Replacement of Timber Harvest and Manufacturing with Recreational Visitors as Economic Base: Case of Valley County, Idaho

AEES 00-07

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Presentation
Western Agricultural Economic Assn.

June 30, 2000

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Moscow, Idaho.

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Executive Summary

This study, and the model developed to accomplish it, are based on secondary data, plus personal interviews with numerous businesses, government officials, residents and visitors to Valley County. The base model was re-estimated using the newer IMPLAN software and incorporating the data from state and local sources.

Results indicate that the affected of a major reduction in timber harvesting will be primarily in the harvesting and manufacturing of wood products sector. If alternative sources of timber can be found, the affects would be less dramatic on the local economy.

The second scenario relates to the effect of expanding recreation on the county, to replace the former commodity production. In this case the increases in demand because of visitors spending would be allocated over several sectors. The employment gains would also be in several sectors. This project permits local officials to evaluate alternative policy proposals for their affects on Valley County.

This is study is supported by Valley County Commissioners, and the Bureau of Reclamation.

The economy of the county is shifting based on the changes in national preferences and the resulting national policy changes. Timber is becoming relatively less important and recreation is becoming a larger part of the local economy. The changes require people with different skills and result in larger turnover and traffic to and from the county highlighting communication and transportation for growth and stability of the economy.

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Introduction

At the request of the Valley County Commissioners, the Idaho Cooperative Extension System and the Department of Agricultural Economics and Rural Sociology faculty , conducted an economic study in Valley County, Idaho. The purpose of this study was to develop a complete description of the Valley County economy and predict the impacts on employment and value added (income) from potential policy changes. To make these predictions, the researchers developed an input/output model. This report summarizes the results of the study by describing the employment, value added, and industry output for each sector of the economy. Furthermore, the predictions of the model under two different scenarios are reported. In the case of the predictions, the description of the changes include the increase or decrease relative to the baseline and the new levels of employment, value added, and total industry output.

This report describes Valley County's economic base. The researchers have divided the economy into seventeen industry sectors and a government sector. Their goal is to discuss the importance of the different sectors in terms of their exports, employment, value added, and industry output (gross sales). Aggregations of sectors have been made to avoid disclosing data from any individual business.

The second section of the report is an impact analysis of two potential policy changes on the resource base of Valley County. While the first section is a description of the actual economy, the second section is a prediction of the potential impacts of policy changes. The impact information for each scenario is presented as changes in employment and value added.

Descriptive Analysis of Valley County's Economic Base

The first part of this paper is a detailed analysis of the economic structure of the region. The wealth of a region can be defined as a function of its total resources and the ability of the community to use them in a sustainable manner to regenerate income. The measure of total county income used in this report is value added, which is the sum of proprietor income, employee compensation, other property type income, and indirect business taxes. Income is derived from businesses converting resources to salable commodities for customers outside the region, attracting customers or new businesses into the region to purchase goods and services, and obtaining government transfers.

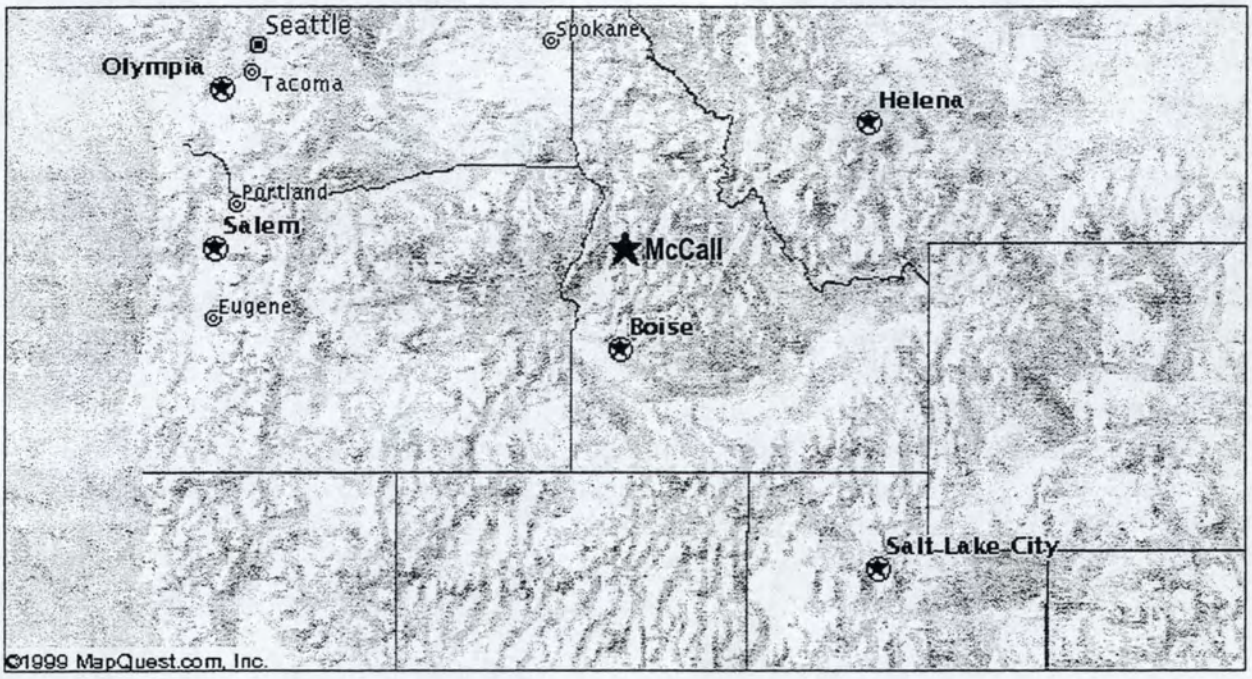
The concept of economic base defines the link between resources a community possesses and regional income generation through flows of income from outside the region to inside. The economy can be divided into two parts, its economic base and it's non-basic sectors. The industry components of the economic base are aggregated major groupings by product type. In

addition, to the industry classifications are government sectors, state and local and federal, and exogenous investment. The economic base produces the exports from the region and generates the income and the tax revenues necessary for the rest of the economy. The non-basic sectors provide goods and services as inputs into production of the basic sector and as purchases for the residents.

From the above information on the links in the economy, one can visualize the county economy as a system of circular flows within the county and between the county and the larger region. The county generates income through the export base (sales to those outside the county) and transfers from outside the region (state and federal payments as well as passive income). Businesses that produce goods and services for export purchase inputs locally and non-locally from what are called the non-basic sectors. These non-base sectors also purchase from the non-basic sectors and import what they cannot purchase locally. Residents contribute to the cycle by buying locally and importing what they cannot purchase locally.

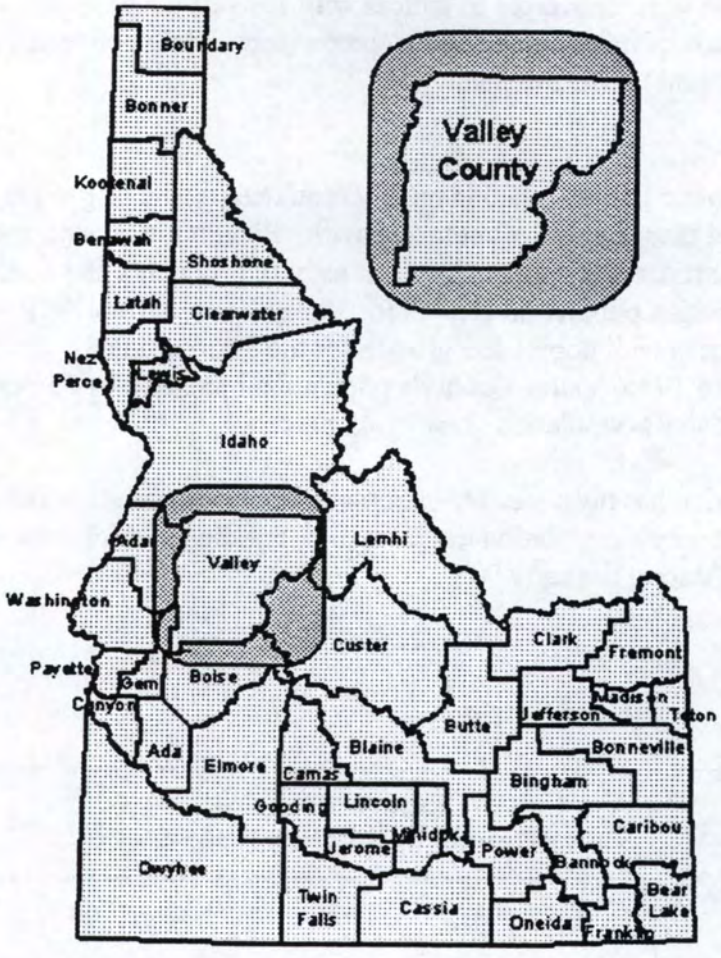
Thus businesses that produce exports, businesses that service the export businesses and residents all contribute to the local economy. A brief description of the basic and non-basic sectors in Valley County is provided in Appendix A.

