0.	0.	0.	0.006900	0.	0.	0.022275
10	constructn	0.001976	0.	0.	0.	0.	0.	0.	0.	0.011552	0.337410
11	food/proc	0.	0.022356	0.043263	0.007369	0.	0.	0.005799	0.	0.	0.
12	wood/prod	0.	0.	0.	0.	0.	0.013217	0.	0.000669	0.000231	0.000071
13	print/pub	0.	0.	0.	0.	0.000917	0.000035	0.	0.000126	0.000578	0.000596
14	concrete	0.	0.	0.	0.	0.	0.000170	0.	0.	0.	0.041956
15	fab/metals	0.003284	0.	0.	0.	0.	0.006648	0.019571	0.005016	0.023103	0.019361
16	elec/mach	0.	0.	0.	0.	0.	0.	0.	0.	0.011552	0.
17	mfg/nec	0.004253	0.042773	0.040726	0.014704	0.010675	0.009660	0.001297	0.004528	0.011023	0.006462
18	transport	0.	0.007204	0.015265	0.	0.002099	0.015244	0.111804	0.007823	0.000462	0.008498
19	postal-ser	0.000269	0.	0.	0.	0.000548	0.000035	0.000060	0.	0.000809	0.000044
20	communicat	0.002142	0.	0.	0.	0.003887	0.000324	0.001600	0.	0.003465	0.002439
21	elec/gs-ut	0.004226	0.012089	0.016742	0.012896	0.010693	0.010695	0.018580	0.018784	0.017327	0.000824
22	water/san	0.048451	0.	0.	0.	0.000654	0.000287	0.000537	0.	0.000173	0.000066
23	wholesale	0.042097	0.019454	0.015018	0.018289	0.017848	0.007338	0.002839	0.	0.001720	0.007794
24	gs/aut-dlr	0.001239	0.012459	0.011863	0.004283	0.003110	0.002633	0.000378	0.	0.003211	0.001882
25	eat/dr	0.	0.	0.	0.	0.000427	0.	0.	0.	0.001812	0.000008
26	trade/nec	0.001173	0.073849	0.052110	0.065641	0.000634	0.016752	0.000007	0.	0.001174	0.024785
27	finance	0.057425	0.227452	0.011255	0.040530	0.007399	0.	0.	0.	0.092413	0.001092
28	ins/re	0.004833	0.007393	0.006380	0.005285	0.004757	0.006735	0.014308	0.	0.121456	0.006894
29	hotel/mot	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.002695
30	ski-tows	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
31	medical	0.	0.	0.	0.	0.000568	0.000772	0.000790	0.	0.	0.000298
32	education	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
33	social-ser	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
34	servic/nec	0.018611	0.023515	0.018361	0.009212	0.017960	0.006808	0.002899	0.005625	0.013862	0.006093
35	loc-gov	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
36	loc-roads	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
37	loc-taxes	0.019150	0.029974	0.019870	0.	0.002614	0.004685	0.005778	0.001792	0.001733	0.002189
38	households	0.051981	0.057877	0.118183	0.061633	0.160454	0.368900	0.311433	0.040088	0.259911	0.207463
39	state-gov	0.005552	0.003395	0.005135	0.013901	0.005638	0.002869	0.004300	0.032858	0.013284	0.001529
40	fed-gov	0.002599	0.014324	0.023425	0.	0.049295	0.056815	0.063901	0.344511	0.107199	0.026214
41	profit/rnt	0.371120	0.013200	0.178607	0.162600	0.099891	0.174341	0.042287	0.368578	0.235653	0.035622
42	deprec	0.063872	0.158800	0.132737	0.055771	0.038223	0.101967	0.070146	0.020096	0.046206	0.011184
43	transfers	0.005506	0.008422	0.007268	0.006020	0.005419	0.007481	0.016299	0.	0.006767	0.007853
44	imp/colo	0.060517	0.017486	0.005817	0.041858	0.483942	0.035268	0.034104	0.004947	0.002844	0.102116
45	imp/world	0.091069	0.119142	0.092260	0.111066	0.066992	0.066664	0.114074	0.016171	0.010480	0.114277

APPENDIX B-2 (continued)

		11 food/proc	12 wood/prod	13 print/pub	14 concrete	15 fab/metals	16 elec/mach	17 mfg/nec	18 transport	19 postal-ser	20 communicat
1	ag/crops	0.025500	0.	0.	0.	0.	0.	0.	0.	0.	0.
2	cattle	0.129503	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	sheep	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4	dairy	0.042746	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	ag-ser/for	0.000425	0.147957	0.	0.	0.	0.	0.	0.	0.	0.
6	metal-min	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	coal/mines	0.	0.	0.	0.	0.	0.	0.000015	0.	0.	0.
8	oil/gas-pr	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
9	nonmet/min	0.000034	0.	0.	0.038783	0.	0.	0.000036	0.	0.	0.
10	constructn	0.007252	0.062395	0.006280	0.005216	0.034751	0.003869	0.	0.000482	0.001836	0.000710
11	food/proc	0.008672	0.	0.	0.	0.	0.	0.	0.	0.	0.
12	wood/prod	0.	0.	0.	0.000216	0.000463	0.	0.	0.000035	0.	0.
13	print/pub	0.001057	0.000014	0.	0.001257	0.000695	0.000078	0.000043	0.000842	0.	0.000874
14	concrete	0.	0.	0.	0.001302	0.	0.	0.	0.	0.	0.
15	fab/metals	0.000332	0.	0.	0.	0.	0.	0.010789	0.000035	0.	0.
16	elec/mach	0.	0.016482	0.	0.	0.	0.	0.	0.000018	0.	0.
17	mfg/nec	0.007141	0.	0.014057	0.020839	0.000609	0.001989	0.000296	0.010755	0.013139	0.007076
18	transport	0.003657	0.022065	0.011070	0.014282	0.035253	0.004886	0.019787	0.013938	0.	0.000227
19	postal-ser	0.000084	0.000165	0.006955	0.000344	0.000525	0.013446	0.000082	0.000119	0.	0.000300
20	communicat	0.006887	0.001921	0.012803	0.005770	0.002409	0.004967	0.001258	0.003408	0.003618	0.000437
21	elec/gs-ut	0.008047	0.020584	0.007570	0.006354	0.008087	0.005891	0.017234	0.001483	0.006126	0.004155
22	water/san	0.000698	0.	0.000546	0.000709	0.000423	0.000486	0.000039	0.000064	0.000353	0.000273
23	wholesale	0.010580	0.005058	0.000081	0.007624	0.001445	0.001742	0.003055	0.002999	0.001638	0.001240
24	gs/aut-dlr	0.002020	0.	0.004095	0.006070	0.000177	0.000579	0.000086	0.003117	0.003827	0.002669
25	eat/dr	0.001600	0.	0.000396	0.000376	0.	0.	0.	0.000232	0.	0.000071
26	trade/nec	0.004934	0.	0.002535	0.012309	0.000037	0.007783	0.000602	0.008679	0.000155	0.000584
27	finance	0.009428	0.	0.041706	0.016369	0.011302	0.001696	0.002096	0.002593	0.	0.102573
28	ins/re	0.004361	0.	0.004332	0.005344	0.006435	0.007347	0.003828	0.004745	0.	0.024932
29	hotel/mot	0.	0.	0.000855	0.	0.	0.	0.	0.	0.	0.000227
30	ski-tows	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
31	medical	0.	0.000014	0.	0.	0.	0.	0.000043	0.000053	0.	0.
32	education	0.000287	0.000226	0.	0.	0.000927	0.000727	0.	0.000018	0.	0.
33	social-ser	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
34	servic/nec	0.011923	0.018151	0.071051	0.008751	0.011460	0.011349	0.001694	0.023657	0.015604	0.000088
35	loc-gov	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
36	loc-roads	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
37	loc-taxes	0.003848	0.004304	0.008662	0.008837	0.001350	0.003673	0.015604	0.021508	0.	0.066471
38	households	0.227188	0.236772	0.336000	0.175942	0.232454	0.355182	0.072833	0.346929	0.769534	0.309744
39	state-gov	0.002552	0.004637	0.013357	0.010222	0.002241	0.005182	0.002169	0.024070	0.	0.011813
40	fed-gov	0.022427	0.070694	0.029479	0.057395	0.019654	0.065952	0.022594	0.047940	0.069406	0.076908
41	profit/rnt	0.025784	0.037853	0.083722	0.122496	0.071789	0.062984	0.035273	0.089123	0.031667	0.128482
42	deprec	0.024761	0.055997	0.103982	0.040865	0.016889	0.023934	0.029810	0.051771	0.012850	0.143247
43	transfers	0.004905	0.	0.004935	0.006088	0.004692	0.008058	0.004107	0.003972	0.	0.028402
44	imp/colo	0.258414	0.155344	0.076065	0.310624	0.114736	0.061544	0.031848	0.291250	0.047013	0.074596
45	imp/world	0.142956	0.139367	0.159462	0.115616	0.421195	0.346656	0.724778	0.046167	0.023235	0.013900

APPENDIX B-2 (continued)

