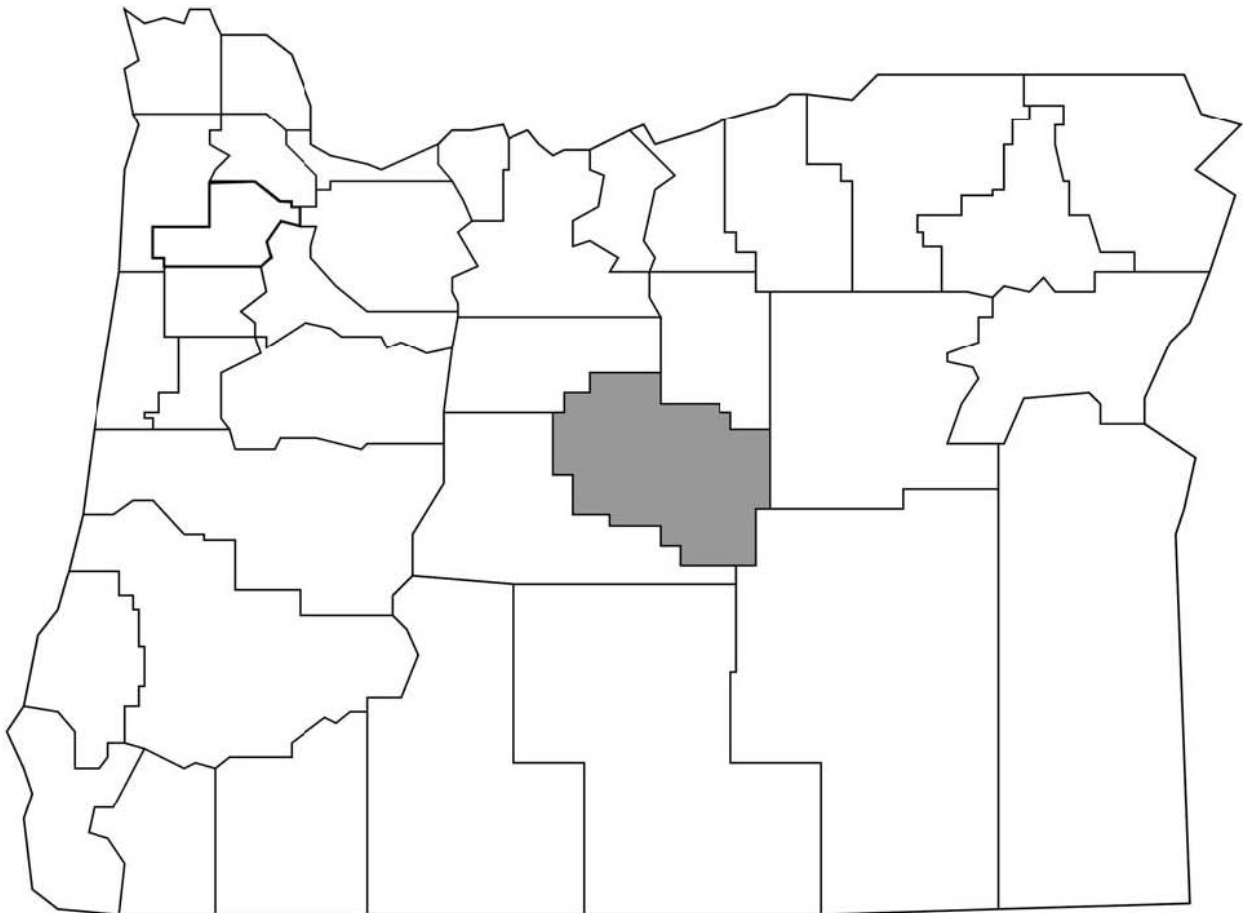


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Crook County's Economic Structure: *An Input-Output Analysis*



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Crook County's Economic Structure: *An*

Input-Output Analysis

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“There was word in the Willamette Valley that the road was open across the mountains in 1866...So in the fall of 1867, the first attempt at settling Central Oregon, Crook County to be, was made...(by settlers from)...near Lebanon in Linn Co.”