McCall and Vicinity



Boise, ID to McCall, ID = 108 miles
Portland, OR to McCall, ID = 458 miles
Spokane, WA to McCall, ID = 266 miles

Valley County, Idaho



Economic Growth

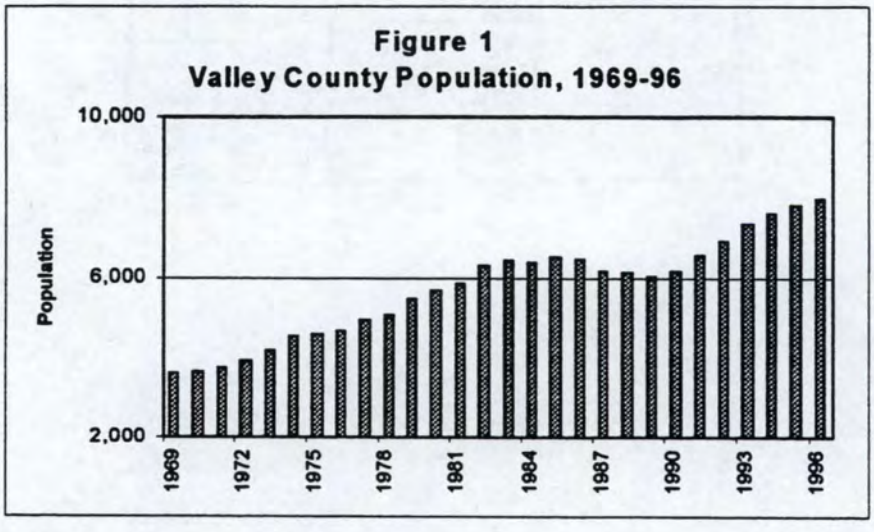
Economic growth in Valley County was evaluated using population, employment, total personal income, and individual income. In order to compare with Idaho, population, employment and income were converted to indices with 1969 as the base year (i.e., 1969=100). To account for the effects of inflation and allow comparison of data between years, all dollar amounts have been deflated to 1992 dollars.

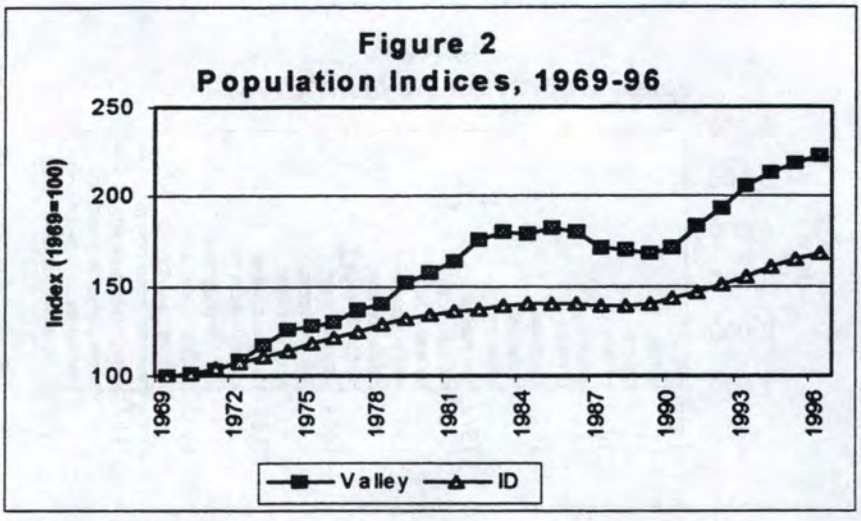
Population

Retaining economic growth in a community requires a stable or growing population to work and consume, and thus support economic growth. Population growth is a reflection of a community's ability to attract and retain individuals as both producers and consumers. The following figures summarize population growth for Valley County from 1969 to 1996 and compare it through indices with population growth for the State of Idaho.

- Between 1969 to 1996, Valley County's population increased by 55 percent (3,585 to 7,957), while Idaho's population grew by 41 percent.

- Idaho's population has been steadily increasing, however growth was flat during the late 80's. Valley County's population has increased, but dipped during the mid 80's and increased again during the early 90's.





Employment

Closely associated with changes in population are changes in employment. Traditionally, it has been assumed that population growth follows employment growth. However, more recently it has been suggested that in some cases, such as when quality of life considerations are involved, employment growth may actually follow population growth. The following graphs summarize employment growth for Valley County, from 1969 to 1996, and compare it with Idaho. The graph labeled *Changes in Valley County Employment, 1969-96* indicates the change in employment by sector for Valley County between 1969 and 1996. *Valley County Employment by Type, 1969-96* compares the trend in Wage and Salary jobs with that for Non-Farm Proprietor Employed (NFPE) jobs.

- Employment in Valley County rose 66% between 1969 to 1996 (1892 to 5546). Idaho's growth rate was 12 percent larger than Valley County's.
- Since 1978, Valley County's employment has been increasing at a faster rate than the State's as a whole.
- Between 1969 and 1996, wage and salary jobs were much greater than non-farm self-employed jobs. In 1969, the number of non-farm self-employed jobs was 18 percent of wage and salary jobs. In 1996, this number increased to 68 percent.
- In 1969 the job/person ratio was 0.53. In comparison 1996 it was 0.70, where the population exceeded the number of jobs. This difference maybe due to the increase in recreation persons or part time residents.

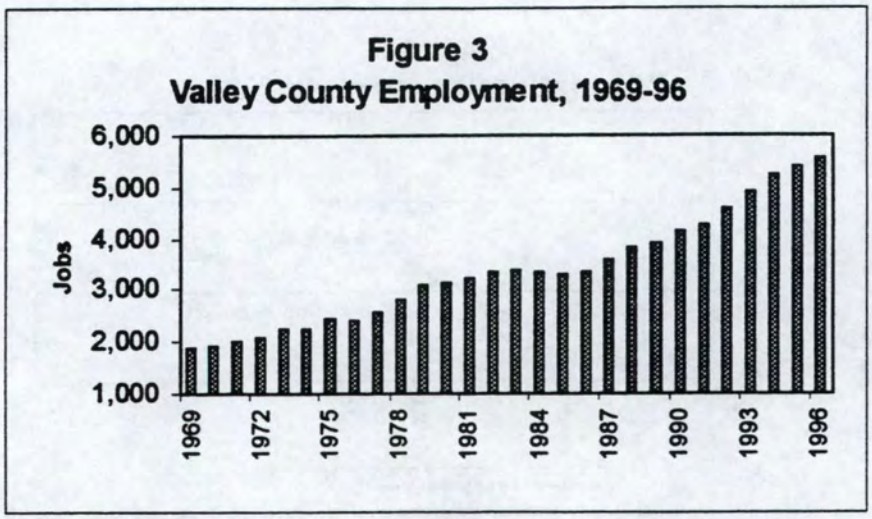


Figure 3
Valley County Employment, 1969-96
Jobs
6,000
5,000
4,000
3,000
2,000
1,000
1969
1972
1975
1978
1981
1984
1987
1990
1993
1996

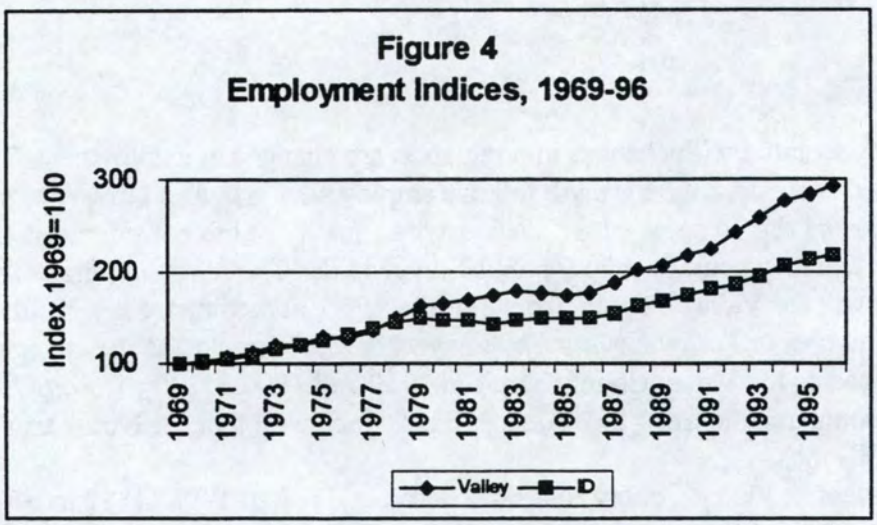


Figure 4
Employment Indices, 1969-96
Index 1969=100
300
200
100
1969
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
Valley
ID