		21 elec/gs-ut	22 water/san	23 wholesale	24 gs/aut-dlr	25 eat/dr	26 trade/nec	27 finance	28 ins/re	29 hotel/mot	30 ski-tows
1	ag/crops	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2	cattle	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	sheep	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4	dairy	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	ag-ser/for	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	metal-min	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	coal/mines	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
8	oil/gas-pr	0.041618	0.	0.	0.	0.	0.	0.	0.	0.	0.
9	nonmet/min	0.	0.000145	0.	0.	0.	0.	0.	0.	0.	0.
10	constructn	0.000859	0.013584	0.009106	0.003662	0.008716	0.004121	0.000506	0.005119	0.033240	0.014113
11	food/proc	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
12	wood/prod	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
13	print/pub	0.000897	0.001148	0.001454	0.011562	0.002463	0.010180	0.008789	0.012617	0.004717	0.004475
14	concrete	0.000183	0.	0.	0.	0.	0.	0.	0.	0.	0.
15	fab/metals	0.000256	0.	0.	0.	0.	0.	0.	0.	0.	0.
16	elec/mach	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
17	mfg/nec	0.001770	0.005687	0.008356	0.004153	0.001808	0.007885	0.000397	0.007706	0.002557	0.003958
18	transport	0.001558	0.000123	0.083470	0.088321	0.000606	0.052266	0.000548	0.001605	0.000378	0.001749
19	postal-ser	0.000783	0.001118	0.001386	0.000942	0.000303	0.001936	0.003028	0.000346	0.000591	0.
20	communicat	0.003176	0.002898	0.011802	0.016753	0.002766	0.026907	0.008331	0.013722	0.045091	0.026050
21	elec/gs-ut	0.198696	0.021479	0.007030	0.010745	0.045906	0.027215	0.003500	0.005904	0.050512	0.020518
22	water/san	0.000297	0.038558	0.000338	0.002261	0.000758	0.001622	0.000231	0.000766	0.016186	0.
23	wholesale	0.001400	0.014612	0.002064	0.000845	0.003883	0.001153	0.000299	0.002206	0.027296	0.010746
24	gs/aut-dlr	0.000515	0.001656	0.002434	0.001210	0.000527	0.002297	0.000116	0.002245	0.000745	0.001153
25	eat/dr	0.000258	0.000271	0.001207	0.000266	0.	0.000205	0.000369	0.006739	0.000132	0.000914
26	trade/nec	0.000453	0.008379	0.000936	0.001073	0.000642	0.000894	0.000952	0.003076	0.014123	0.000249
27	finance	0.067981	0.253065	0.029586	0.027943	0.060635	0.014872	0.000960	0.009834	0.129313	0.044767
28	ins/re	0.000744	0.009005	0.004997	0.014323	0.015837	0.025114	0.004752	0.004088	0.009193	0.012189
29	hotel/mot	0.000087	0.	0.	0.	0.000758	0.000040	0.	0.000678	0.	0.
30	ski-tows	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
31	medical	0.000045	0.	0.000050	0.	0.	0.	0.	0.	0.	0.
32	education	0.	0.000140	0.000045	0.	0.	0.	0.	0.	0.	0.
33	social-ser	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
34	servic/nec	0.002784	0.052940	0.022995	0.027266	0.004320	0.022987	0.026504	0.045316	0.011502	0.034226
35	loc-gov	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
36	loc-roads	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
37	loc-taxes	0.075825	0.074604	0.016498	0.026047	0.033727	0.047170	0.002841	0.012294	0.017206	0.013656
38	households	0.142984	0.289519	0.193566	0.409021	0.379518	0.301843	0.134375	0.208143	0.283518	0.244136
39	state-gov	0.003163	0.000127	0.010132	0.004205	0.006810	0.008193	0.004739	0.001903	0.002499	0.019107
40	fed-gov	0.017518	0.032072	0.095962	0.058745	0.141415	0.077412	0.053984	0.030072	0.021967	0.207100
41	profit/rnt	0.103482	0.060666	0.307122	0.198811	0.155374	0.258688	0.129190	0.177887	0.084784	0.171917
42	deprec	0.064733	0.012352	0.032794	0.033524	0.053054	0.033139	0.007038	0.020661	0.114373	0.080349
43	transfers	0.000841	0.009924	0.005692	0.016317	0.018062	0.015663	0.425948	0.002520	0.010472	0.013886
44	imp/colo	0.262615	0.050901	0.039014	0.021531	0.029654	0.038617	0.054765	0.410542	0.052929	0.049626
45	imp/world	0.004479	0.045027	0.111966	0.020476	0.032456	0.019580	0.127836	0.014011	0.066677	0.025117

APPENDIX B-2 (continued)

		31 medical	32 education	33 social-ser	34 servic/nec	35 loc-gov	36 loc-roads	37 loc-taxes	38 households	39 state-gov	40 fed-gov
1	ag/crops	0.	0.	0.	0.	0.	0.	0.	0.003643	0.	0.
2	cattle	0.000692	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	sheep	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4	dairy	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	ag-ser/for	0.	0.	0.	0.	0.000072	0.	0.	0.000144	0.000017	0.
6	metal-min	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	coal/mines	0.	0.	0.	0.	0.	0.	0.	0.000059	0.	0.
8	oil/gas-pr	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
9	nonmet/min	0.	0.	0.	0.000034	0.000115	0.018889	0.	0.000584	0.000998	0.
10	constructn	0.002957	0.000390	0.	0.004224	0.005990	0.019198	0.	0.003936	0.486664	0.077843
11	food/proc	0.006841	0.013150	0.	0.	0.000654	0.	0.	0.002306	0.	0.
12	wood/prod	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
13	print/pub	0.003205	0.000495	0.000754	0.005365	0.007682	0.000789	0.	0.001439	0.000105	0.000011
14	concrete	0.	0.	0.	0.	0.000409	0.001164	0.	0.003495	0.001947	0.000054
15	fab/metals	0.	0.	0.	0.001496	0.000758	0.006687	0.	0.000045	0.000015	0.
16	elec/mach	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.005505
17	mfg/nec	0.003278	0.003018	0.002165	0.002416	0.005929	0.007924	0.	0.014197	0.001693	0.001676
18	transport	0.001026	0.001639	0.000736	0.007653	0.000998	0.000330	0.	0.008137	0.000471	0.013646
19	postal-ser	0.004935	0.001406	0.001664	0.001273	0.005190	0.000117	0.	0.003756	0.000104	0.008430
20	communicat	0.006407	0.003727	0.001867	0.007635	0.008399	0.001414	0.	0.019209	0.000405	0.000589
21	elec/gs-ut	0.003908	0.017712	0.001470	0.013684	0.009286	0.027112	0.	0.023183	0.000866	0.000978
22	water/san	0.000937	0.003218	0.000049	0.001527	0.007330	0.000824	0.055328	0.006053	0.000021	0.000005
23	wholesale	0.003545	0.004329	0.000448	0.012598	0.003501	0.037102	0.	0.029052	0.001256	0.000785
24	gs/aut-dlr	0.000955	0.000879	0.000628	0.000704	0.001726	0.000840	0.	0.016854	0.000482	0.000052
25	eat/dr	0.000009	0.000195	0.000006	0.000996	0.000133	0.000077	0.	0.017493	0.000025	0.000095
26	trade/nec	0.003658	0.002920	0.000956	0.010556	0.004714	0.001376	0.	0.106871	0.001119	0.000336
27	finance	0.004430	0.032724	0.	0.011763	0.025455	0.016475	0.	0.036985	0.	0.
28	ins/re	0.012729	0.011710	0.001759	0.010228	0.009396	0.007125	0.	0.040664	0.000925	0.000051
29	hotel/mot	0.	0.	0.	0.	0.	0.	0.	0.001125	0.	0.000140
30	ski-tows	0.	0.	0.	0.	0.	0.	0.	0.013217	0.	0.
31	medical	0.034265	0.000437	0.005820	0.	0.010560	0.	0.008759	0.046776	0.080444	0.030800
32	education	0.	0.004980	0.	0.000111	0.000206	0.000020	0.578395	0.006332	0.148574	0.015770
33	social-ser	0.	0.	0.	0.	0.000343	0.	0.014178	0.	0.032421	0.
34	servic/nec	0.011504	0.005837	0.001889	0.034397	0.024156	0.006157	0.	0.034008	0.007954	0.011273
35	loc-gov	0.	0.	0.	0.	0.021847	0.	0.271282	0.	0.004831	0.021690
36	loc-roads	0.	0.	0.	0.	0.	0.	0.058790	0.	0.028404	0.
37	loc-taxes	0.008830	0.002071	0.005437	0.020730	0.	0.032587	0.	0.014290	0.	0.033804
38	households	0.334418	0.639713	0.162760	0.278805	0.450157	0.417545	0.	0.003370	0.059897	0.040322
39	state-gov	0.006513	0.070184	0.	0.003153	0.011357	0.000003	0.	0.058084	0.006052	0.327191
40	fed-gov	0.016672	0.000200	0.005960	0.049619	0.019097	0.024257	0.	0.120156	0.002585	0.007526
41	profit/rnt	0.406006	0.084280	0.001761	0.140225	0.301679	0.202075	0.013268	0.037400	0.006236	0.037627
42	deprec	0.016793	0.	0.	0.043487	0.	0.	0.	0.	0.	0.
43	transfers	0.014500	0.013340	0.801697	0.009323	0.010619	0.008117	0.	0.032864	0.110887	0.262262
44	imp/colo	0.045218	0.029601	0.000836	0.071535	0.012647	0.065855	0.	0.105741	0.007505	0.009601
45	imp/world	0.045772	0.051847	0.001340	0.256462	0.039397	0.095940	0.	0.188533	0.007100	0.091939

		41	42	43	44	45
		investment	min/rkd	transfers	exp/colo	exp/world
1	ag/crops	0.	0.	0.	0.013413	0.009539
2	cattle	0.	0.	0.	0.050851	0.001250
3	sheep	0.	0.	0.	0.041363	0.
4	dairy	0.	0.	0.	0.006601	0.001589
5	ag-ser/for	0.	0.	0.	0.002428	0.
6	metal-min	0.	0.	0.	0.009275	0.002294
7	coal/mines	0.	0.	0.	0.055388	0.011539
8	oil/gas-pr	0.	0.001226	0.	0.006086	0.
9	nonmet/min	0.	0.	0.	0.	0.
10	constructn	0.435206	0.058688	0.004376	0.	0.
11	food/proc	0.	0.000634	0.	0.017167	0.010499
12	wood/prod	0.008873	0.000127	0.	0.005517	0.007111
13	print/pub	0.	0.000677	0.	0.000026	0.
14	concrete	0.	0.000423	0.	0.	0.
15	fab/metals	0.	0.029870	0.	0.	0.
16	elec/mach	0.	0.005117	0.	0.002765	0.049202
17	mfg/nec	0.	0.007977	0.	0.029471	0.013476
18	transport	0.	0.002605	0.	0.068346	0.011870
19	postal-ser	0.	0.000057	0.	0.000009	0.
20	communicat	0.	0.003040	0.	0.001225	0.001755
21	elec/gs-ut	0.	0.002947	0.	0.	0.
22	water/san	0.	0.001320	0.	0.	0.
23	wholesale	0.070732	0.003477	0.000327	0.074569	0.031582
24	gs/aut-dlr	0.058118	0.002102	0.000612	0.006407	0.000354
25	eat/dr	0.	0.000080	0.	0.032090	0.038967
26	trade/nec	0.	0.001763	0.000361	0.041258	0.050100
27	finance	0.	0.	0.	0.	0.
28	ins/re	0.036730	0.040182	0.000461	0.	0.
29	hotel/mot	0.	0.000157	0.	0.047767	0.058004
30	ski-tows	0.	0.	0.	0.044438	0.053953
31	medical	0.	0.000304	0.032461	0.027408	0.000705
32	education	0.	0.	0.	0.004218	0.001193
33	social-ser	0.	0.	0.	0.	0.
34	servic/nec	0.	0.008893	0.024186	0.060796	0.007429
35	loc-gov	0.	0.	0.	0.	0.
36	loc-roads	0.	0.	0.	0.	0.
37	loc-taxes	0.	0.001120	0.	0.006508	0.007903
38	households	0.	0.168954	0.886853	0.	0.
39	state-gov	0.	0.000762	0.	0.006675	0.008105
40	fed-gov	0.	0.012796	0.139158	0.	0.
41	profit/rnt	0.	0.004730	-0.147293	0.	0.
42	deprec	0.	0.025570	0.	0.	0.
43	transfers	0.	0.000634	0.	0.	0.434880
44	imp/colo	0.138862	0.495652	0.045280	0.135134	0.076727
45	imp/world	0.251479	0.118117	0.013219	0.202803	0.109973

DIRECT INPUT COEFFICIENTS SUMMED DOWN COLUMNS

1	ag/crops	1.000000
2	cattle	1.000000
3	sheep	1.000000
4	dairy	1.000000

APPENDIX B-3

UPPER COLORADO MAIN STEM REGION OF WESTERN COLORADO (Households in Processing Sector)

Direct and Indirect Requirements Per Dollar Delivered to Final Demand (1977)