—Wanda Clark, 1981, *The History of Crook County, Oregon*

Introduction

Roads and people from west of the Cascades are still an important factor and increasingly affect Crook County’s economy. Economic and political relationships with metropolitan Oregon significantly impact all of nonmetropolitan (nonmetro) Oregon. Crook County is a good case study for rural Oregon since it is very representative of rural Oregon (Figure 1) and, to some extent, the nation, when considering many issues associated with the interactions of rural and urban economies.

For almost 100 years (1892 to 1992), Crook County was a bellwether in presidential elections. Political scientists from throughout the nation attempted to explain why this little county, with its population of ranchers, small businesspeople, and workers at the Les Schwab Plant, so consistently reflected the national mood. My own view is that the county was isolated, that its people acquired a sense of fairness and common sense, that they followed national politics closely but not too closely, and when they made up their minds, they reflected a basic American point of view (Church, Foster 2000, T04).

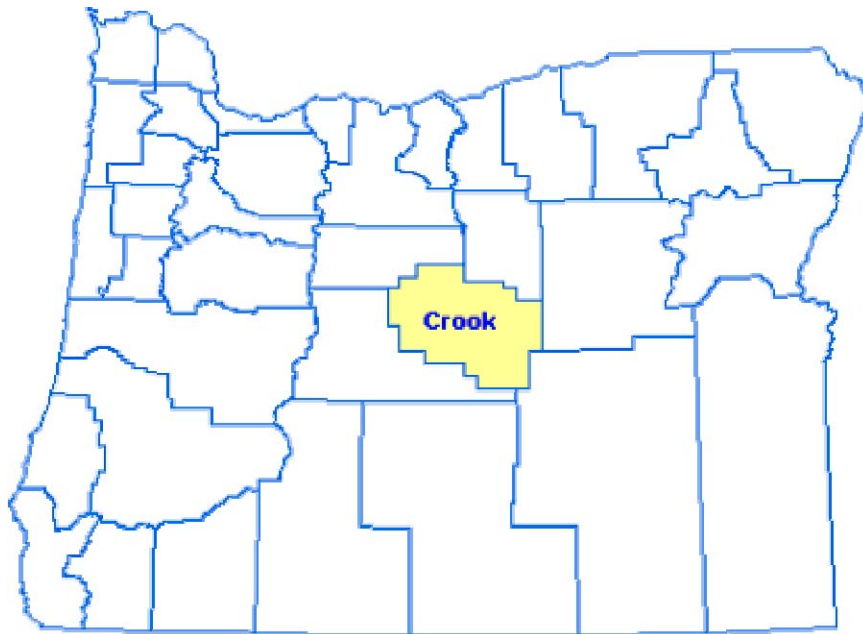
This report profiles the demographic and economic trends in Crook County, estimates the export base of the county, provides an overview of the Crook County Input-Output Model, uses a hypothetical economic shock to demonstrate how the Model can be used to estimate economic impacts, and suggests some areas that Crook County might consider as it works to increase the resilience of its economy.

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The author appreciates Fred Obermiller’s and John Tanaka’s (OSU Agricultural and Resource Economics Department) reviews of and suggestions for this report.

Population and Economic Trends

Crook County is a nonmetropolitan county located on the high plateau of central Oregon (Figure 1). In the 2000 U.S. Census, 19,182 people lived within Crook County’s 2,979 square miles; hence the population density per square mile was approximately 6.5 people. The county contained one incorporated place—Prineville, with a population of 7,356 people (U.S. Census Bureau, 2002).

Figure 1. Crook County, Oregon.