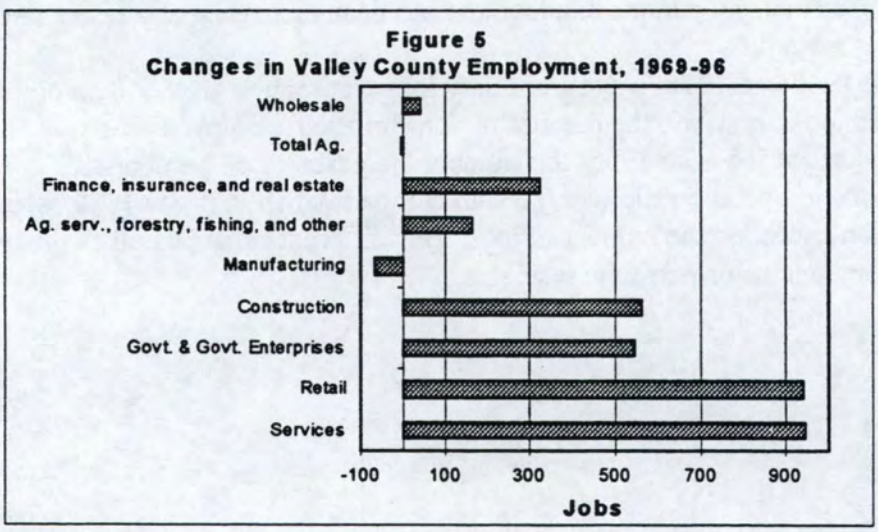
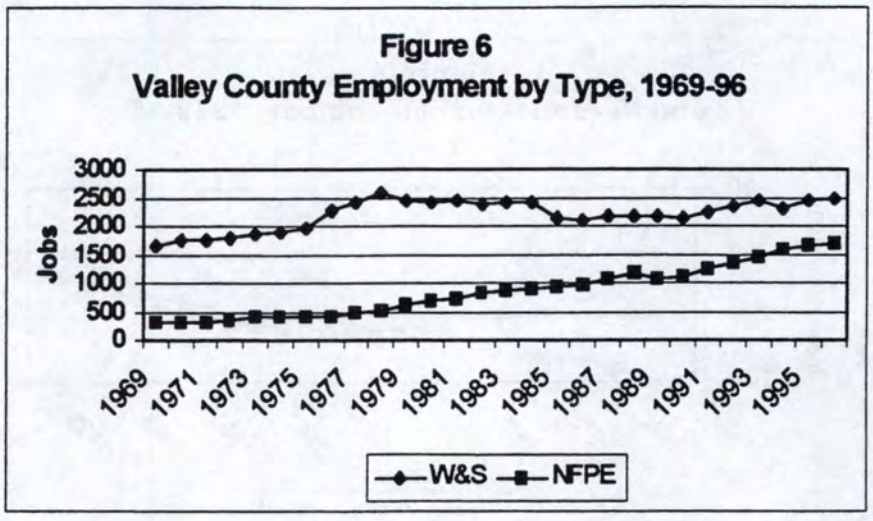


Figure 5
Changes in Valley County Employment, 1969-96
Wholesale
Total Ag.
Finance, insurance, and real estate
Ag. serv., forestry, fishing, and other
Manufacturing
Construction
Govt. & Govt. Enterprises
Retail
Services
-100
100
300
500
700
900
Jobs



Total Personal Income

The following graphs describe personal income in Valley County. Personal income can be used as a method to estimate a community's economic growth. The two graphs labeled *Valley County Personal Income, 1969-96 (Fig. 7)* and *Total Personal Income Indices, 1969-96 (Fig. 8)* summarize Valley County's income growth for the 1969 to 1996 time period, and compare it to that of the state of Idaho. *Change in Valley County Income, 1969-96 (Fig. 9)* shows the change in source of personal income by sector for Valley County. Net earnings and transfer payments are compared in *Valley County Income by Type, 1969-96 (Fig.* 10). All dollar amounts used have been deflated to 1992 dollars.

- Valley County personal income is four times higher in 1996 than it was in 1969, reaching over $150 million.
- The state of Idaho's total personal income has more than doubled since 1969.
- Transfer payments measured 40% of Valley's net yearnings in 1996.

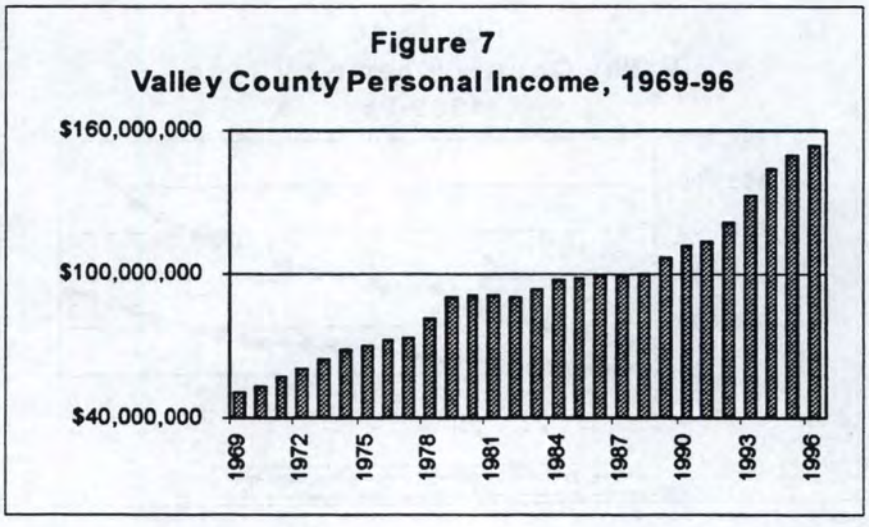


Figure 8
Total Personal Income Indices, 1969-96

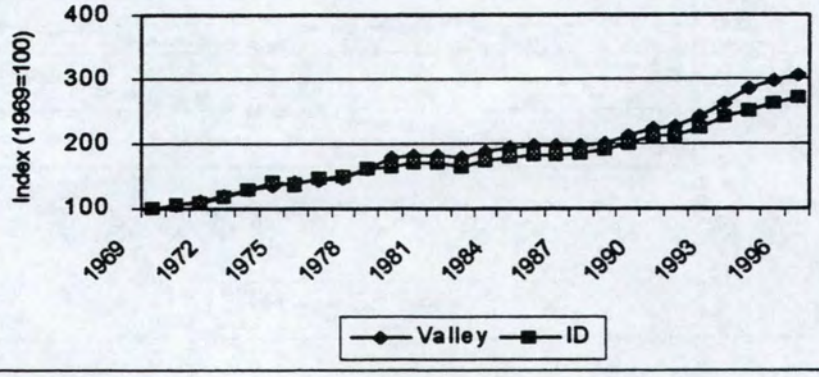


Figure 9
Change in Valley County Income, 1969-96

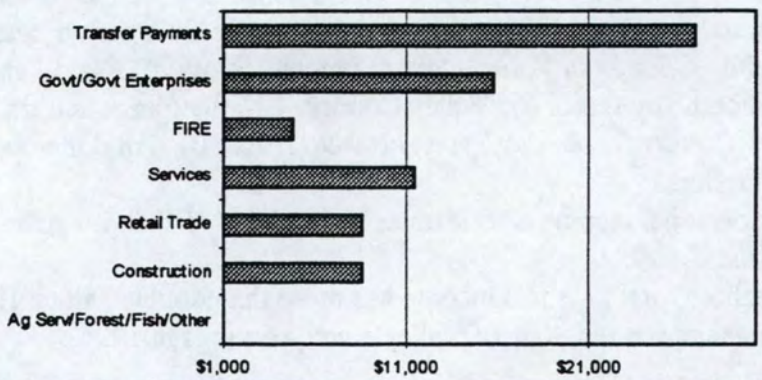
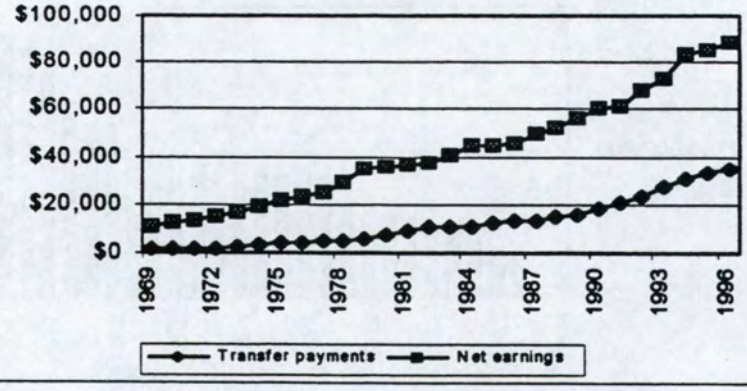


Figure 10
Valley County Income by Type, 1969-96



Individual Per Capita Income

Individual income is used as a scale to measure the economic well-being of a specific area, and the people who reside there. These numbers were adjusted for inflation and have varied. Per capita income and average earnings per job were used to measure individual income.