		1	2	3	4	5	6	7	8	9	10
		ag/crops	cattle	sheep	dairy	ag-ser/for	metal-min	coal/mines	oil/gas-pr	nonmet/min	constructn
1	ag/crops	1.002	0.057	0.071	0.290	0.006	0.002	0.002	0.000	0.002	0.002
2	cattle	0.008	1.047	0.007	0.004	0.000	0.000	0.001	0.000	0.000	0.000
3	sheep	0.	0.	1.100	0.	0.	0.	0.	0.	0.	0.
4	dairy	0.000	0.001	0.002	1.081	0.000	0.000	0.000	0.000	0.000	0.000
5	ag-ser/for	0.132	0.044	0.046	0.046	1.001	0.002	0.000	0.000	0.000	0.000
6	metal-min	0.	0.	0.	0.	0.	1.091	0.	0.	0.	0.
7	coal/mines	0.000	0.000	0.000	0.000	0.000	0.000	1.177	0.000	0.000	0.000
8	oil/gas-pr	0.001	0.002	0.002	0.002	0.001	0.002	0.002	1.149	0.002	0.001
9	nonmet/min	0.000	0.000	0.000	0.000	0.000	0.001	0.009	0.000	1.001	0.037
10	constructn	0.007	0.005	0.005	0.005	0.003	0.007	0.007	0.001	0.024	1.517
11	food/proc	0.001	0.025	0.049	0.009	0.001	0.002	0.009	0.000	0.001	0.001
12	wood/prod	0.000	0.000	0.000	0.000	0.000	0.014	0.000	0.001	0.000	0.000
13	print/pub	0.002	0.005	0.003	0.003	0.002	0.003	0.003	0.001	0.005	0.004
14	concrete	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.000	0.002	0.065
15	fab/metals	0.004	0.001	0.001	0.001	0.000	0.008	0.024	0.006	0.024	0.031
16	elec/mach	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.012	0.000
17	mfg/nec	0.010	0.052	0.052	0.023	0.015	0.020	0.013	0.007	0.019	0.020
18	transport	0.009	0.022	0.030	0.013	0.009	0.030	0.145	0.011	0.011	0.028
19	postal-ser	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.000	0.003	0.002
20	communicat	0.009	0.012	0.011	0.010	0.010	0.015	0.017	0.002	0.017	0.018
21	elec/gs-ut	0.017	0.033	0.040	0.033	0.023	0.036	0.049	0.030	0.040	0.023
22	water/san	0.054	0.008	0.008	0.018	0.003	0.006	0.006	0.001	0.004	0.005
23	wholesale	0.051	0.033	0.031	0.040	0.025	0.025	0.021	0.002	0.015	0.027
24	gs/aut-dlr	0.005	0.018	0.019	0.009	0.007	0.012	0.010	0.001	0.011	0.012
25	eat/dr	0.003	0.005	0.005	0.004	0.004	0.009	0.010	0.001	0.010	0.008
26	trade/nec	0.021	0.105	0.089	0.116	0.025	0.075	0.059	0.008	0.046	0.088
27	finance	0.086	0.263	0.041	0.082	0.022	0.030	0.033	0.006	0.119	0.034
28	ins/re	0.016	0.025	0.024	0.021	0.016	0.033	0.044	0.004	0.143	0.039
29	hotel/mot	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.001	0.005
30	ski-tows	0.002	0.003	0.004	0.003	0.003	0.007	0.007	0.001	0.005	0.006
31	medical	0.009	0.012	0.014	0.010	0.011	0.026	0.027	0.004	0.020	0.023
32	education	0.020	0.031	0.025	0.014	0.008	0.017	0.020	0.004	0.014	0.016
33	social-ser	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
34	servic/nec	0.037	0.051	0.042	0.034	0.030	0.034	0.033	0.011	0.043	0.035
35	loc-gov	0.009	0.014	0.011	0.006	0.003	0.007	0.008	0.002	0.005	0.006
36	loc-roads	0.002	0.003	0.002	0.001	0.001	0.001	0.002	0.000	0.001	0.001
37	loc-taxes	0.032	0.050	0.041	0.022	0.012	0.024	0.029	0.007	0.019	0.022
38	households	0.169	0.238	0.276	0.205	0.220	0.521	0.530	0.072	0.401	0.456

APPENDIX B-3 (continued)

		11 food/proc	12 wood/prod	13 print/pub	14 concrete	15 fab/metals	16 elec/mach	17 mfg/nec	18 transport	19 postal-ser	20 communicat
1	ag/crops	0.047	0.002	0.002	0.001	0.001	0.002	0.000	0.002	0.004	0.002
2	cattle	0.137	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3	sheep	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4	dairy	0.047	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5	ag-ser/for	0.012	0.148	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000
6	metal-min	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	coal/mines	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8	oil/gas-pr	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.001
9	nonmet/min	0.001	0.003	0.001	0.039	0.002	0.001	0.000	0.001	0.001	0.001
10	constructn	0.015	0.098	0.015	0.012	0.056	0.010	0.002	0.005	0.012	0.006
11	food/proc	1.013	0.001	0.002	0.001	0.001	0.001	0.001	0.002	0.003	0.002
12	wood/prod	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
13	print/pub	0.004	0.002	1.003	0.003	0.003	0.002	0.001	0.003	0.004	0.004
14	concrete	0.002	0.005	0.002	1.003	0.003	0.002	0.001	0.002	0.004	0.002
15	fab/metals	0.001	0.002	0.001	0.001	1.001	0.000	0.011	0.000	0.001	0.000
16	elec/mach	0.000	0.017	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
17	mfg/nec	0.021	0.009	0.023	0.027	0.007	0.010	1.003	0.019	0.029	0.015
18	transport	0.015	0.032	0.022	0.022	0.043	0.015	0.023	1.025	0.019	0.010
19	postal-ser	0.002	0.002	0.009	0.002	0.002	0.016	0.001	0.002	1.004	0.003
20	communicat	0.018	0.013	0.026	0.014	0.011	0.017	0.005	0.016	0.028	1.014
21	elec/gs-ut	0.029	0.043	0.030	0.021	0.023	0.026	0.027	0.021	0.044	0.025
22	water/san	0.007	0.004	0.006	0.004	0.004	0.005	0.002	0.006	0.009	0.009
23	wholesale	0.028	0.021	0.016	0.017	0.012	0.016	0.007	0.018	0.031	0.016
24	gs/aut-dlr	0.010	0.008	0.013	0.011	0.006	0.009	0.002	0.011	0.020	0.011
25	eat/dr	0.008	0.007	0.009	0.005	0.006	0.008	0.002	0.009	0.017	0.008
26	trade/nec	0.058	0.044	0.055	0.042	0.037	0.058	0.014	0.059	0.101	0.050
27	finance	0.069	0.025	0.071	0.037	0.030	0.028	0.011	0.029	0.050	0.131
28	ins/re	0.024	0.021	0.029	0.024	0.023	0.030	0.010	0.027	0.044	0.048
29	hotel/mot	0.000	0.001	0.001	0.000	0.001	0.001	0.000	0.001	0.001	0.001
30	ski-tows	0.005	0.005	0.006	0.004	0.004	0.006	0.002	0.006	0.012	0.006
31	medical	0.017	0.019	0.023	0.013	0.016	0.022	0.006	0.023	0.045	0.023
32	education	0.016	0.014	0.019	0.014	0.011	0.015	0.013	0.025	0.023	0.051
33	social-ser	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001
34	servic/nec	0.037	0.041	0.098	0.025	0.029	0.034	0.009	0.047	0.059	0.026
35	loc-gov	0.007	0.006	0.008	0.006	0.004	0.005	0.006	0.010	0.008	0.023
36	loc-roads	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.002	0.002	0.005
37	loc-taxes	0.024	0.020	0.027	0.020	0.014	0.019	0.022	0.037	0.029	0.082
38	households	0.348	0.379	0.471	0.268	0.324	0.458	0.119	0.456	0.930	0.447

APPENDIX B-3 (continued)

		21 elec/gs-ut	22 water/san	23 wholesale	24 gs/aut-dlr	25 eat/dr	26 trade/nec	27 finance	28 ins/re	29 hotel/mot	30 ski-tows
1	ag/crops	0.001	0.002	0.001	0.002	0.002	0.002	0.001	0.001	0.002	0.001
2	cattle	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3	sheep	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4	dairy	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5	ag-ser/for	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6	metal-min	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	coal/mines	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8	oil/gas-pr	0.060	0.003	0.001	0.002	0.004	0.003	0.001	0.001	0.004	0.002
9	nonmet/min	0.000	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.002	0.001
10	constructn	0.005	0.028	0.017	0.012	0.019	0.012	0.003	0.011	0.056	0.025
11	food/proc	0.002	0.002	0.001	0.002	0.002	0.002	0.001	0.001	0.002	0.001
12	wood/prod	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
13	print/pub	0.004	0.007	0.004	0.015	0.006	0.013	0.010	0.015	0.009	0.007
14	concrete	0.002	0.003	0.002	0.003	0.003	0.002	0.001	0.002	0.004	0.002
15	fab/metals	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001
16	elec/mach	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
17	mfg/nec	0.008	0.016	0.015	0.016	0.011	0.018	0.004	0.014	0.012	0.011
18	transport	0.009	0.014	0.092	0.102	0.012	0.064	0.005	0.009	0.014	0.011
19	postal-ser	0.003	0.005	0.003	0.004	0.003	0.005	0.004	0.002	0.003	0.002
20	communicat	0.013	0.020	0.021	0.033	0.017	0.041	0.014	0.023	0.060	0.037
21	elec/gs-ut	1.264	0.052	0.023	0.038	0.079	0.054	0.012	0.021	0.084	0.041
22	water/san	0.009	1.050	0.005	0.010	0.008	0.009	0.002	0.005	0.023	0.004
23	wholesale	0.012	0.033	1.013	0.020	0.021	0.017	0.007	0.013	0.043	0.023
24	gs/aut-dlr	0.006	0.011	0.008	1.012	0.010	0.011	0.004	0.008	0.009	0.008
25	eat/dr	0.006	0.010	0.007	0.011	1.009	0.009	0.004	0.012	0.009	0.006
26	trade/nec	0.034	0.066	0.037	0.066	0.057	1.053	0.022	0.037	0.066	0.040
27	finance	0.106	0.299	0.050	0.065	0.095	0.049	1.013	0.031	0.171	0.071
28	ins/re	0.017	0.037	0.022	0.044	0.042	0.050	0.014	1.020	0.035	0.031
29	hotel/mot	0.000	0.001	0.000	0.001	0.001	0.001	0.000	0.001	1.001	0.001
30	ski-tows	0.004	0.007	0.004	0.008	0.007	0.006	0.002	0.004	0.006	1.005
31	medical	0.016	0.026	0.016	0.029	0.026	0.024	0.009	0.015	0.023	0.018
32	education	0.064	0.062	0.020	0.033	0.035	0.043	0.007	0.017	0.028	0.020
33	social-ser	0.002	0.001	0.000	0.001	0.001	0.001	0.000	0.000	0.001	0.000
34	servic/nec	0.022	0.091	0.042	0.061	0.032	0.051	0.037	0.063	0.041	0.055
35	loc-gov	0.029	0.028	0.009	0.014	0.015	0.019	0.003	0.007	0.012	0.008
36	loc-roads	0.006	0.006	0.002	0.003	0.003	0.004	0.001	0.001	0.003	0.002
37	loc-taxes	0.106	0.100	0.031	0.050	0.055	0.069	0.010	0.025	0.043	0.030
38	households	0.305	0.512	0.313	0.587	0.516	0.467	0.187	0.303	0.458	0.357