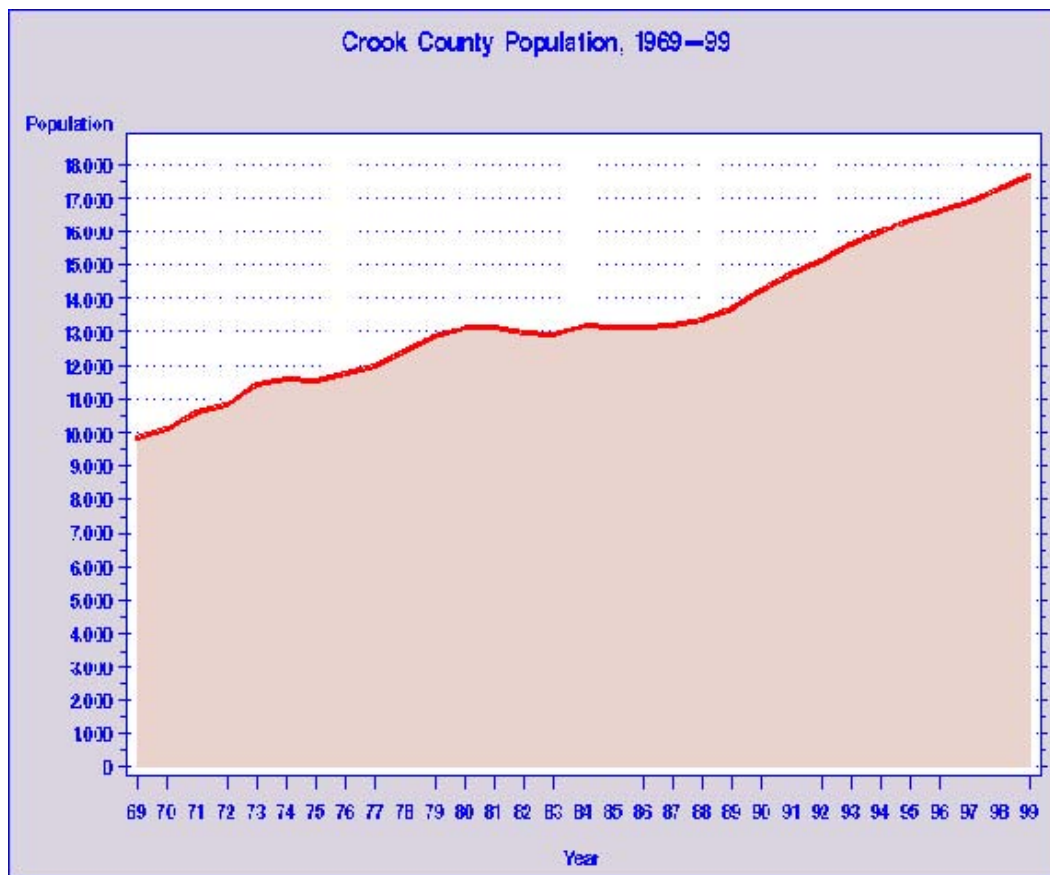
Source: Smith, Gary W. 2001. Oregon Regional Economic Analysis Project Web page (<http://www.pnreap.org/Oregon>).

Crook County, again like many nonmetro counties nationally, is a natural resource-based economy, which the county is trying to diversify so that it can more effectively adjust to the variations of a globalized marketplace. Its population is growing and diversifying, like many areas with significant natural capital and lifestyle opportunities. People are moving to and visiting Crook County to enjoy the environmental amenities.

These changes are creating tensions, as expressed in a lighthearted way by a resident explaining the county's lost bellwether status: "We got new people in the '90s," she says with a smile. "We got all those new people who didn't know how to vote" (Ibid).

"Population growth is both a cause—and a consequence—of economic growth. Patterns of population growth and change reflect differences among regions to attract and retain people both as producers and consumers in their economy" (Smith 2001, 2).

Figure 2. Crook County Population, 1969–99.