Per capita personal income can be used as an indicator of the quality of consumer markets, and shows the economic well-being of all county residents. Per capita personal income is defined as the total county income divided by the population of the county. The *Per Capita Income, 1969-96 (Fig. 12)* compares Valley County to State of Idaho's values.

- Per capita income in Valley County was $14,022 in 1969, and increased 38 percent to $19,299 in 1996. Idaho had a per capita income increase of 61 percent during the same time period to $18,025.

Figure 11
Valley County Per Capita Income, 1969-96

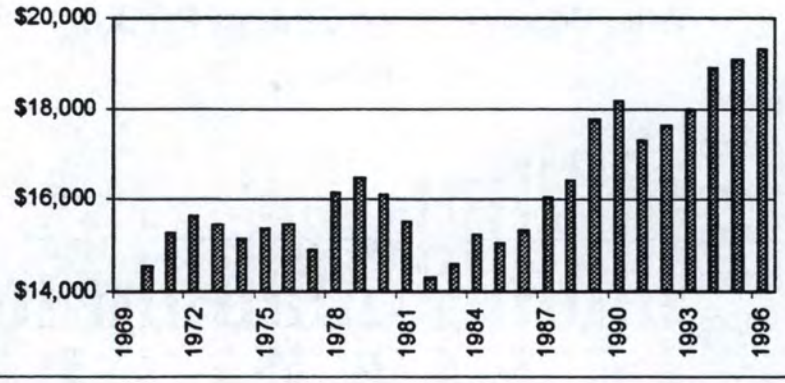
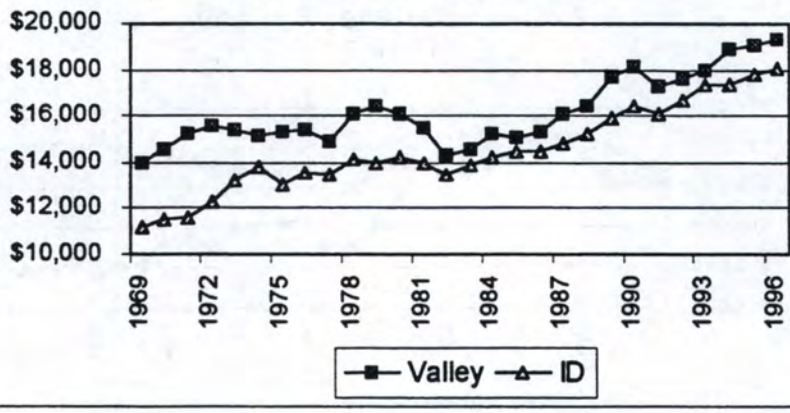


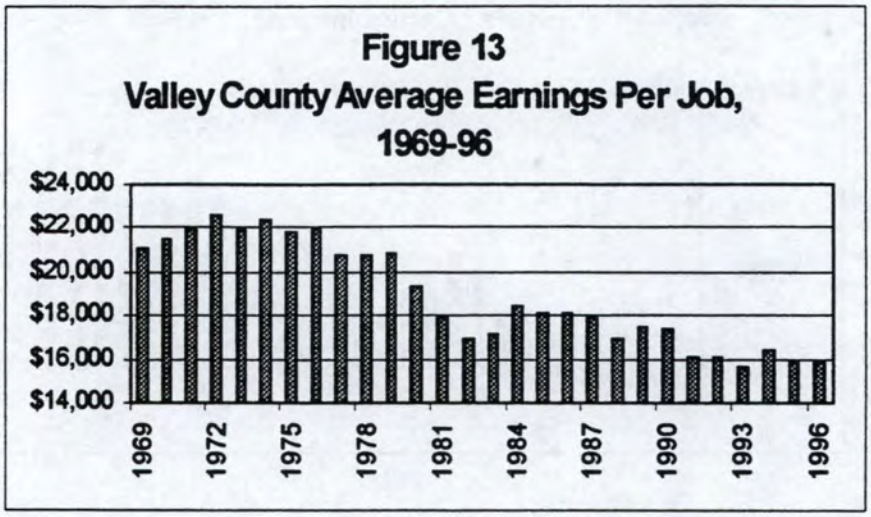
Figure 12
Per Capita Income, 1969-96

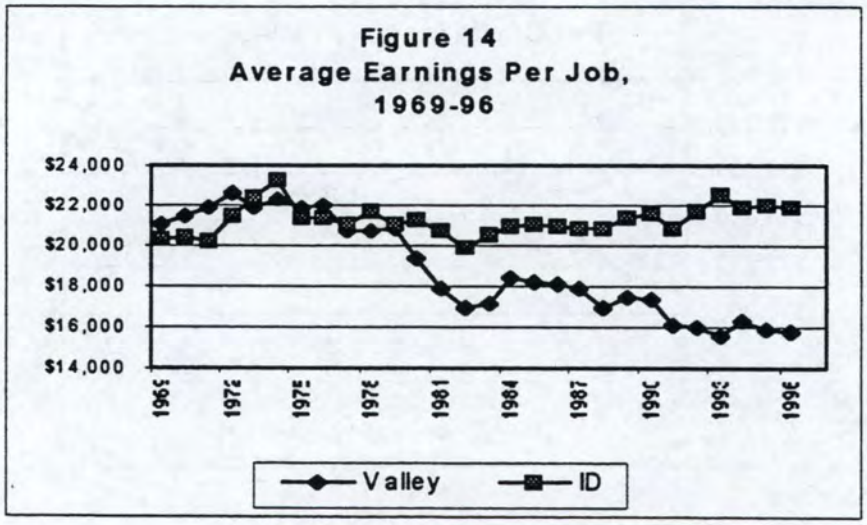


Average Earnings Per Job

Average earnings per job is estimated by dividing total earnings by total employment (Fig. 13). While per capita income considers the entire population, inflation adjusted average earnings per job focuses on the economic well-being of the community's workforce. The following figures summarize average real earnings per job for Valley County from 1969-96 and compare it to the state of Idaho (Fig. 14).

- Between 1969-96 average earnings per job for Valley County have varied dramatically. The last three years shown, average earnings per job have been approximately at or below Idaho's, which were down from the 1989 peak of $37,635.
- Between 1969 and 1996, average earnings per job for Valley County averaged 17 percent higher than Idaho's average earnings per job. In 1996 the average earnings per job was $20,935.





The Valley County Input/Output Model

Regional models can be categorized as nonstructural or structural (Treyz, 1993). Nonstructural models lack economic behavioral structure and thus base regional changes upon trends, such as historical shift-share, employment, tax revenues and expenditures which are used to predict future changes. Naïve time series forecasts versus multiple simultaneous equations bracket the spectrum of nonstructural models. The second type of regional model, structural models, are behavioral. The structural model predicts agent behavior as the effect or impact response from a specific stimulus. Advantages of structural models for policy analysis is that the policy change is first specified and the structural model then estimates the impacts on the various agents in the economy. To address impacts on all agents in the economy, structural models require economic structure and behavioral mechanisms for each agent. The model of choice for regional impact analysis is regional Input/Output (I/O).

The precursor to regional I/O models were simplified Keynesian framework accounts that developed a single multiplier from an economic base. The more complex the intersector linkages, complex interactions between agents and need for sectoral multipliers, the greater the advantages I/O has for impact analysis (Davis, 1990). As the applicability of Leontief's national I/O structure to a regional scale was recognized, survey based regional I/O models were constructed. The availability of non-survey based I/O models, in particular IMPLAN (Taylor et al, 1992) have proliferated use of regional I/O modeling.