APPENDIX B-3 (continued)

		31 medical	32 education	33 social-ser	34 servic/nec	35 loc-gov	36 loc-roads	37 loc-taxes	38 households
1	ag/crops	0.002	0.004	0.001	0.001	0.002	0.002	0.003	0.004
2	cattle	0.002	0.002	0.000	0.000	0.000	0.000	0.001	0.001
3	sheep	0.	0.	0.	0.	0.	0.	0.	0.
4	dairy	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000
5	ag-ser/for	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.001
6	metal-min	0.	0.	0.	0.	0.	0.	0.	0.
7	coal/mines	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8	oil/gas-pr	0.001	0.003	0.000	0.002	0.002	0.003	0.002	0.002
9	nonmet/min	0.001	0.001	0.000	0.001	0.001	0.020	0.002	0.001
10	constructn	0.009	0.009	0.002	0.011	0.016	0.036	0.013	0.011
11	food/proc	0.009	0.016	0.001	0.001	0.003	0.002	0.010	0.004
12	wood/prod	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
13	print/pub	0.006	0.005	0.002	0.008	0.011	0.004	0.007	0.005
14	concrete	0.002	0.003	0.001	0.002	0.003	0.005	0.003	0.005
15	fab/metals	0.000	0.001	0.000	0.002	0.001	0.008	0.001	0.001
16	elec/mach	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
17	mfg/nec	0.012	0.017	0.006	0.010	0.017	0.019	0.017	0.020
18	transport	0.011	0.018	0.005	0.018	0.014	0.016	0.016	0.023
19	postal-ser	0.007	0.005	0.003	0.003	0.008	0.003	0.006	0.006
20	communicat	0.019	0.025	0.007	0.019	0.025	0.017	0.024	0.030
21	elec/gs-ut	0.023	0.054	0.010	0.034	0.036	0.058	0.047	0.045
22	water/san	0.006	0.011	0.002	0.007	0.013	0.008	0.069	0.010
23	wholesale	0.018	0.030	0.007	0.026	0.023	0.056	0.029	0.037
24	gs/aut-dlr	0.009	0.015	0.004	0.008	0.013	0.011	0.014	0.021
25	eat/dr	0.008	0.015	0.004	0.008	0.011	0.011	0.013	0.021
26	trade/nec	0.053	0.090	0.023	0.054	0.071	0.064	0.080	0.129
27	finance	0.031	0.079	0.012	0.038	0.063	0.054	0.083	0.062
28	ins/re	0.035	0.050	0.012	0.030	0.039	0.038	0.045	0.056
29	hotel/mot	0.001	0.001	0.000	0.001	0.001	0.001	0.001	0.001
30	ski-tows	0.006	0.011	0.003	0.005	0.008	0.008	0.009	0.016
31	medical	1.057	0.039	0.016	0.019	0.040	0.028	0.046	0.058
32	education	0.017	1.027	0.008	0.024	0.017	0.035	0.604	0.028
33	social-ser	0.000	0.000	1.000	0.001	0.001	0.001	0.015	0.001
34	servic/nec	0.035	0.045	0.012	1.057	0.056	0.036	0.049	0.055
35	loc-gov	0.007	0.008	0.003	0.010	1.028	0.015	0.286	0.010
36	loc-roads	0.001	0.002	0.001	0.002	0.001	1.003	0.061	0.002
37	loc-taxes	0.025	0.029	0.012	0.037	0.022	0.054	1.032	0.035
38	households	0.447	0.797	0.206	0.393	0.598	0.569	0.692	1.188

UPPER COLORADO MAIN STEM REGION OF WESTERN COLORADO (Households in Final Demand)

Direct and Indirect Requirements Per Dollar Delivered to Final Demand, 1977

		1	2	3	4	5	6	7	8	9	10
		ag/crops	cattle	sheep	dairy	ag-ser/for	metal-min	coal/mines	oil/gas-pr	nonmet/min	constructn
1	ag/crops	1.001	0.057	0.070	0.289	0.005	0.000	0.000	0.000	0.000	0.000
2	cattle	0.008	1.047	0.007	0.003	0.000	0.000	0.001	0.000	0.000	0.000
3	sheep	0.	0.	1.100	0.	0.	0.	0.	0.	0.	0.
4	dairy	0.000	0.001	0.002	1.081	0.000	0.000	0.000	0.000	0.000	0.000
5	ag-ser/for	0.131	0.043	0.046	0.046	1.001	0.002	0.000	0.000	0.000	0.000
6	metal-min	0.	0.	0.	0.	0.	1.091	0.	0.	0.	0.
7	coal/mines	0.000	0.000	0.000	0.000	0.000	0.000	1.177	0.000	0.000	0.000
8	oil/gas-pr	0.001	0.001	0.001	0.001	0.001	0.001	0.001	1.149	0.001	0.000
9	nonmet/min	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.000	1.000	0.036
10	constructn	0.005	0.002	0.002	0.003	0.001	0.002	0.002	0.001	0.020	1.513
11	food/proc	0.000	0.024	0.048	0.008	0.000	0.000	0.007	0.000	0.000	0.000
12	wood/prod	0.000	0.000	0.000	0.000	0.000	0.014	0.000	0.001	0.000	0.000
13	print/pub	0.001	0.004	0.002	0.002	0.001	0.001	0.001	0.000	0.003	0.002
14	concrete	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.064
15	fab/metals	0.004	0.001	0.001	0.001	0.000	0.007	0.023	0.006	0.024	0.030
16	elec/mach	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.012	0.000
17	mfg/nec	0.007	0.047	0.048	0.019	0.011	0.011	0.004	0.005	0.013	0.012
18	transport	0.005	0.017	0.025	0.009	0.005	0.020	0.135	0.010	0.003	0.019
19	postal-ser	0.001	0.001	0.000	0.001	0.001	0.000	0.000	0.000	0.001	0.000
20	communicat	0.005	0.006	0.004	0.005	0.005	0.001	0.003	0.000	0.007	0.006
21	elec/gs-ut	0.011	0.024	0.030	0.025	0.015	0.017	0.029	0.027	0.025	0.006
22	water/san	0.052	0.006	0.006	0.016	0.001	0.001	0.002	0.000	0.001	0.001
23	wholesale	0.046	0.025	0.022	0.034	0.019	0.009	0.004	0.000	0.003	0.013
24	gs/aut-dlr	0.002	0.014	0.014	0.006	0.003	0.003	0.001	0.000	0.004	0.004
25	eat/dr	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.003	0.000
26	trade/nec	0.003	0.079	0.059	0.094	0.001	0.019	0.002	0.000	0.003	0.039
27	finance	0.078	0.250	0.026	0.072	0.011	0.003	0.005	0.002	0.098	0.010
28	ins/re	0.008	0.013	0.011	0.011	0.006	0.008	0.019	0.000	0.124	0.017
29	hotel/mot	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
30	ski-tows	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
31	medical	0.000	0.001	0.000	0.000	0.001	0.001	0.001	0.000	0.000	0.001
32	education	0.016	0.025	0.019	0.009	0.003	0.005	0.008	0.003	0.004	0.005
33	social-ser	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
34	servic/nec	0.029	0.040	0.029	0.024	0.020	0.010	0.009	0.007	0.024	0.014
35	loc-gov	0.007	0.012	0.009	0.004	0.002	0.002	0.004	0.001	0.002	0.002
36	loc-roads	0.002	0.003	0.002	0.001	0.000	0.001	0.001	0.000	0.000	0.000
37	loc-taxes	0.027	0.043	0.032	0.016	0.006	0.009	0.013	0.005	0.007	0.008

APPENDIX B-4 (continued)

		11 food/proc	12 wood/prod	13 print/pub	14 concrete	15 fab/metals	16 elec/mach	17 mfg/nec	18 transport	19 postal-ser	20 communicat
1	ag/crops	0.046	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2	cattle	0.137	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3	sheep	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4	dairy	0.047	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5	ag-ser/for	0.011	0.148	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6	metal-min	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	coal/mines	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8	oil/gas-pr	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.000	0.000	0.000
9	nonmet/min	0.000	0.002	0.000	0.039	0.001	0.000	0.000	0.000	0.000	0.000
10	constructn	0.012	0.095	0.010	0.009	0.053	0.006	0.001	0.001	0.003	0.002
11	food/proc	1.012	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
12	wood/prod	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
13	print/pub	0.002	0.001	1.001	0.002	0.001	0.000	0.000	0.001	0.000	0.002
14	concrete	0.001	0.004	0.000	1.002	0.002	0.000	0.000	0.000	0.000	0.000
15	fab/metals	0.001	0.002	0.000	0.001	1.001	0.000	0.011	0.000	0.000	0.000
16	elec/mach	0.000	0.017	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
17	mfg/nec	0.015	0.003	0.015	0.022	0.002	0.003	1.001	0.011	0.013	0.008
18	transport	0.008	0.025	0.013	0.017	0.037	0.006	0.021	1.016	0.001	0.001
19	postal-ser	0.000	0.001	0.007	0.001	0.001	0.014	0.000	0.000	1.000	0.001
20	communicat	0.009	0.004	0.014	0.007	0.003	0.006	0.002	0.004	0.004	1.002
21	elec/gs-ut	0.016	0.029	0.012	0.011	0.011	0.008	0.022	0.004	0.008	0.008
22	water/san	0.004	0.001	0.002	0.002	0.001	0.001	0.001	0.002	0.001	0.005
23	wholesale	0.017	0.009	0.001	0.008	0.002	0.002	0.003	0.004	0.002	0.002
24	gs/aut-dlr	0.004	0.001	0.004	0.006	0.000	0.001	0.000	0.003	0.004	0.003
25	eat/dr	0.002	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000
26	trade/nec	0.020	0.003	0.004	0.013	0.002	0.008	0.001	0.009	0.000	0.001
27	finance	0.050	0.005	0.046	0.023	0.013	0.004	0.005	0.005	0.002	0.107
28	ins/re	0.008	0.003	0.006	0.011	0.008	0.008	0.004	0.006	0.000	0.027
29	hotel/mot	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
30	ski-tows	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
31	medical	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
32	education	0.008	0.005	0.008	0.007	0.003	0.004	0.011	0.014	0.001	0.040
33	social-ser	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
34	servic/nec	0.021	0.024	0.076	0.012	0.014	0.013	0.003	0.026	0.017	0.006
35	loc-gov	0.004	0.002	0.004	0.003	0.001	0.002	0.005	0.007	0.000	0.019
36	loc-roads	0.001	0.001	0.001	0.001	0.000	0.000	0.001	0.001	0.000	0.004
37	loc-taxes	0.014	0.009	0.013	0.013	0.004	0.006	0.018	0.024	0.002	0.069