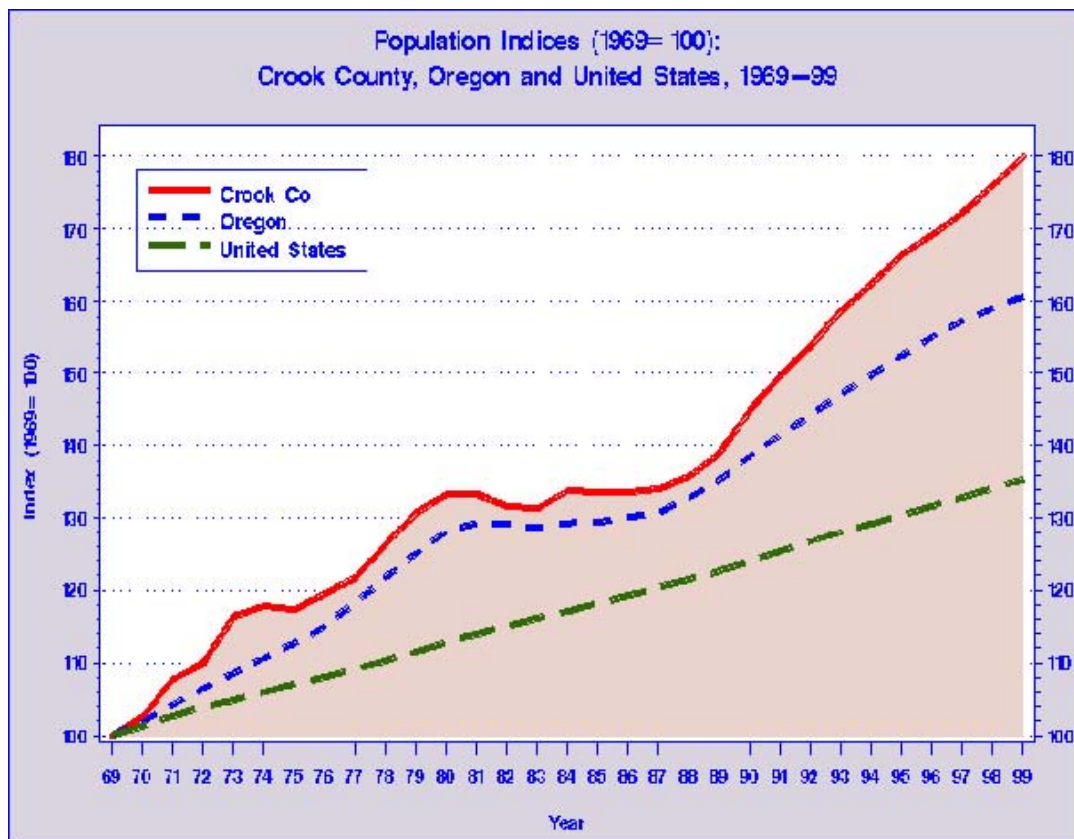


Source: Smith, Gary W. 2001. Oregon Regional Economic Analysis Project Web page (<http://www.pnreap.org/Oregon>).

As Figure 2 shows, total population growth for Crook County from 1969 to 1999 was 80 percent. That growth rate, as further depicted by Figure 3, is higher than Oregon's, which was 60.8 percent, and that of the U.S., which was 35.5 percent.

For a nonmetro Oregon county like Crook County to exceed the U.S. population growth rate was not unusual. Nonmetro Oregon's average population growth rate, which is not depicted in these graphs, was 53.9 percent (Smith 2001, 4); however, most of nonmetro Oregon did not outpace the average population growth rate for Oregon, as did Crook County.