In addition to the general limitations of I/O in impact analysis, non-survey based I/O models have the inherent drawbacks stemming from the use of secondary or national data combined with an identical algorithm to estimate an I/O model for every county in the US. The I/O model developed for Valley County starts with the IMPLAN data base. The county model generated by IMPLAN is then modified extensively with a combination of Idaho ES-202, direct surveys, and Idaho Extension data sources. The analysis portion of the IMPLAN program was not used. The multipliers and subsequent impact analysis were accomplished with a spreadsheet.

This report first details the account system and multiplier calculations used for the Valley County regional economy. The combined theory and data description provides the user of the Valley County I/O model the necessary tools to use the model for impact analysis.

Input/Output: An Accounting System for an Economy

Input/Output (I/O) comprises both a system of economic accounts for a region as well as a tool for economic analysis and forecasting. Input/Output is first a method of social accounting. The accounts of an I/O are displayed in matrix form as the transactions-among-sectors table, (Table 6 Appendix A) which depicts the economic structure and interdependencies among industries and agencies of the Valley County economy. The table shows customers for each industry and the input needs are for each industry. The focus of input/output analysis is the cumulative interdependent nature of expansion or contraction of an economy. By accounting for each industry's direct purchases or sales we can then ascertain the indirect impact of each industry. A social account is an empirical framework resulting from a theoretical structure which sets forth relationships between various aspects of a social entity. An account refers to the framework itself and/or the values within that framework.

Users of the Input/Output (I/O) technique require a knowledge of the definitions of the I/O accounts and then an understanding of how the accounts are used to model the economic interdependencies in an economy. This section provides a summary of the I/O accounts and compares and relates them to regional income and product accounts.

I/O Model Application

I/O models can be used to show economic impacts from governmental policy, business introduction and other potential changes in a local or regional economy. To derive economic impacts from a change or "shock" to an economy we must first decide whether it is a change to final demand or to output. Final demand changes are changes in purchases of goods and services for final consumption such as purchases made by the federal government or households. These purchases may be food, computers, houses, buildings or any other good or service. Output changes are sales or value of production (agricultural commodities) from a given industry. These sales can be anything ranging from alfalfa hay and cattle to gold and electronic parts or sales to region visitors.

Table 1. Output Multipliers for Valley County, Idaho.

Valley County, Idaho 1996 Output Multipliers	Type I Multiplier	Type II Multiplier
	$ chg TIO/$ chg TGI	$ chg TIO/ $ chg TGI
Cattle	1.15	1.90
Other Livestock	1.30	2.02
Pasture & Crops	1.13	2.01
Ag., Forest & Recreation Services	1.09	1.59
Mining	1.03	1.46
New Construction & Maintenance.	1.35	1.61
Other Construction & Maintenance	1.16	1.44
Harvesting & Manufacturing Wood Products	1.06	1.30
Manufacturing	1.10	1.47
Transportation	1.10	1.53
Communication & Utilities	1.09	1.38
Wholesale & Retail Trade	1.08	1.71
Auto Service & Fuel	1.12	1.55
Food & Lodging	1.12	1.46
FIRE	1.12	1.33
Non-Professional Services	1.15	1.73
Professional Services	1.14	1.74
Households		1.31

Table 2. Employment Multipliers for Valley County, Idaho.

Valley County, Idaho 1996 Employment Multipliers	Direct Employment	Final Demand Type I	Final Demand Type II	Employ Multiplier Type I	Employ Multiplier Type II
	Jobs/mil$	chg Jobs/chg mil$FD	chg Jobs/chg mil$FD	chg Jobs / job	chg Jobs / job
Cattle	10.75	14.23	18.26	1.32	1.70
Other Livestock	52.38	61.70	65.64	1.18	1.25
Pasture & Crops	21.45	23.88	28.52	1.11	1.33
Ag., Forest & Recreation Services	38.07	43.15	46.00	1.13	1.21
Mining	6.86	12.53	16.43	1.83	2.40
New Construction & Maintenance.	12.37	17.12	18.51	1.38	1.50
Other Construction & Maintenance	12.76	16.23	17.74	1.27	1.39
Harvesting & Mfg Wood Products	4.35	6.66	8.24	1.53	1.89
Manufacturing	11.05	13.29	15.30	1.20	1.38
Transportation	17.91	20.48	22.83	1.14	1.27
Communication & Utilities	4.55	6.24	7.85	1.37	1.72
Wholesale & Retail Trade	35.40	36.68	40.34	1.04	1.14
Auto Service & Fuel	19.22	21.07	23.41	1.10	1.22
Food & Lodging	29.49	33.32	35.25	1.13	1.20
FIRE	10.70	13.70	15.00	1.28	1.40
Non-Professional Services	20.90	24.74	28.16	1.18	1.35
Professional Services	22.06	25.32	28.89	1.15	1.31

At the request of the Valley County Commissioners, two scenarios, a loss of the mill and an increase in recreation were used to demonstrate the capabilities of the model.

Scenario 1: A decrease of timber availability and effect of roadless initiative

Timber has historically been an important part in Valley County's economy. Currently it still holds an important roll, but the increase in recreation activities have shifted the economy to a more tourism dependant economy. This scenario, requested by the Valley County Commissioners, evaluates the in-county effects of reducing the timber that's available for harvest and the closing of the mill.

Logging in the county occurs on private, Bureau of Land Management, Idaho State Department of Lands, and Forest Service land. Portions of the Boise and Payette National Forest have been logged to supply lumber to the mill, and in the past this has been a significant source of timber for processing. Timber harvesting in National Forests is in jeopardy due to timber harvest reductions and the proposed roadless initiative, both would greatly effect the mill and the county.

Table 3. Effect of timber availability and roadless initiative in Valley County

Sectors	Harvesting & Manufacturing Wood Products Type II	Direct Impacts	Indirect Impact Harvest & Mfg. Wood Prod
Cattle	0.0001	($27,300,000)	($1,639)
Other Livestock	0.0001		($3,076)
Pasture & Crops	0.0000		($652)
Ag., Forest & Recreation Services	0.0008		($22,863)
Mining	0.0000		($488)
New Residential Structures & Maintenance.	0.0012		($33,791)
Other Construction & Maintenance	0.0060		($163,064)
Harvesting & Manufacturing Wood Products	1.2144		($33,152,162)
Manufacturing	0.0003		($7,296)
Transportation	0.0128		($350,657)
Communication & Utilities	0.0108		($294,518)
Wholesale & Retail Trade	0.0277		($756,342)
Auto Service & Fuel	0.0066		($180,801)
Food & Lodging	0.0169		($461,867)
FIRE	0.0257		($701,692)
Non-Professional Services	0.0144		($392,154)
Professional Services	0.0162		($442,347)
Households	0.2286		($6,239,592)
Total	1.5826	($27,300,000)	($43,205,004)

Summary

Directly the loss of the mill would cause a 60% decrease in this business sector. This amounts to an economic loss of $27,300,000 or a decrease of purchases made from this sector to other business sectors in the county. There will be a $6,239,592 decrease of local employment, which means there will also be the same amount of reduction in household purchases from local business (ie. grocery stores etc).

Scenario 2: Effect of increase in recreation

A second scenario considers tourism development. Tourism can be a number of things including campers, hunters, snowmobilers, ranch experiences, fishermen, other outdoor experiences or just people passing through who stop for a few days or a few hours. How many of these different types of visitors would be required to replace the dollar volume lost in scenario 1. Table 4 shows the in-county spending per recreational visitor days (RVD) for Valley County visitors in 1999. Table 5 shows the current levels of visitors estimated for the same period.

Table 4. Recreational Persons Daily Spending in Valley County

Recreation Type	Per Person Daily Spending
Hunters	$14.70
Boaters	13.92
Snowmobilers	32.92

Downhill Skiers	57.88
Cross-country Skiers	18.45
Fishermen	7.04
Campers	3.77

Table 5. Visitor Spending in Valley County, 1998-99

Activity	Number of Visitors	Estimated Recreation Revenue
Snowmobile	78,444	$2,572,963
Downhill Ski	101,489	5,878,418
Cross-country Ski	68,879	1,270,818
Hunt	152,800	2,246,160
Boat	91,029	1,267,124
Fish	340,741	2,398,817
Camp	468,879	1,767,674
TOTAL	1,302,261	15634300

Table 6. Impact of Recreation to Valley County.