		21 elec/gs-ut	22 water/san	23 wholesale	24 gs/aut-dlr	25 eat/dr	26 trade/nec	27 finance	28 ins/re	29 hotel/mot	30 ski-tows
1	ag/crops	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2	cattle	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3	sheep	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4	dairy	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5	ag-ser/for	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6	metal-min	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	coal/mines	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8	oil/gas-pr	0.060	0.002	0.001	0.001	0.003	0.002	0.000	0.000	0.003	0.001
9	nonmet/min	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001
10	constructn	0.003	0.023	0.014	0.006	0.014	0.007	0.001	0.009	0.052	0.022
11	food/proc	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12	wood/prod	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
13	print/pub	0.002	0.005	0.002	0.013	0.004	0.011	0.009	0.013	0.007	0.005
14	concrete	0.000	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.002	0.001
15	fab/metals	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001
16	elec/mach	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
17	mfg/nec	0.003	0.007	0.010	0.006	0.003	0.010	0.001	0.008	0.004	0.005
18	transport	0.003	0.004	0.086	0.091	0.002	0.054	0.001	0.003	0.005	0.004
19	postal-ser	0.002	0.002	0.002	0.001	0.001	0.002	0.003	0.001	0.001	0.000
20	communicat	0.005	0.007	0.013	0.018	0.004	0.029	0.009	0.015	0.048	0.028
21	elec/gs-ut	1.252	0.033	0.011	0.016	0.059	0.037	0.005	0.010	0.067	0.028
22	water/san	0.006	1.046	0.002	0.004	0.003	0.005	0.001	0.002	0.019	0.001
23	wholesale	0.003	0.017	1.003	0.002	0.005	0.002	0.001	0.003	0.029	0.012
24	gs/aut-dlr	0.001	0.002	0.003	1.002	0.001	0.003	0.000	0.002	0.001	0.001
25	eat/dr	0.000	0.001	0.001	0.000	1.000	0.000	0.000	0.007	0.000	0.001
26	trade/nec	0.001	0.011	0.003	0.003	0.001	1.002	0.001	0.004	0.016	0.001
27	finance	0.090	0.272	0.034	0.034	0.068	0.025	1.003	0.015	0.147	0.052
28	ins/re	0.003	0.013	0.007	0.016	0.017	0.028	0.005	1.006	0.013	0.014
29	hotel/mot	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.001	1.000	0.000
30	ski-tows	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.000
31	medical	0.001	0.001	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000
32	education	0.056	0.049	0.013	0.019	0.023	0.032	0.003	0.009	0.017	0.011
33	social-ser	0.001	0.001	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000
34	servic/nec	0.008	0.068	0.028	0.034	0.009	0.029	0.029	0.049	0.020	0.039
35	loc-gov	0.027	0.024	0.006	0.009	0.011	0.015	0.001	0.005	0.008	0.005
36	loc-roads	0.006	0.005	0.001	0.002	0.002	0.003	0.000	0.001	0.002	0.001
37	loc-taxes	0.097	0.085	0.021	0.032	0.040	0.055	0.005	0.016	0.030	0.019

APPENDIX B-4 (continued)

		31	32	33	34	35	36	37
		medical	education	social-ser	servic/nec	loc-gov	loc-roads	loc-taxes
1	ag/crops	0.000	0.001	0.000	0.000	0.000	0.000	0.000
2	cattle	0.002	0.002	0.000	0.000	0.000	0.000	0.001
3	sheep	0.	0.	0.	0.	0.	0.	0.
4	dairy	0.000	0.001	0.000	0.000	0.000	0.000	0.000
5	ag-ser/for	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6	metal-min	0.	0.	0.	0.	0.	0.	0.
7	coal/mines	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8	oil/gas-pr	0.000	0.001	0.000	0.001	0.001	0.002	0.001
9	nonmet/min	0.000	0.000	0.000	0.000	0.000	0.020	0.001
10	constructn	0.005	0.001	0.000	0.007	0.010	0.031	0.007
11	food/proc	0.007	0.013	0.000	0.000	0.001	0.000	0.008
12	wood/prod	0.000	0.000	0.000	0.000	0.000	0.000	0.000
13	print/pub	0.004	0.001	0.001	0.006	0.009	0.001	0.003
14	concrete	0.000	0.000	0.000	0.000	0.001	0.002	0.000
15	fab/metals	0.000	0.000	0.000	0.002	0.001	0.008	0.001
16	elec/mach	0.000	0.000	0.000	0.000	0.000	0.000	0.000
17	mfg/nec	0.004	0.004	0.002	0.003	0.007	0.009	0.005
18	transport	0.002	0.003	0.001	0.010	0.003	0.005	0.003
19	postal-ser	0.005	0.002	0.002	0.002	0.006	0.000	0.003
20	communicat	0.007	0.005	0.002	0.009	0.010	0.003	0.006
21	elec/gs-ut	0.006	0.023	0.002	0.019	0.014	0.036	0.021
22	water/san	0.002	0.004	0.000	0.003	0.008	0.003	0.062
23	wholesale	0.004	0.005	0.001	0.014	0.004	0.038	0.007
24	gs/aut-dlr	0.001	0.001	0.001	0.001	0.002	0.001	0.001
25	eat/dr	0.000	0.000	0.000	0.001	0.000	0.000	0.000
26	trade/nec	0.004	0.003	0.001	0.011	0.006	0.003	0.004
27	finance	0.008	0.037	0.001	0.017	0.031	0.025	0.047
28	ins/re	0.014	0.013	0.002	0.012	0.011	0.011	0.012
29	hotel/mot	0.000	0.000	0.000	0.000	0.000	0.000	0.000
30	ski-tows	0.	0.	0.	0.	0.	0.	0.
31	medical	1.036	0.001	0.006	0.000	0.011	0.000	0.013
32	education	0.007	1.008	0.004	0.015	0.002	0.022	0.588
33	social-ser	0.000	0.000	1.000	0.000	0.000	0.001	0.014
34	servic/nec	0.014	0.009	0.002	1.039	0.029	0.010	0.017
35	loc-gov	0.003	0.002	0.002	0.007	1.023	0.010	0.280
36	loc-roads	0.001	0.000	0.000	0.001	0.000	1.002	0.059
37	loc-taxes	0.011	0.005	0.006	0.025	0.004	0.038	1.011

APPENDIX C

CRITIQUE OF DATA SOURCES

INTRODUCTION

Data gathered for the Upper Main Stem interindustry study were secured from a wide variety of primary and secondary sources. Data from secondary sources were basically used to provide preliminary estimates of total gross output levels for the respective sectors delineated in the study. As the study progressed, it was discovered that particular secondary sources could not be used for such estimation purposes. The reasons for this are quite specific and vary depending on the source. Primary data were used extensively to estimate the gross flows matrix; they were also used to estimate a level of total gross output for several of the sectors. Thus, the purpose of this section is to criticize the various data sources and specifically explain how the data and any attending problems were handled in the study. The discussion commences with an overview of the primary sources. Following this, the section is divided by SIC division descriptions with each containing an identification of relevant data sources, comment on the adequacy of the data for the Upper Main Stem region interindustry study, and mention of how the data were handled.

Following the discussion is a complete listing, in bibliographic form, of data sources cited. Reference numbers in the text of this section refer to the sequence numbers of this list, not the bibliography entries at the conclusion of the report. Following each entry is an abbreviated annotation in brackets. The SIC numbers in the annotation indicate that data pertinent

to that respective SIC classification are contained in the source cited; a verbal description is used when SIC numbers are not appropriate.

PRIMARY SOURCES

Data from primary sources can be classified into two categories: first, information obtained directly from economic producers, and second, information obtained from the files of government agencies, trade associations, and others who receive report forms from economic producers. As indicated previously, data obtained directly from economic producers were secured through the interview process; a mail questionnaire was not employed in the study.

Data identifying gross flows for the agriculture and livestock sectors were largely secured from the Cooperative Extension Service, Department of Economics, Colorado State University, and a study conducted at Colorado State University, for the Bureau of Land Management and the Forest Services, Effects of Federal Grazing Land on the Economy of Colorado (45) (also see 38). Specifically, the Extension Service data pertained to estimated costs of producing particular crops and animals, not the aggregate expense levels of individual farm operators.

John Pederson and Oded Rudawsky of the Colorado School of Mines had just completed a rather extensive study of minerals and energy in Colorado about the time the research for this inquiry was commencing (41). The decision was made to use the basic findings of Pederson and Rudawsky and limit the interviewing for this sector. The limited interviewing that did occur was highly selective and for the express purpose of securing information necessary for the modification of published results of the Pederson and Rudawsky study.

Special comment on the data secured from the Colorado Department of Labor and Employment is warranted (10). Employment and wage information contained in the reports of each employer in the state is placed on reels of computer tape for processing by the Department. The Colorado Manpower Review (9) publishes a summary of this data for the state and the Denver-Boulder labor market area; detailed information for individual counties does not ordinarily get published. Accordingly, the information pertinent to employment and earnings in the Upper Main Stem region of Western Colorado had to be obtained directly from the Colorado Department of Labor and Employment. The computer tapes released for use in the Upper Main Stem study covered the reports of calendar years 1972 and 1973 and the first three quearters of 1974. This presented some difficulty because the study was designed to cover calendar year 1977. Further, the Colorado Department of Labor and Employment used 1967 SIC descriptions at the four-digit level to classify firms, while the Upper Main Stem used 1972 SIC codes. Still other difficulties were presented by what appeared to be obvious misclassification of firms (this is especially true at the four-digit level) and recording errors, not to mention a change in report procedures between 1973 and 1974. Considerable effort was required to modify Colorado Department of Labor and Employment data before it could be used. These adjustments were made on a case-by-case basis and did not follow a specific formula.

Serious difficulties were not encountered with the information secured from the files and in-house reports of other government agencies, trade associations, and other organizations (5, 6, 19, 22, 23, 24, 25, 29, 31, 39, 46, 70, and 79). The data were not always in the form requested, but were sufficiently detailed so that, with slight modifications, they were quite useful. Specific comment on these data and others follow in the respective SIC division.

AGRICULTURE AND FORESTRY

Of all economic sectors in the model, agriculture has the most current and detailed secondary data. The most versatile document in terms of securing individual crop data on an individual county basis is the Colorado Agricultural Statistics publication (1). Issued annually by the Colorado Department of Agriculture, it publishes detail on major state crops, and identifies the production levels in respective counties. Specific limitations are nonetheless inherent in the tabular presentations. For example, crops are reported on a production and market value basis; and there is a difference between market value and market receipts. The implication of this is not too severe for crops when virtually all production is marketed; but this is not the case with crops such as hay. Total gross output in the model is defined in terms of market receipts; so an adjustment of the value of the hay crop, as reported in Colorado Agricultural Statistics, was made. Specifically, the ratio of hay marketings reported in the 1974 Federal Census of Agriculture to the 1974 market value of hay reported in Colorado Agricultural Statistics was applied to the latter's 1977 report.

The Colorado Agricultural Statistics also has a tendency to aggregate certain "minor" crops not only across crop lines but also county lines. For example, potatoes are identified for Morgan, Weld, and the respective counties in the San Luis Valley; one value is then reported for the rest of the state. Hence, while potato production is not important in the Upper Main Stem region of Western Colorado, precise documentation of that fact is not possible because of aggregated reporting for crops.

Other particular adjustments were not attempted on the irrigated and dry agricultural output as reported by Colorado Agricultural Statistics. The publication is not well enough documented to determine whether or not

an adjustment is warranted. Further all production indices available are for the entire state and are highly aggregated (2).