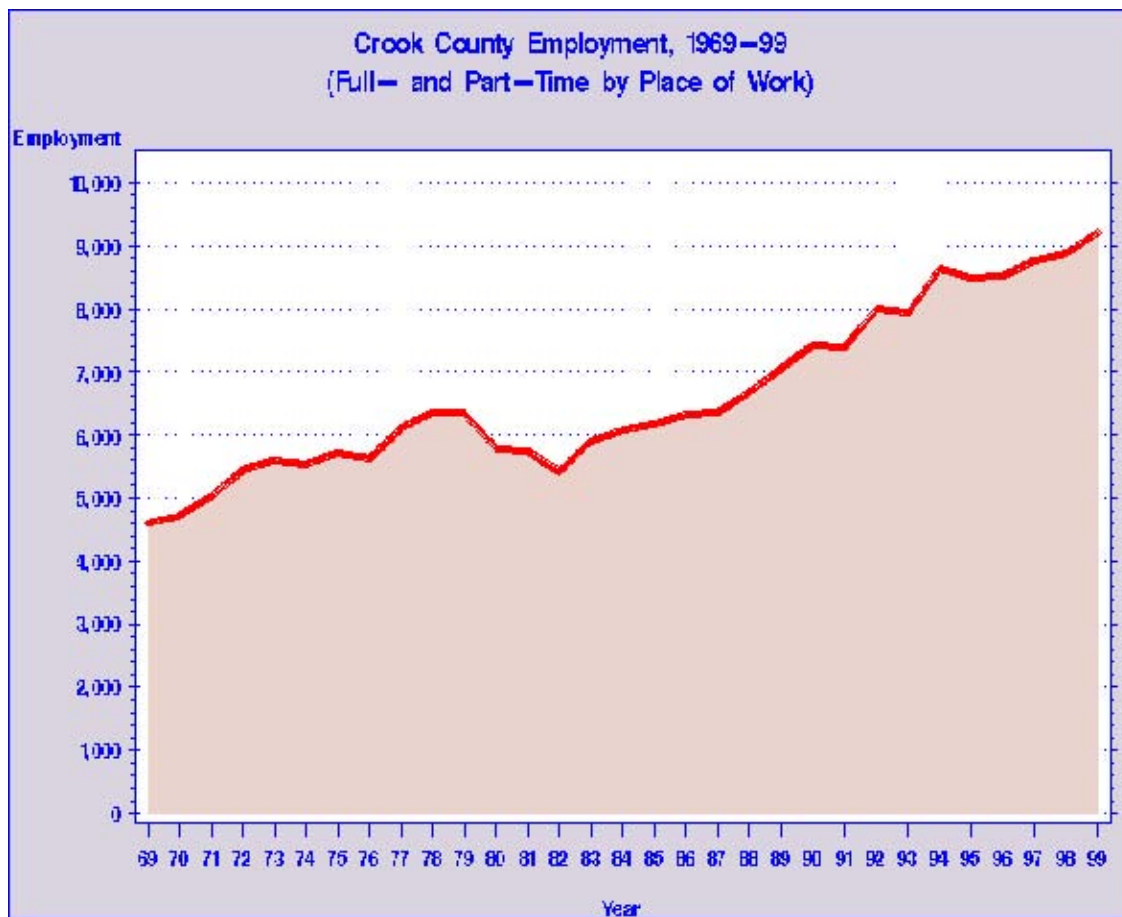
Figure 3. Population Indices (1969 = 100): Crook County, Oregon, and the United States, 1969-99.



Source: Smith, Gary W. 2001. Oregon Regional Economic Analysis Project Web page (<http://www.pnreap.org/Oregon>).

One frequent goal of economic development is to create the ability for a community to weather economic fluctuations or become more economically resilient. *An economically resilient community is one that can be economically shocked, quickly begin a rebound, and reach an equilibrium that may be very different from the pre-shock equilibrium, yet provides a similar number of jobs and preserves the community's population.* “Quickly” is measured in months rather than years. *An economic shock or event is a market change that is a surprise and affects the employment growth rates and may permanently affect the employment level* (Bartik 1991, 11). A new equilibrium is reached when the local area's attractiveness to households and firms is at least enough to prevent decline (Ibid, 72). Probably the most important variable, for many people concerned with economic resilience, is employment. “Employment numbers remain the most popular and frequently cited statistics used for tracking local area economic conditions and trends” (Smith 2001, 2). Note that the estimates throughout this report are for full- and part-time jobs and do not necessarily represent individual people. A person may hold more than one of the jobs discussed. Also, employment estimates in the following graphs are based on place-of-work and do not include place-of-residence considerations. Crook County employment grew by 4,601 jobs, or 99.9 percent, from 1969 to 1999 (Figure 4).