Recreational Visitor Type	Numbers of Persons by Recreation Type Needed to Compensate for 60% Decrease in Harvesting & Manufacturing of Wood Products [1]	Fold Increase in Visitors
Hunters	1,857,143	3.9
Boaters	1,961,207	25.0
Snowmobilers	832,317	12.0
Downhill Skiers	471,666	4.6
Cross-country Skiers	1,479,675	21.5
Fishermen	3,877,841	11.3
Campers	7,241,379	15.4

1. With current local purchase patterns

Summary

Reduction in the timber harvest and manufacturing sector would be expected to result in a direct decrease in output of $27 million and indirectly another $5.9 million for a total reduction of $43.2 million. This would be expected to be a loss of 390 direct jobs and 436 indirect and induced

jobs for a total of 826 jobs lost in the community.

Because a major share of recreation purchases are made outside the county, a major increase in tourism would be needed to compensate for the timber harvest and manufacturing. Table 5 of the scenario gives an idea of the magnitude of expansion that would be needed.

The increase in visitors of different types would need to be substantial to compensate for timber harvest and manufacturing loss. In all likely hood the quality of the recreational experience could not be maintained. A 25 fold increase in boaters on the county lakes would be down right dangerous. The county also currently does not have the infra-structure to accommodate those numbers of persons. Therefore the county would be expected to lose economic activity as a result of the timber harvest and processing reduction.

Appendix A

Valley County Industry Aggregations

Livestock:

The livestock sector is mainly comprised of cow/calf operations. The factor that effects this sector greatly is the short grazing season.

Other Livestock:

There are a small number of sheep ranchers in the county, along with some horses. This, however is a smaller sector than the cattle ranchers.

Pasture and Crops:

The sector is comprised primarily of grazing pasture production. There is a limited acreage used for alfalfa or hay for bailing. The majority of the pasture is non-irrigated land.

Ag., Forestry, and Recreation Services:

This is a relatively small sector in the county. Most agricultural services are purchased within the county. The larger portion of this sector is made up of the recreation services, which are boat related services. The remainder of this sector is the growing of trees for sale, or tree nurseries.

Mining:

The mining sector in Valley County is almost non-existent.

New Construction and Maintenance:

This sector includes all the new residential structures as well as their maintenance and repair. This is an important sector in the county due to the growing popularity of the natural resources and recreation activities the county has to offer. Second homes to many of the county's recreation visitors have expanded this sector.

Other Construction and Maintenance:

This sector includes all other construction, utility, farm structures, government facilities, highways and streets as well as their maintenance and repair.

Harvesting and Manufacturing of Wood Products:

This is one of the most important sectors to the county. This sector includes logging companies, mills, and other such related businesses. The county has an abundant source of trees which have been logged for many years. Prior to the counties recreation sector, this sector was the base of the county's economy.

Manufacturing:

This is a very small sector in the county's economy. There are few businesses which

manufacture small scale items.

Transportation:

There are four systems for transportation in the county. A railroad line runs through the county form **south to north** which has some recreational use, but is mostly used for hauling lumber from the mills. Load is picked up in Cascade at the mill on the southwestern corridor of the county. An interstate highway traverses the county from north to south. Some local traveling exists.

Communication and Utilities:

Phone communication is the larger component of in-county communication. It also includes the various local newspapers and the local radio station. The utilities include city sewer and water, and the electric company.

Wholesale and Retail Trade:

This sector includes grocery, clothing, furniture, feed, lumber or home centers, and other such retail stores. This sector also involves a number of small firms supplying special niche markets. The only contribution of this sector to the Valley economy is wages paid and local services purchased, such as utilities.

Auto Service and Fuel:

There are service stations located in all parts of the county. Because of Highway 55 being a major corridor for traffic to travel from north to south, and vice versa, within the state, and the only highway in the county, the increases in traffic provide a great service to the economy.

Food and Lodging:

There are eating and drinking establishments in every community in the county. These range from simple fast food locals to those with more extensive menus. Most employ local labor and are locally owned so proprietors' incomes remain within the county. Supplies for these businesses must be imported to the county.

FIRE (Finance, Insurance, and Real Estate):

There are financial services available in the county as well as insurance and real estate agents. These are small offices connected to larger national firms, however some real estate offices are locally owned.

Professional Services:

This sector includes doctors, hospitals, nursing facilities, lawyers, accountants and other such services. The majority of these employ or are owned by local persons, so proprietor's income stays within the county.

Non-Professional Services:

This includes electricians, beauty or barber shops, day cares, storage facilities, and other

such services. These are generally locally owned and do not employ many persons.

Proprietary Income:

Proprietary income is the return to owners' efforts for operating a business. This becomes large in profitable times and can become zero in difficult times. The actual residential location is important because that is where the income is attributed. In the case of a number of businesses in Valley County, the owners reside outside the county resulting in their proprietary income being classified as nonresidential.

Other Property Income:

Includes corporate income, corporate transfer payments, interest and rental income.

Indirect Business Taxes:

Covers sales, excise, and value added taxes as well as customers duties. These are taxes paid during normal operation of industry. Other types of taxes such as income and property are paid out of income, therefore exogenous tot he I/O model.

Households:

The consumers which purchase goods and services created by the economy. They are also the recipients of wages which create the purchasing power.

Federal Government:

Sales are goods or services that have been produced or stockpiled by governmental units. Purchases are expenditures for goods and services to provide federal government services.

State/Local Government- Non-education:

Sales are non-education goods and services produced or stockpiled and sold. Purchases are expenditures for goods and services required to provide government services or goods.

State and Local Education:

Sales are education goods and services produced or stockpiled and sold. Purchases are expenditures for goods and services required to provide government services or goods.

Enterprises/Corporations:

Organizations which produce goods or services for government or private entities.

Capital/Inventory:

Capital goods purchased for formation of private capital. Inventory is the value of goods not dispersed or purchases which are additions to inventory.

Exports:

Commodities or services sold outside the region being analyzed or to non-residents visiting the region.

Appendix B

Valley County I/O Data

Through input/output (I/O) modeling, exogenous shocks to an economy and estimated impacts to industry output, income and employment can be derived. There are many widely used and published secondary I/O models on the market today including IMPLAN and RIMS II. Often with these models, national average make tables are used that do not represent the local agricultural industries and agricultural sectors and are overly aggregated. Using crop and livestock cost and return estimates, the I/O model can be expanded and localized to investigate impacts to specific industries. Using enterprise budgets, each production cost is allocated to the I/O industry where purchased. If more than one budget exists for a region, a weighted or average of the costs and returns by the acreage or unit of output of each commodity for a regional account are used. By using margining techniques and regional purchase coefficients the I/O accounts are converted to producer prices and purged of all imports. The commodity accounts can now be expanded by multiplying value of production estimates by the technical coefficients derived from the cost and return estimates. Following these procedures yields an industry by commodity matrix which includes regional production practices, not national. This also gives the researcher the opportunity to disaggregate and broaden the scope of the model.

Given that survey-based models are time consuming and expensive; and conversion of a national model through secondary procedures unreliable, the hybrid-type county level input/output provides the best solution. There are several hybrid-type approaches. Among the most promising is the "mongrel model" or the mixed survey/non-survey model suggested by Jensen (1980). Jensen suggested a two-step approach for development of a "mongrel model". First, a non-survey input/output model is developed from a microcomputer program such as IMPLAN. The second step involves the insertion of superior data obtained from surveys, other primary sources, or reliable secondary sources. There is a substitution of superior data into the model and appropriate techniques are employed to balance the regional models.

The emergence of controversial public land management decisions, surface and groundwater regulation, agricultural production regulations, and environmental concerns have created a need for a method to localize I/O models. This localization of I/O models more accurately defines agricultural sectors pertinent to a region. Instead of including all of agriculture in one economic sector or a few broad sectors, numerous agricultural sectors can be used.

Many crops grown in the United States are grown strictly in certain regions and are aggregated with other industries in the secondary impact models. These crops, however small in importance nationally, may have large impacts in their respective production area. Most secondary I/O models have economic sectors that may produce aggregation errors. Morimoto (1970) investigated aggregation errors in I/O models. For example, the Valley County, Idaho economy relies heavily on timber production and manufacturing as an economic base with that sector being the largest. In the secondary I/O model there are sectors called Pasture and Crops, and Harvesting and Manufacturing Wood Products. However, when deriving impacts, the sector where the impacts occur should be disaggregated as much as possible.

The estimation errors encountered with the secondary I/O models do not necessarily arise from errant agricultural production functions or technology. The problems arise from the

aggregation of those agricultural sectors. Burchell, et al. (1998) stated that even when county technology varies widely from the nation's average for one or more industries, model accuracy might not be significantly affected due to inter-county trade. These errors in technology are reduced through the use of regional purchase coefficients (RPC's) and margining techniques discussed later.