Procedures employed to secure and report information are not documented in Colorado Agricultural Statistics. A regional analyst must be concerned with the quality of data, but really has no basis for judgment without supporting documentation. For example, onion production is reported in Colorado Agricultural Statistics for the Western Slope (no county delineation); the Bureau of Reclamation also reports onion production in the annual publication of Water and Land Resource Accomplishments for farms served by the Grand Valley and Uncompahgre projects (73) and (74). The Bureau's report suggests there is a definite element of randomness involved, i.e., both acreage planted and production yields vary over time. By contrast, the acreages reported by Colorado Agricultural Statistics are rather consistent. It should also be mentioned that in certain years the Bureau's publication reports considerably more acreage for farms served by the above two projects than the state publication does for the entire Western Slope; and for the counties involved, the authors suggest that it makes a considerable difference in the aggregate value of marketings.

Data on the value of marketings of livestock are reported in Colorado Agricultural Statistics for final marketings only. Further, the data are reported at the state level. Not only are interfarm transactions not reported, but the relative value of individual county output cannot be directly determined. Thus, the value of the total gross output of the livestock sector in the Upper Main Stem interindustry study was determined from information secured from the Cooperative Extension Service, Department of Economics, Colorado State University.

Determination of the gross flows for agriculture and livestock production was highly dependent on information secured from the Cooperative Extension Service and Federal Grazing in Colorado, an unpublished study conducted at Colorado State University for the Bureau of Land Management and the Forest Service. This was supplemented with data published in Cost of Producing Crops in the Irrigated Southwest (84) and information supplied by the Northwest Colorado Agri-Business Association (39) and Tri River Agri-Business Farm Management Association (46). Government payments to the agricultural sectors were determined from the Agricultural Stabilization and Conservation Service, Annual Report - Colorado (47).

Data on the employment of labor in the agricultural sectors are not readily available from published sources. The estimate of the dollars paid for wages in each of the sectors was based on the Cooperative Extension Service information and Laing's thesis on the Impacts of Federal Grazing Land (38). Employment levels were then imputed using a 2,000 hour work year. The number of people employed in agriculture as identified in the 1970 Census of Population (61) could also have been used to obtain an employment coefficient, but wasn't. The aggregate value for agricultural services was estimated by using the Cooperative Extension Service information and checked for consistency by interview.

In summary, adequate data do appear to exist for the agricultural sectors of the Upper Main Stem economy. However, particular concern is noted for the high level of aggregation in some cases, a lack of published interfarm transaction values for livestock, and lack of good data on employment. Also, it appears that there is a general lack of documentation, a deficiency which must be overcome in order to judge the quality of the data.

MINING

Publications by the federal government were not considered for inclusion in the mining division of the model. At the national level, and sometimes the state level, information pertaining to mining production quantities and values can be secured. Because of the characteristically small number of operators, information on specific minerals in specific counties is rarely published. Examples of federal publications for which this is largely true are: Census of Mineral Industries (60); Minerals Yearbook (72); Statistical Data for the Uranium Industry (77); and Uranium Exploration Expenditures and Plans (78).

State of Colorado documents were relied upon quite extensively, but not without reservation. The most comprehensive, yet most limiting, state document is A Summary of Mineral Industry Activities in Colorado (13). This publication lists production by mineral value and by county. Listing by mineral value has several very specific limitations. For some outputs the unit price is not always given; thus, quantity calculation becomes difficult, if not nearly impossible. Where unit price is given it is always applied to all production; thus, for example, the market value for metallurgical coal is published as being equal to the market value for other types of coal. The unit price for ores refers to a refined market value; thus, when ore is subject to reduction away from the county in which it was mined, the value accruing to the mining county is overstated. One last criticism is leveled at the practice in the publication of adding nearly $100 million to the value of state mineral production and footnoting it as minerals mined out of, but refined in, the state; no indication is given as to what the minerals are or where they are refined.

Data are available monthly in the Monthly Report (15) and annually in Coal (14) on the production of coal. Tonnage values, labor employed, and days worked are reported for every coal mine in the state. Barrels of oil pumped, cubic feet of gas produced, and the volume of injections are published for every well in the state in Oil and Gas Statistics (17). Thus, the researcher is left with the task of determining a unit value when information on coal, oil, and gas is secured from these sources.

The Pederson and Rudawsky study, "The Role of Minerals and Energy in the Colorado Economy," was used as a data source in the mining division, especially as it related to oil and gas production. A publication that complemented Oil and Gas Statistics when identifying potential interviews for the oil and gas sector was the Rocky Mountain Petroleum Directory (83).

In the final analysis, the total gross output values used in the mining division of the Upper Main Stem study were estimated based on information gained by interviewing. Federal publications fail to publish sufficient information at the county level and state publications leave much to be desired with respect to unit pricing. Furthermore, state documents do not necessarily identify the economic production that takes place in some counties.

CONSTRUCTION

Publications such as the Census of Construction Industries (52) and (53) and the Construction Review (67) aggregate on the state level and hence are inadequate for estimation of activities in individual counties. The publication Construction Reports - Housing Authorized by Building Permits and Public Contracts (65), though county specific, fails to account for permits and contracts authorized during a given period.

In a relatively small county there is not necessarily sufficient volume to either avoid "lumpy" reporting or maintenance of the assumption that level of work in a given period is equal to the dollar value of the authorizations. Finally, the Construction Reports do not suggest how much of the job is involved with various types of contractors so that an estimation of value of intersector transactions can be made. In conclusion, the authors saw no alternative but to estimate total gross output for the construction sector from primary data.

MANUFACTURING

Both the 1972 Census of Manufacturers (59) and County Business Patterns is fairly complete in a broad sense but still quite limited in what detail is published. Disclosure requirements preclude publishing critical information and result in a high degree of aggregation. Even in those sectors where the data are published, restrictions are imposed because seasonal variations (e.g., as in food processing) are not reflected in the first quarter reporting. As a result, neither of these publications was of much use for the Upper Main Stem interindustry study. In fact, levels of output for the manufacturing sectors had to be estimated from primary data.

The Directory of Colorado Manufacturers (81), published annually by the Bureau of Economic and Business Research (University of Colorado), was used extensively in the determination of which manufacturers to interview. The publication identifies firms by four-digit SIC classification, location, and employment range. Key personalities are also identified. Some information in the Directory of Colorado Manufacturers is quite dated, but the document is nonetheless an invaluable reference.

Before interviewing a given owner or manager, an attempt was always made to gain a "feel" for the type of firm that was involved. For example,

secondary research was done on what the output per worker might be and what might be expected in terms of value added. A publication quite often referred to for answers to these types of questions was the Annual Survey of Manufacturers (50). Though the information contained therein was not directly used in the Upper Main Stem study, it did provide for an ongoing consistency check. Specifically, the document contains, on a four-digit SIC basis, ratios pertaining to inputs and outputs of the manufacturing sectors of the national economy.

In summary, detailed secondary data do not exist for manufacturing activities in the study region. Aggregate levels of economic activity for individual sectors must be determined from primary data and checked for consistency by observing secondary data.

TRANSPORTATION, COMMUNICATIONS, ELECTRIC, GAS, AND SANITARY SERVICES

Secondary data for the transportation, communications, electric, gas, and sanitary services sectors are quite available and generally speaking, of fairly good quality. Despite this, only a limited amount of them were used in the Upper Main Stem study. The reasons for this are largely in the nature of the filing system at the Colorado Public Utilities Commission (PUC) (23) and methods employed prior to seeking an interview with any given firm. Consequently, before any single interview was conducted, an attempt was made to learn as much as possible about the firm in question. This meant that for firms in the public utilities sectors, the research started with an examination of the reports filed with the PUC. The PUC reports were readily accessible so they were also used to estimate levels of total gross output where applicable. For those cases in which the PUC does not have jurisdiction, because municipal-owned enterprises are involved, estimates were made based on information filed with the Colorado State

Auditor (24). Despite the above mentioned relatively high incidence of direct information, secondary data sources still merit comment.

The Interstate Commerce Commission publishes materials pertaining to various forms of transportation on a regional basis: examples are Transport Statistics in the United States: Pipelines (36) and Transport Statistics in the United States: Motor Carriers (37). These types of documents were not really helpful in the study because their use necessitates a significant amount of prorating. A similar argument holds for documents published by the Federal Aviation Administration. As a result, the best alternative was to estimate the level of economic activity in the transportation sector from PUC reports and information gained in interviews.

United States Postal Service (U.S.P.S.) revenues were determined by examining postal receipt schedules for each post office in the region. Since Congress created the independent U.S.P.S., postal receipts for individual post offices are no longer published. Accordingly, this information was obtained directly from the Sectional Center Facility (SCF) managers (79). The SCF manager in Grand Junction was interviewed to gain information on the expense patterns for the U.S.P.S. Despite the accuracy of this information, it is suggested that the regional accounting perspective can lead to an erroneous conclusion about the U.S.P.S. This is because the postal sector's total gross output was defined in terms of an expense level rather than a revenue level. The reason for doing this is that the imputed postal revenue for the Upper Main Stem region of Western Colorado is higher that the actual revenue, but it is not known how much higher. For example, Mountain Bell mails statements to local customers from Denver; the actual revenue for the U.S.P.S. is identified with the Denver Post Office, yet a portion of the expenses connected with the handling of those statements is

absorbed by the local Post Office. Thus, a portion of the actual Denver revenue imputes to the Upper Main Stem region.

Information on rural telephone systems can be obtained from the Annual Statistical Report: Rural Telephone Borrowers (49). Territorial integrity for rural systems in the region is such that the information is straightforward and does not have to be allocated. Mountain Bells' activities, on the other hand, had to be estimated by prorating the various revenues and charges identified in their annual report to the Colorado PUC. This was greatly facilitated by having additional information supplied directly by the company. Radio and television activities were estimated by prorating data contained in the Federal Communications Commission's Annual Report (30). Specifically, the data identified revenue for stations outside the metropolitan area. The basis for allocation was the volume of retail sales as identified in the Annual Report (21) of the Colorado Department of Revenue.

Published secondary data were of limited use for estimating electric and gas revenues. For example, examination of Annual Statistical Report: Rural Electric Borrowers (48) sometimes fails to include the operation of electric associations which are headquartered outside the Upper Main Stem region. Information contained in Statistics of Publicly Owned Electric Utilities in the United States (34) is reported on a company basis and the Upper Main Stem region is only part of the territory of the Public Service Company of Colorado. Statistics of Publicly Owned Electric Utilities in the United States (35) does not identify all the municipal operations in the Upper Main Stem region. Thus, the estimation of total gross output for the electricity and natural gas sector was determined by the information obtained from PUC reports, the State Auditor, and interviews.

The water, sewerage, and sanitary services sector is characterized by a high incidence of special tax districts. Complete information on the activities of these districts is not published anywhere. Thus, the audit reports filed with the Colorado State Auditor were examined in detail to secure information for this sector. For those instances where private enterprise is involved, the information was obtained at the PUC office.

In summary, though considerable information is published for the transportation, communication, electric, gas, and sanitary services sectors, problems associated with excessive aggregation, territorial integrity, and incomplete reporting precluded use of the information in the Upper Main Stem interindustry study.

TRADE - WHOLESALE AND RETAIL

Examination of Robert Morris Associates' Annual Statement Studies (43) suggested that to arrive at any meaningful coefficients for the trade sectors, a rather exhaustive and detailed study of the trade sectors would have been required. Considering the time and financial constraint imposed on the research, such a detailed study could not be justified. Accordingly, very little primary data were secured for the trade sectors other than gasoline stations and restaurants in the Upper Main Stem interindustry study.