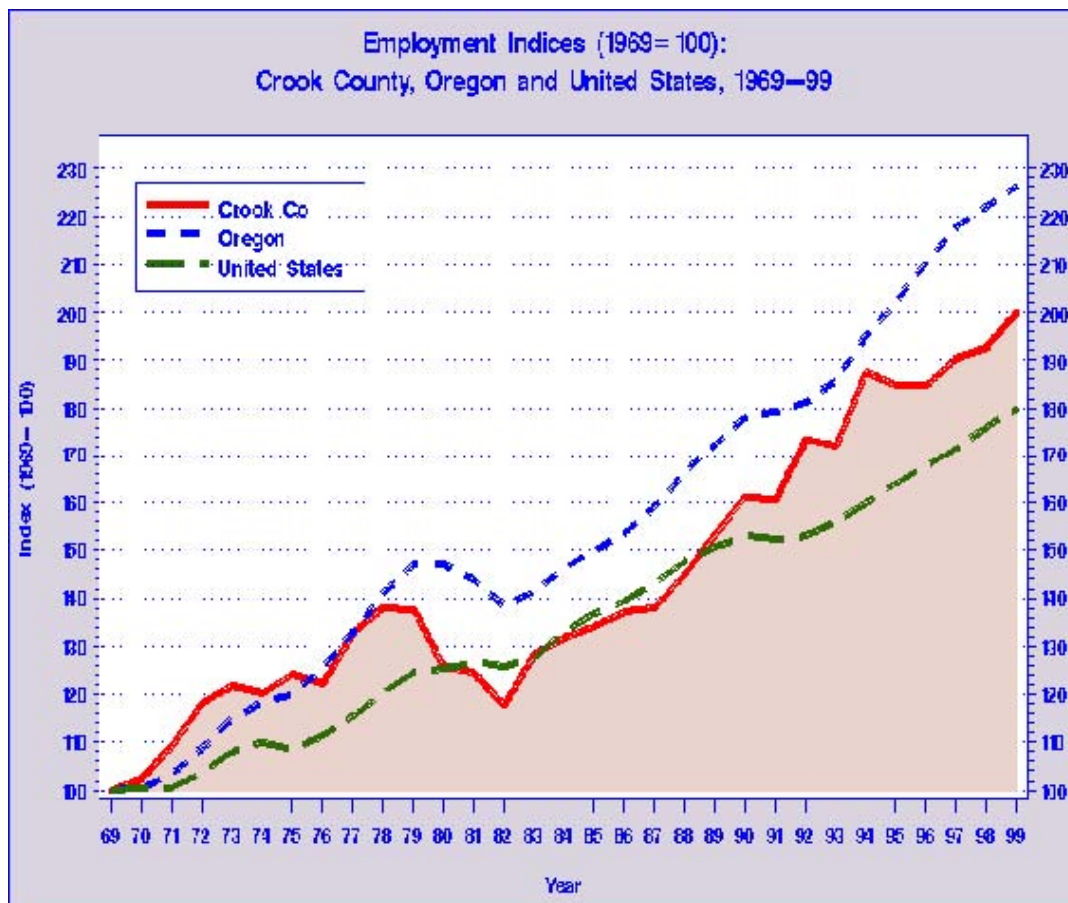
Figure 4. Crook County Employment, 1969–99 (Full- and Part-Time by Place of Work).



Source: Smith, Gary W. 2001. Oregon Regional Economic Analysis Project Web page (<http://www.pnreap.org/Oregon>).

Crook County once again exceeded the U.S., which had a 79.8 percent employment increase, and nonmetro Oregon, which had a 98.3 percent increase (Smith 2001, 3). The county's employment growth was less than Oregon's, at 126.1 percent (Figure 5).

Figure 5. Employment Indices (1969 = 100): Crook County, Oregon, and the United States, 1969–99.



Source: Smith, Gary W. 2001. Oregon Regional Economic Analysis Project Web page (<http://www.pnreap.org/Oregon>).

Although Crook County's employment growth rate exceeded its population growth rate, both Oregon and the U.S. had rates that were proportionately higher than Crook County's. So while Crook County's job ratio (employment/population) increased from .47 to .52, Oregon's job ratio increased from .45 to .63 and the U.S. job ratio increased from .45 to .60. Crook County did exceed the nonmetro Oregon average job ratio increase, which grew from .43 to .45 (Ibid, 7).