This paper integrates crop or livestock cost and return estimates into a framework suitable for use in a "mongrel" type I/O model using IMPLAN as a base. By studying agricultural enterprises as individual economic sectors, with expenditure patterns different from national averages and in a less aggregate format, the researcher gains the ability to more accurately estimate the impacts these agricultural sectors have on local and regional economies.

We used five basic steps to create I/O accounts cost and return estimates: (1) gathering control (output) total and cost and return estimates pertinent to the study region, (2) converting from purchaser prices to producer prices using retail trade margin procedures, (3) allocating cost and return accounts to I/O sectors, (4) purging imports with IMPLAN regional purchase coefficients, and (5) updating a secondary model make matrix. IMPLAN was used as a basis for modeling in this discussion. The IMPLAN software helps to alleviate the costs of obtaining primary data and can be easily updated with primary data such as cost and return estimates, ES202 data, and BEA numbers. Also, with the IMPLAN program and software, data transfers easily into spreadsheet format for model and program construction.

After deciding which sectors would be included in the I/O model, and how they would be aggregated, control totals would be gathered for those commodities. Control totals are merely values of production, employment, and income generated from each commodity. The values of production can be found using state agricultural statistics, the Department of Commerce's Census of Agriculture, Bureau of Economic Analysis and Department of Labor values. These published values are based on statewide numbers and can be broken down to a county or regional values based on acreage in the county or production of that commodity within the county. The employment and income values are available from the Bureau of Economic Analysis' Regional Economic Information System (REIS). They publish employment and income numbers for agricultural production in an aggregate format, so they must be proportioned based on employment in the cost and return estimates, ES202 state-level employment data, relative commodity output, or other methods available to the researcher.

Next, cost and return estimates must be constructed for each of the agricultural sectors that control totals were compiled for. The cost and return estimate is the cornerstone of an accurate and precise I/O account. The more detailed the cost and return estimates are the better the production function for the I/O sector will be. If more than one enterprise budget exists for a given commodity then the various costs and returns are weighted by the amount of acreage of that crop in the study area. For example, if two grazing enterprise budgets exist for the same size of operation, one with a federal grazing lease and another without, weight the numbers in each budget according to the number of head relevant to each. Next, sum the various production items from the cost and returns to arrive at a localized and weighted production function for cow-calf operations in the region. For the sake of simplicity, we transform the cost and return estimates into a single vector of production purchases and gross returns for the enterprise.

Converting from Producer to Purchaser Prices

To make the model more precise, the retail trade sectors need to be converted from producer prices to purchaser prices. The producer price is the price paid for a commodity at the factory door. The purchaser price is the price paid for a commodity at a retail outlet which includes transportation costs, wholesale mark-up, retail mark-up, and producer price (Minnesota IMPLAN Group, 1997). The cost and return estimates contain purchaser prices for most of the purchased inputs and therefore all purchases from the retail sector need to be margined. A margin is the portion of a commodity's value going to each appropriate handler such as the transportation cost, wholesaler mark-up and retail mark-up. There are different types of margins included with the IMPLAN software: household, government, and investment. The margins used in IMPLAN come from the United States Department of Commerce Summary Tape Files, but there are other sources that may better represent rural retail businesses such as Financial Studies of the Small Business by Financial Research Associates that is published yearly, or "Annual Statement Studies" by Robert Morris Associates. Once the margin source is chosen, they must be applied to each of the retail purchases made in the budget by multiplying the margins and the budget costs. Margining makes the I/O model more accurate in terms of the impact local trade has on retail businesses. In the case of Valley County, Idaho, we know that the only margin that is not an import for the production of pasture is the retail margin; all transportation and wholesale margins are imported. For areas where it is unclear whether or not the transportation and wholesale sectors exist, IMPLAN margins or the best method available should be used to convert from producer prices and allocate costs to their respective sectors (Willis and Holland, 1997).

Allocating Cost and Return Accounts to I/O Sectors

The sectors included in the aggregated Valley County I/O model and margined to their corresponding I/O account. These model sectors for Valley County are part of a hybrid IMPLAN I/O model built for Valley County.

When allocating costs to I/O accounts some of the cost and return items may be "lumped" together and need to be separated into two or three different accounts. However, more detailed cost and return estimates will likely have most cost items separated. If using IMPLAN as the modeling software don't forget the value-added accounts, employee compensation, indirect business taxes, proprietor income, and other property type income. These numbers can be derived from ratios between IMPLAN and your employment, income and output totals for each given sector. Notice that the new I/O accounts vector adds to the same amount as the value of production. This happens because the I/O model must balance so that purchases equal sales. Updates can be made with the simple insertion of new values of production for each model sector.

Purging Imports and Direct Requirement Calculation

The idea of I/O modeling is to capture impacts to local economies. This allows for the true regional interaction of the sector with the other sectors of the economy within the model as explained by Coupal and Holland (1995). Import purging is done through the use of regional purchase coefficients (RPC's). RPC's represent the proportion of the total local demand met by local production and attempts to account for "cross hauling" of goods (MIG, Inc., 1997.) The RPC's are generated by the IMPLAN software and may be exported for use outside of the

software framework. To purge the imports from an account, each item in the vector of margined costs is multiplied by the RPC generated for that industry. This process will not change the total output or value of production for the I/O account, all that is done is a transformation of the vector into local purchases and imports of all other commodities and services. Some imports were already derived when margining the retail trade sectors. If better data than IMPLAN is available for estimating regional purchases, that data may be used instead and either entered into the IMPLAN software directly or used outside of the software.

With the imports now purged from the I/O account, the technical coefficients for the new sector can be derived. Dividing the vector of now margined and import purged costs by the value of production results in a vector of technical coefficients. Once the direct requirement vector (or matrix with all sectors in the I/O model) is constructed, all that is needed for updating the I/O model, if all production functions remain unchanged, is the output (value of production for the sectors), income, and employment estimates. These estimates of output can be multiplied through the direct requirement matrix and re-balanced to create an updated model.

Appendix C

Table 6. Valley County I/O Gross Transactions.

Valley County ID Gross Transactions, 1996	Cattle	Other Livestock	Pasture & Crops	Ag., Forest & Recreation Services	Mining	New Construction & Maintenance.	Other Construction & Maintenance	Harvesting & Manu-facturing Wood Products
Cattle	128,129	0	0	0	0	0	0	0
Other Livestock	46	9,872	0	49,481	0	0	0	0
Pasture & Crops	357,500	49,667	0	0	0	0	0	0
Ag., Forest & Recreation Services	51,250	15,414	26,214	383,229	4,262	46,495	83,231	10,085
Mining	0	0	0	0	4,631,540	1,543	37,819	0
New Residential Structures & Maintenance.	0	0	0	0	0	5,455	7,910	0
Other Construction & Maintenance	37,971	2,117	0	37,282	75,860	143,737	205,105	157,748
Harvesting & Manufacturing Wood Products	44	0	0	0	0	3,101,298	684,209	8,010,000
Manufacturing	0	0	0	0	1,048	14,180	11,424	8,478
Transportation	0	0	0	25,651	21,246	179,823	185,158	406,251
Communication & Utilities	12,908	1,286	24,500	22,749	38,897	84,062	180,485	183,615
Wholesale & Retail Trade	39,445	2,011	44,432	31,437	29,133	1,350,798	1,618,352	420,931
Auto Service & Fuel	0	0	0	9,910	1,598	190,813	347,368	101,146
Food & Lodging	0	0	0	0	0	11,577	89,442	257,986
FIRE	128,988	4,088	120,583	102,202	51,409	218,838	479,386	348,178
Non-Professional Services	7,258	257	17,442	53,124	13,606	71,103	290,271	207,664
Professional Services	19,854	1,188	35,934	58,672	25,328	234,907	1,658,324	113,719
Households	2,231,169	103,352	1,389,560	1,659,743	3,214,335	1,964,406	5,904,423	7,049,027
Non Local Employee Compensation	0	0	0	0	0	1,671,954	4,876,227	585,379
Non Local Proprietary Income	0	0	0	116,047	102,277	1,274,655	3,980,407	2,854,474
Other Property Income	869,648	43,676	453,697	594,190	1,077,704	354,768	880,529	8,526,959
Indirect Business Taxes	356,154	8,102	15,123	129,887	408,031	128,855	233,205	284,392
Non Res Households	0	0	0	0	0	0	0	0
Federal Government	149	13	0	1,347	1,759	13,644	33,684	15,501
State/Local Government Non-Education	12,850	910	0	21,351	5,483	28,284	104,761	139,911
State & Local Education	0	0	0	0	0	152	0	15,990
Capital & Inventory	0	0	0	75	9,456	5,299	6,985	53,074
Imports	676,792	44,393	297,276	1,904,414	1,371,899	8,715,557	19,179,953	15,749,490
Col Sum	4,930,154	286,347	2,424,761	5,200,791	11,084,872	19,812,205	41,078,659	45,500,000

Appendix C Cont.