Secondary data sources used to estimate the levels of total gross output included the Census of Wholesale Trade (64), the Census of Retail Trade (62), and the Colorado Department of Revenue's Annual Report (21). Both Census publications referred to calendar year 1972, used 1972 SIC classifications, and needed updating to reflect 1977 conditions. Difficulties encountered in this activity emanated from the Colorado Department of Labor and Employment data being classified by 1967 SIC codes and the lack of

price indices for Colorado. The Department of Revenue report is classifed by 1967 SIC descriptions and pertains to a fiscal year. Other problems associated with the use of the Department of Revenue report stem from the failure to identify the ratio of tax exempt sales at the county level and what appears to be a rather significant understatement of the volume of wholesale activities. The total gross output values were thus estimated as follows. Mean values were calculated for each trade sector using two annual reports of the Colorado Department of Revenue; the state exemption ratio for each respective sector was used to increase reported county retail sales; output values where shifted to conform to 1972 SIC descriptions by using ratios describing the relationships between Colorado labor data for 1972 and the wholesale and retail census for 1972.

Select interviews were used to gain information relative to what values would be used for regional flows and margining of the trade sectors. Further, information contained in publications such as "Economic Impact of Alternative Energy Supply Policies in Colorado" (26) and "An Interindustry Analysis of the Colorado River Basin in 1960 with Projections to 1980 and 2010" (80) was used to routinely check for consistency. Given these limitations, caution must be expressed in regard to the accuracy of the coefficients in the trade sector. It is recommended that an in-depth study of this sector, employing primary data collection techniques, be undertaken in the near future.

FINANCE, INSURANCE, AND REAL ESTATE

Secondary data on the activities of commercial banks are contained in Sheshunoff and Company's The Banks of Colorado (44). This is a privately-printed industry publication that shows the balance sheet and income statement

for each bank in the state. A source such as Bank Operating Statistics (32), published by the Federal Deposit Insurance Corporation, aggregates information by region; none of these regions correspond to the geographic delineation of the Upper Main Stem study. Accordingly, the Sheshunoff data were used to identify the level of economic activity for commercial banks.

Savings and Loan Association data are published in Combined Financial Statements - Member Savings and Loan Association of the Federal Home Loan Bank System (33). Association activities are identified by state total, metropolitan area, and the area outside the metropolitan area. Thus, to estimate total gross output for savings and loan associations, the activity outside the metropolitan area was prorated to the Upper Main Stem region by using the personal adjusted gross income figures reported in the Colorado Department of Revenue's Annual Report (21). Information pertaining to the activities of the Federal Credit Bank's operations was gained from filed reports (31).

Insurance activities were estimated from information gained largely from interview. The Colorado Division of Insurance publishes the Insurance Industry in Colorado: Statistical Report (20). This document indentifies, on a company basis and a line basis, premiums earned and losses incurred. As a first approximation, the difference between premiums and losses was prorated by Colorado adjusted gross income to estimate Upper Main Stem insurance activity. This first approximation was then modified based on information gained in interviews.

Real estate activities were estimated by first obtaining the value of documentary fees paid in each of the five counties (29). From the documentary fees paid an estimate was made of the transaction values involved and a six percent commission was allowed on the same. The estimated commissions were

used in turn as the approximation for the total gross output of the real estate sector.

In summary, direct information pertaining to finance, insurance, and real estate does not exist in published form for the study region. Estimates must be made using a combination of published secondary data and information gained from primary sources.

SERVICES

Data sources for services are grouped into three categories for discussion purposes. The first part of the discussion will focus on data sources pertinent to the health and medical care field; the second pertains to data sources for the education sector; and final portion comments on data sources for all other services.

Information pertaining to institutional health care was secured directly from the providers of the services. These providers include the Veterans Administration Hospital, the State Home, private, and public hospitals, and nursing homes. Contact with the nursing homes was facilitated by an interview with the Colorado Health Care Association (25). A partial list of hospitals and nursing homes in the region is contained in the Directory - Medicare Providers and Suppliers of Services (68).

The value of services provided by physicians, dentists, optometrists, and others was estimated by using secondary information. For a first approximation, information contained in "National Health Expenditures" (28) was adjusted by using the index values published in Medicare: Health Insurance for the Aged - Geographical Index of Reimbursement by State and County (69). The resulting figure was then adjusted based on information gained in interviews and secured from the Colorado State Department of

Health (7), the Colorado Department of Social Services (22), and the Social Security Administration (70).

Data are readily available for education activities in the Upper Main Stem region. Data pertaining to colleges were secured directly from the respective institutions. The Colorado Commission on Higher Education (CCHE) (5) also provided information on other institutions of higher education. Revenues and Expenditures: Colorado School Districts (6), published annually by the Colorado Department of Education, was used to identify the level of total gross output for public schools. This document is rather comprehensive and identifies revenues and expenditures for each school district in the state. Data secured from the CCHE and the Department of Education's revenue and expenditure report were supplemented with information gained in interviews. Because of the high quality data described above, the Bureau of the Census data contained in Finances of School Districts (57) were not used in the Upper Main Stem interindustry study.

The information contained in Census of Selected Service Industries (63) was used as a first approximation of the total gross output for all other services. Colorado Department of Labor and Employment data were used to update the census data to an approximation of 1977 conditions. Concomitantly, the data that pertained to dental laboratories in this publication were removed to the health and medical care sector. Estimation of total gross output for ski tows was accommodated by interview.

As with the trade sectors, very little primary information was collected for the services not elsewhere classified sector. Accordingly, given this limitation, caution is expressed with regard to the accuracy of the coefficients in this sector in the Upper Main Stem interindustry study. Further, it is recommended that an in depth study of the sector be conducted employing primary data collection techniques.

PUBLIC ADMINISTRATION

Rather extensive information on local and county government activities is contained in the Bureau of Census publications, Compendium of Government Finances (54), Finances of County Governments (55), Finances of Municipalities and Township Governments (56), and Compendium of Public Employment (58). Two considerations precluded the use of these documents in the Upper Main Stem interindustry study. First, the desire to have even more detailed data to facilitate the separation of local and county government enterprises. Second, preliminary investigation suggested that the dollar increase in a number of local and county government budgets was rather significant between 1972 and 1977.

Secondary data published by the state were used extensively during the preliminary stages of the research but were later replaced with primary data. The Local Government Financial Compendium (11) does not list expenditures and revenues for communities under 1,000 people. Further, the publication does not account for special tax districts. The Division of Property Taxation's Annual Report to the Governor and the Legislature (12) identifies valuations, levies, and property tax revenues for every local tax authority. The Colorado Department of Revenue's Annual Report (21) contains information sufficient to estimate local sales tax collections. Though each publication contains good quality data, the Upper Main Stem study eventually used the files of the State Auditor. The audit reports filed here are more complete, more detailed, and more extensive in coverage than the state publication.

Data pertaining to the total expenditures of the State of Colorado were secured directly from the Colorado Department of Planning and Budget (19). A recent executive order had caused all state budgets to be regionalized according to the various planning regions in the state. Though

the planning regions do not conform to the delineation of the Upper Main Stem interindustry study, the budget regionalization greatly facilitated the search for data on state expenditures. Information on tax payments to the State of Colorado is contained in the Department of Revenue's Annual Report (21). An estimation of revenues from hunting and fishing licenses was made based on information in Colorado Big Game Harvest (16). Revenue generated because of activities on state lands was estimated by using the State Board of Land Commissioners' Summary of Transactions (18).

Following the collection of the above data, interviews were arranged with the agencies that made significant expenditures in behalf of the State of Colorado. Scheduling the expense patterns of the Colorado Department of Highways was greatly facilitated by the use of Colorado's Annual Highway Report (8). In summary, the data secured on the State of Colorado pecuniary activities were not difficult to obtain and are rather comprehensive.

Revenues accruing to the federal government account were largely estimated by prorating from a Colorado base. The Treasury publication, Combined Statement of Receipts, Expenditures, and Balances of the United States Government for the Fiscal Year Ended June 30, 1975 (75), identified revenue by state and by category. Thus, the figure published for Colorado was adjusted by using information in the Colorado Department of Revenue's Annual Report (21) and the Treasury's Statistics of Income 1969, Zip Code Area Data from Individual Income Tax Returns (76). This first approximation was then adjusted by using information gained from the Forest Service, the Bureau of Land Management, the Bureau of Reclamation, and the publication Public Land Statistics (71).

For a first approximation of federal expenditures, data were secured from Federal Outlays in Colorado (39). This publication shows estimates

for federal outlays by agency and by county. Many of the estimates are prorated by using standardized criteria. Thus, the research for the Upper Main Stem interindustry study sought to estimate federal expenditures independently. Some documents, such as the Veterans Administration's Annual Report (82) and the Railroad Retirement Board's Annual Report (42), were examined and the data so secured prorated to the Upper Main Stem region of Western Colorado. This practice was too limiting, so more direct information was obtained. Specifically, the major agencies were contacted: these include the Social Security Administration, the Bureau of Reclamation, the Bureau of Land Management, the Geological Survey, the Forest Service, the U.S. Postal Service, and the Department of Energy.

In summary, the data on federal government revenues are approximations derived largely from state totals. The data pertaining to federal expenditures are largely estimations based on information gained in interviews.

Households were not interviewed for the Upper Main Stem study. Further, the data pertaining to household income and expenses are a direct result of the estimations made for the income and expenses of the other sectors in the study.

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APPENDIX D

COMPONENTS OF TRANSFER ACCOUNT

APPENDIX D-1
COMPONENTS OF TRANSFER ACCOUNT ROW

Column Head	Dollars Charged Transfer Account	Explanation
1. Ag Crops	80,911	insurance loss pool
2. Cattle	146,501	insurance loss pool
3. Sheep	88,881	insurance loss pool
4. Dairy	21,630	insurance loss pool
5. Ag Ser, For	25,974	insurance loss pool
6. Metal Min	31,147	insurance loss pool
7. Coal Mines	414,896	insurance loss pool
9. Nonmet Min	48,978	insurance loss pool
10. Constructn	2,056,666	insurance loss pool
11. Food Proc	72,530	insurance loss pool
13. Print/Pub	28,854	insurance loss pool
14. Concrete	84,443	insurance loss pool
15. Fab Metals	37,828	insurance loss pool
16. Elec Mach	241,116	insurance loss pool
17. Mfg NEC	144,931	insurance loss pool
18. Transport	236,229	insurance loss pool
20. Communicat	811,850	insurance loss pool
21. Elec/Gas Ut	35,498	insurance loss pool
22. Water/San	88,773	insurance loss pool
23. Wholesale	462,574	insurance loss pool
24. Gs/Aut Dlr	449,284	insurance loss pool

APPENDIX D-1 (continued)

Column Headed	Dollars Charged Transfer Account	Explanation
25. Eat/Dr	796,190	insurance loss pool
26. Trade NEC	2,039,786	insurance loss pool
27. Finance	190,986	insurance loss pool
	5,998,248	interest on outside finance
	20,504,160	interest payments
28. Ins/RE	133,233	insurance loss pool
29. Hotel/Mot	493,562	insurance loss pool
30. Ski Tows	721,219	insurance loss pool
31. Medical	1,087,781	insurance loss pool
32. Education	773,342	insurance loss pool
33. Social Ser.	9,981	insurance loss pool
	3,983,143	transfer payments
34. Servic NEC	762,073	insurance loss pool
35. Loc Gov	200,830	insurance loss pool
36. Loc Roads	53,692	insurance loss pool
39. Households	23,977,820	insurance loss pool
40. State Gov	137,479	insurance loss pool
	4,196,822	transfer payments
	10,318,636	financial surplus
41. Fed Gov	56,310,000	transfer payments
43. Min R+D	34,298	insurance loss pool
46. Exp World	17,132,992	dividends received by area residents
	118,771,495	regional capital shortage
	54,116,442	mineral research and dev.
	53,079,646	federal deficit

APPENDIX D-2
COMPONENTS OF TRANSFER ACCOUNT COLUMN

Row Headed	Dollars from Transfer Account	Explanation
10. Constructn	1,669,203	insurance loss pool
23. Wholesale	124,638	insurance loss pool
24. Gs/Aut Dlr	233,534	insurance loss pool
26. Trade NEC	137,708	insurance loss pool
28. Ins/RE	175,698	insurance loss pool
31. Medical	12,381,828	insurance loss pool
34. Servic NEC	9,225,160	insurance loss pool
39. Households	7,368,860	insurance loss pool
	64,489,965	transfer payments
	266,416,315	close dividends, interest, and entrepreneurial income to households
41. Fed Gv	53,079,646	federal deficit
42. Profit/Rnt	(266,416,315)	close dividends, interest, and entrepreneurial income to households
	17,132,192	dividends received by area residents
	54,116,442	mineral research and development
	20,504,160	interest paid by local financial institutions
	118,711,485	regional capital shortage
	(231,147)	residual in account balancing
46. Imp Colo	954,224	insurance loss pool
	5,998,248	interest on outside finance
	10,318,636	Colorado financial surplus
46. Imp World	5,042,025	insurance loss pool

APPENDIX E

SURVEY FORM USED FOR THE INTERINDUSTRY STUDY

Colorado School of Mines
golden, colorado 80401 • (303) 279-0300

mineral economics department

VOLUNTARY QUESTIONNAIRE

Upper Main Stem Colorado River Inter-Industry Analysis

This questionnaire is designed to enable you to provide us, in as simple a form as possible, a detailed account of your firm's purchases and sales in 1977. The specific focus of the analysis is the component of that activity occurring in the five country Upper Main Stem Colorado River region comprised of Eagle, Garfield, Mesa, Pitkin, and Summit counties.

This information will be handled in strictest confidence. Your responses will be aggregated with those of other firms in your economy sector, eliminating the possibility that any single firm's responses will be identifiable. Participation on your part is voluntary.

1. We are particularly interested in obtaining data which are a reasonable representation of your firm's current operation. Data for a fiscal or calendar year 1977 or later are preferred. In the event that data are not available in this form, please use any consecutive twelve months since 1976 (please indicate).

2. You may indicate sales and purchase in dollar amounts or percentages.

3. When exact data are not available, please use estimates. If it is not possible to provide information for certain questions, please indicate.

Name of Firm: _____

What is your major product(s) or service(s)? If convenient, list the appropriate SIC classification(s). _____

_____

_____

What was the total number of employees you had at any one time in 1977?

Full Time: _____ Part Time: _____

PURCHASES (OUTLAYS) ANALYSIS

	SUPPLY SOURCE; SECTORS FROM WHICH YOU PURCHASE	PURCHASES IN UPPER MAINSTEM COLORADO COUNTIES $ or % of Total	PURCHASES FROM OTHER COLORADO COUNTIES $ or % of Total	PURCHASES OUTSIDE COLORADO $ or % of Total
1.	AGRICULTURE (all crops)			
2.	LIVESTOCK: RELATED PRODUCTS (dairy and poultry products, honey, animal specialties, etc.)			
3.	AGRICULTURAL SERVICES (veterinary, custom field work, etc.); FORESTRY			
4.	METAL MINING; RELATED SERVICES			
5.	COAL MINING; RELATED SERVICES			
6.	OIL AND GAS EXTRACTION; RELATED SERVICES			
7.	SHALE OIL EXTRACTION; RELATED SERVICES			
8.	NON-METALLIC MINING; RELATED SERVICES			
9.	ALL CONSTRUCTION			
10.	FOOD AND KINDRED PRODUCTS (processed foods for human and animal consumption)			
11.	LUMBER; WOOD PRODUCTS (loggers, sawmills, cabinet shops, miscellaneous wood products manufacturers)			
12.	PRINTING AND PUBLISHING; PAPER AND ALLIED PRODUCTS (includes newspaper advertising)			
13.	STONE; GLASS; CLAY PRODUCT MANUFACTURERS			
14.	FABRICATED METALS; NON-ELECTRICAL MACHINERY MANUFACTURERS			
15.	ELECTRICAL MACHINERY AND EQUIPMENT; TRANSPORTATION EQUIPMENT; ELECTRONIC INSTRUMENTS AND COMPONENTS MANUFACTURING			
16.	ALL OTHER MANUFACTURERS (chemicals, petroleum refiners, rubber, jewelry, sporting goods, etc.)			
17.	TRANSPORTATION: AIRLINES, BUS LINES, RAILROADS, TRUCK LINES, AMBULANCES, U.P.S., R.E.A., ECT.			
18.	U. S. POSTAL SERVICE (postage, mail box rental)			
19.	COMMUNICATION: RADIO, TELEVISION, TELEPHONE, TELEGRAPH (includes media advertising, cable subscriptions, etc.)			
20.	ELECTRICITY; NATURAL GAS (utilities)			
21.	WATER, SEWERAGE, TRASH REMOVAL SERVICES (utilities)			
22.	WHOLESALE TRADE (wholesaling intermediaries)			
23.	AUTOMOBILE DEALERS; GASOLINE SERVICE STATIONS			
24.	EATING AND DRINKING ESTABLISHMENTS			
25.	RETAIL - NOT LISTED ELSEWHERE			
26.	FINANCE (interest payments)			
27.	INSURANCE PREMIUMS - LIFE, ACCIDENT, HEALTH, MEDICAL, FIRE, CASUALTY, SURETY, TITLE, PENSION, HEALTH, AND WELFARE FUNDS (non-government)			
28.	REAL ESTATE (commissions and management fees)			
29.	HOTELS, MOTELS, OTHER LODGING			
30.	RECREATIONAL FACILITIES (ski tows, theaters, golf courses, hunting guides, bowling alleys, etc.)			
31.	HEALTH SERVICES (medical, dental, hospitals, laboratories, other patient care facilities)			
32.	EDUCATIONAL SERVICES (primary, secondary, post-secondary, technical, professional)			
33.	SERVICES - Not elsewhere listed.			
34.	LOCAL AND COUNTY GOVERNMENTS (taxes, permits licenses)			
35.	STATE GOVERNMENT (taxes, permits, license fees)			
36.	FEDERAL GOVERNMENT (taxes, permits, license fees, employers FICA, unemployment insurance)			
37.	HOUSEHOLDS (payments subject to withholding)			
38.	RENTS; (DIVIDEND PAYMENTS); RETAINED EARNINGS			
39.	DEPRECIATION EXPENSE			
40.	TOTAL			

Please indicate the value of your establishment's net inventory change in 1977.
(This may be a positive or negative figure.) NET INVENTORY CHANGE: $_____

SALES ANALYSIS

DEMAND SOURCE: SECTORS TO WHICH YOU SELL	SALES IN UPPER MAINSTEM COLORADO COUNTIES $ or % of Total	SALES TO OTHER COLORADO COUNTIES $ or % of Total	SALES OUTSIDE COLORADO $ or % of Total
1. AGRICULTURE (all crops)			
2. LIVESTOCK; RELATED PRODUCTS (dairy and poultry producers, bee keepers, animal breeders, etc.)			
3. AGRICULTURAL SERVICES (veterinarians, custom field work operators, etc.); FORESTRY			
4. METAL MINING; RELATED SERVICE OPERATORS			
5. COAL MINING; RELATED SERVICE OPERATORS			
6. OIL AND GAS EXTRACTION; RELATED SERVICE OPERATORS			
7. SHALE OIL EXTRACTION; RELATED SERVICE OPERATORS			
8. NON-METALLIC MINING; RELATED SERVICE OPERATORS			
9. ALL CONSTRUCTION			
10. FOOD AND KINDRED PRODUCTS (processors of foods for human or animal consumption)			
11. LUMBER;WOOD PRODUCTS (loggers, sawmills, cabinet shops, miscellaneous wood manufacturers)			
12. PRINTERS AND PUBLISHERS; PAPER AND ALLIED PRODUCTS (includes newspaper advertising, etc.)			
13. STONE; GLASS; CLAY PRODUCT MANUFACTURERS			
14. FABRICATED METALS; NON-ELECTRICAL MACHINERY MANUFACTURERS			
15. ELECTRICAL MACHINERY AND EQUIPMENT; TRANSPORTATION EQUIPMENT; ELECTRONIC INSTRUMENTS AND COMPONENTS MANUFACTURERS			
16. ALL OTHER MANUFACTURERS (chemicals, petroleum refiners, rubber, jewelry, sporting goods, etc.)			
17. TRANSPORTATION: AIRLINES, BUS LINES, RAIL ROADS, TRUCK LINES, AMBULANCES, U.P.S., R.E.A., etc.			
18. U. S. POSTAL SERVICE			
19. COMMUNICATION: RADIO, TELEVISION, TELEPHONE, TELEGRAPH			
20. ELECTRICITY; NATURAL GAS COMPANIES			
21. WATER, SEWERAGE, TRASH REMOVAL SERVICE ENTERPRISES			
22. WHOLESALE TRADE (wholesaling intermediaries)			
23. AUTOMOBILE DEALERS; GASOLINE SERVICE STATIONS			
24. EATING AND DRINKING ESTABLISHMENTS			
25. RETAIL - NOT ELSEWHERE LISTED			
26. FINANCE INSTITUTIONS (banks, trust companies, savings and loan associations, brokers, etc.)			
27. INSURANCE (companies, agents, brokers)			
28. REAL ESTATE (owners, lessors, buyers, sellers, agents, developers)			
29. HOTELS, MOTELS, OTHER LODGING			
30. RECREATION FACILITIES (ski tows, theaters, golf courses, hunting outfitters, bowling alleys, etc.)			
31. HEALTH SERVICE ESTABLISHMENTS (medical, dental, hospitals, laboratories, other patient care facilities)			
32. EDUCATIONAL INSTITUTIONS (primary, secondary, post-secondary, technical, professional)			
33. SERVICES - Not elsewhere listed			
34. LOCAL AND COUNTY GOVERNMENTS			
35. STATE GOVERNMENT			
36. FEDERAL GOVERNMENT			
37. HOUSEHOLDS (direct sales for private consumption)			
38. TOTAL			

At what level of output capacity did your establishment operate during 1977

LEVEL OF CAPACITY UTILIZATION: %_____

What is your estimate of your establishment's total water use for all phases of your operation? (Note: please use any convenient unit of measurement; e.g., gallons per day, 1000 gallons per day, acre feet per year, etc.)

TOTAL WATER INTAKE: _____

APPENDIX F

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