Valley County ID Gross Transactions, 1996	Manufac-turing	Transporta-tion	Communica-tion & Utilities	Wholesale & Retail Trade	Auto Service & Fuel	Food & Lodging	FIRE	Non-Professional Services
Cattle	0	0	0	4	1	7,929	0	268
Other Livestock	0	0	0	0	0	24,741	0	1,973
Pasture & Crops	0	0	0	0	0	0	0	0
Ag., Forest & Recreation Services	660	0	569	5,051	0	41,087	107,093	16,716
Mining	0	0	8,682	1	0	418	0	0
New Residential Structures & Maintenance.	0	0	0	0	0	0	820,002	0
Other Construction & Maintenance	27,980	74,575	573,687	99,583	36,083	451,536	627,077	261,765
Harvesting & Manufacturing Wood Products	25,620	120	20,449	5,415	333	1,169	324	7,276
Manufacturing	97,424	0	0	0	0	0	0	51,199
Transportation	18,266	191,973	123,845	24,159	18,140	170,528	70,848	90,163
Communication & Utilities	29,234	66,925	674,192	258,643	100,346	695,799	579,626	563,694
Wholesale & Retail Trade	71,122	41,684	122,072	60,925	68,216	284,955	33,512	176,940
Auto Service & Fuel	3,752	25,433	12,921	26,676	12,879	64,507	23,628	78,586
Food & Lodging	0	47,430	102,104	0	0	1,429,845	230,112	189,543
FIRE	41,047	103,157	408,900	476,746	229,540	312,472	2,624,174	1,110,446
Non-Professional Services	27,596	51,916	337,381	353,168	98,070	589,691	578,881	1,526,758
Professional Services	16,980	28,014	151,632	83,588	33,085	227,304	424,801	624,343
Households	700,168	1,332,824	4,571,369	8,635,809	1,610,025	5,540,103	4,481,223	9,435,600
Non Local Employee Compensation	0	173,995	237,198	1,049,074	360,173	2,219,746	511,991	0
Non Local Proprietary Income	0	227,450	855,263	220,239	101,057	541,044	448,317	115,009
Other Property Income	529,183	487,300	9,035,937	2,377,583	727,427	2,159,213	14,129,128	2,468,762
Indirect Business Taxes	24,668	89,753	2,427,496	2,990,113	501,355	1,493,903	3,405,315	545,391
Non Res Households	0	0	0	0	0	0	0	0
Federal Government	2,611	3,125	39,480	37,724	14,704	52,375	93,992	126,617
State/Local Government Non-Education	4,094	13,435	54,986	23,075	10,691	119,239	107,021	50,155
State & Local Education	500	387	2,169	287	70	8,279	190	4,429
Capital & Inventory	810	27	608	69	6,424	110	104	676
Imports	1,454,220	1,953,555	5,271,654	2,144,207	1,897,362	10,387,678	5,482,817	7,102,529
Col Sum	3,075,935	4,913,080	25,032,593	18,872,137	5,825,982	26,823,669	34,780,175	24,548,838

Appendix C Cont.

Valley County ID Gross Transactions, 1996	Professional Services	Households	Local Employee Compensa-tion	Local Proprietors Income	Non Local Employee Compensa-tion	Non Local Proprietary Income	Other Property Income	Indirect Business Taxes
Cattle	205	45,683	0	0	0	0	0	0
Other Livestock	308	72,033	0	0	0	0	0	0
Pasture & Crops	0	0	0	0	0	0	0	0
Ag., Forest & Recreation Services	0	311,509	0	0	0	0	0	0
Mining	0	698	0	0	0	0	0	0
New Residential Structures & Maintenance.	0	542,240	0	0	0	0	0	0
Other Construction & Maintenance	101,794	61,169	0	0	0	0	0	0
Harvesting & Manufacturing Wood Products	602	227,546	0	0	0	0	0	0
Manufacturing	0	0	0	0	0	0	0	0
Transportation	44,463	933,436	0	0	0	0	0	0
Communication & Utilities	197,555	2,989,282	0	0	0	0	0	0
Wholesale & Retail Trade	59,872	13,278,823	0	0	0	0	0	0
Auto Service & Fuel	24,478	3,098,704	0	0	0	0	0	0
Food & Lodging	154,154	7,310,933	0	0	0	0	0	0
FIRE	778,016	9,679,505	0	0	0	0	0	0
Non-Professional Services	405,382	4,914,716	0	0	0	0	0	0
Professional Services	614,863	9,549,682	0	0	0	0	0	0
Households	6,106,636	0	0	0	0	0	0	0
Non Local Employee Compensation	839,625	0	0	0	0	0	0	0
Non Local Proprietary Income	501,823	0	0	0	0	0	0	0
Other Property Income	588,443	5,761,203	0	0	0	0	0	0
Indirect Business Taxes	100,351	1,170,953	0	0	0	0	0	0
Non Res Households	0	3,247,634	67,095,023	14,615,252	14,138,559	10,913,164	13,373,992	0
Federal Government	111,900	16,874,002	8,619,691	991,428	3,694,153	424,898	(895,025)	2,210,760
State/Local Government Non-Education	99,343	17,555,277	2,709,597	0	83,802	0	416,587	12,103,084
State & Local Education	1,377	361,813	0	0	0	0	0	0
Capital & Inventory	121	11,591,321	0	0	0	0	53,865,892	0
Imports	3,955,833	87,048,799	0	0	0	0	(9,345,962)	0
Col Sum	14,687,142	196,626,962	78,424,311	15,606,680	17,916,514	11,338,061	57,415,484	14,313,845

Appendix C Cont.

Valley County ID Gross Transactions, 1996	Federal Government	State/Local Government Non-Education	State & Local Education	Capital & Inventory	Exports	Row sum
Cattle	0	2,453	199	137,322	4,607,962	4,930,154
Other Livestock	0	7,561	273	2,180	117,880	286,346
Pasture & Crops	0	0	0	0	2,017,593	2,424,761
Ag., Forest & Recreation Services	0	115,366	2,686	2,757	3,977,117	5,200,791
Mining	0	9,006	181	99,738	6,295,246	11,084,872
New Residential Structures & Maintenance.	0	533,595	0	14,852,014	3,050,989	19,812,205
Other Construction & Maintenance	12,365	13,243,871	99,397	19,086,555	5,661,401	41,078,659
Harvesting & Manufacturing Wood Products	30	12,204	803	10,747	33,391,811	45,500,000
Manufacturing	0	0	0	1,013,661	1,878,521	3,075,935
Transportation	29,680	116,528	28,790	45,930	2,188,202	4,913,080
Communication & Utilities	13,903	500,405	48,211	71,790	17,694,485	25,032,593
Wholesale & Retail Trade	4,069	217,325	9,892	521,247	384,944	18,872,136
Auto Service & Fuel	3,431	56,307	7,141	62,257	1,674,445	5,825,982
Food & Lodging	2,089	433,912	0	3,981	16,560,561	26,823,670
FIRE	21,758	1,021,297	50,898	944,523	15,524,022	34,780,175
Non-Professional Services	5,401	313,579	30,545	401	14,654,629	24,548,838
Professional Services	2,283	314,574	19,385	32,655	416,026	14,687,142
Households	11,656,007	14,980,897	1,464,315	0	0	94,030,991
Non Local Employee Compensation	4,995,432	463,327	14,657	(82,264)	0	17,916,514
Non Local Proprietary Income	0	0	0	0	0	11,338,062
Other Property Income	1,616,596	3,819,917	1,641	911,979	0	57,415,484
Indirect Business Taxes	0	0	798	0	0	14,313,844
Non Res Households	22,978,242	8,915,768	0	36,649,570	4,699,758	196,626,962
Federal Government	25,654,685	114,440	3,530	16,175,112	3,782,611	78,198,910
State/Local Government Non-Education	9,947,163	18,675,617	9,615	13,035,148	1,168,672	76,500,152
State & Local Education	277	1,936,751	1,352,555	0	308	3,685,536
Capital & Inventory	29	101,482	1,577	14,344,734	39,826,873	119,815,745
Imports	1,255,469	10,593,969	538,446	1,893,709	2,323,426	181,897,485
Col Sum	78,198,910	76,500,152	3,685,535	119,815,745	181,897,483	

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