A number of factors may have contributed to these changes in job ratios and the differential rate at which they occurred for the different areas: the percentage of women participating in the formally defined workforce, changing age distributions and the percentage of retirees within the population who are not participating in the workforce, and shifts of some full-time jobs to more than one part-time job (Ibid).

Over the past decade, the median age of people in Oregon has increased from 34.5 to 36.3 years. Crook County's median age increased even more than Oregon's: it went from 35.8 to 38.6 years. However, this increase in median age was driven primarily by the aging of baby boomers, most of whom are still in the workforce. The percentage of people 65 years and older has declined during that same period in Oregon from 13.8 to 12.8 percent and in Crook County from 15.9 to 14.7 percent (U.S. Census Bureau 1990 and 2000). Since both Oregon's and Crook County's ages increased, while the 65 years and older component went down, it may be difficult to explain the different changes in job ratios based on the percentage of retirees growing faster in Crook County than in Oregon. It is possible that younger retirees make up a greater percentage of the Crook County population than in Oregon generally.

Statewide, the composition of the workforce from 1969 to 1999 has shifted toward more service occupations, which can have a higher percentage of part-time jobs. That shift has also taken place in Crook County, though the change has not been as great as that of Oregon (Table 1).

Table 1. Crook County and Oregon Employment Changes, 1969–1999.

Sector	Crook County				Oregon			
	1969	%	1999	%	1969	%	1999	%
Total full- and part-time employment	4,604	100.0	9,205	100.0	920,165	100.0	2,080,821	100.0
Wage and salary employment	3,499	76.0	6,718	73.0	764,258	83.1	1,668,788	80.2
Proprietors' employment	1,105	24.0	2,487	27.0	155,907	16.9	412,033	19.8
Farm proprietors' employment	434	9.4	678	7.4	32,204	3.5	39,993	1.9
Nonfarm proprietors' employment	671	14.6	1,809	19.7	123,703	13.4	372,040	17.9
Farm employment	830	18.0	897	9.7	51,521	5.6	69,093	3.3
Nonfarm employment	3,774	82.0	8,308	90.3	868,644	94.4	2,011,728	96.7
Private employment	3,111	67.6	7,073	76.8	716,851	77.9	1,749,067	84.1
Ag. serv., forestry, fishing, and other	73	1.6	174	1.9	8,342	0.9	40,393	1.9
Mining	18	0.4	16	0.2	1,879	0.2	3,074	0.1
Construction	97	2.1	492	5.3	44,008	4.8	122,480	5.9
Manufacturing	1,367	29.7	1,744	18.9	187,500	20.4	258,507	12.4
Transportation and public utilities	115	2.5	452	4.9	52,834	5.7	91,755	4.4
Wholesale trade	76	1.7	774	8.4	46,281	5.0	101,463	4.9
Retail trade	602	13.1	1,239	13.5	143,650	15.6	355,884	17.1
Finance, insurance, and real estate	219	4.8	457	5.0	67,712	7.4	159,756	7.7
Services	544	11.8	1,692	18.4	164,645	17.9	615,755	29.6
Government and government enterprise	663	14.4	1,235	13.4	151,793	16.5	262,661	12.6
Federal, civilian	192	4.2	333	3.6	24,601	2.7	29,822	1.4
Military	58	1.3	59	0.6	15,818	1.7	12,605	0.6
State and local	413	9.0	843	9.2	111,374	12.1	220,234	10.6

Source:

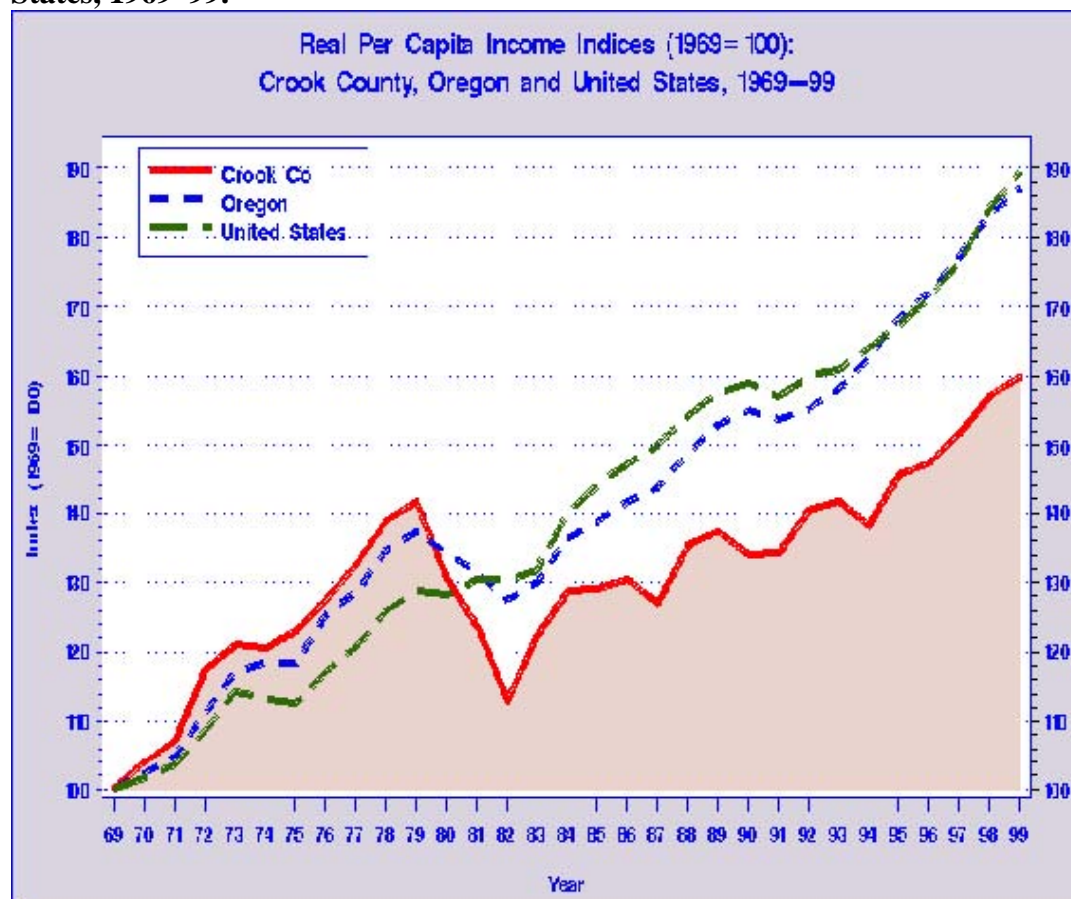
Regional Economic Information Service—Geospatial & Statistical Data Center (geostat).

As a percentage of total employment, the Services sector in Crook County has grown by 55.6 percent (from 11.8 to 18.4 percent), while in Oregon it has grown by 65.4 percent (from 17.9 to 29.6 percent). In addition, the Construction sector in Crook County grew by 153.7 percent, to move from a relatively small part of the county economy to over 5.3 percent of its sectoral employment.

Construction plays an even larger role, when its indirect and induced impacts are considered. So the growth of the Construction and Services sectors and the slight increase in Retail trade's sectoral employment proportion may be part of the explanation for the increase in jobs ratio for Crook County.

Population, employment, and job ratio growth rates have been positive and would seem to indicate that Crook County's economy has weathered the past 30 years very well. Particularly when compared to nonmetro Oregon generally, Crook County's employment and population have increased over the past 30 years. During that time, Crook County has needed to adjust to some severe economic shocks, including the significant decline of farm prices during the early 1980s, the restructuring of the timber industry to accommodate implementation of environmental legislation of the 1970s, endangered species listings, and the additional mechanization of timber industry production processes. Although Crook County continues to grow faster than nonmetro Oregon, it has been falling behind the Oregon and U.S. growth rates in job ratios, as discussed above, real per capita income, and real average earnings per job. Real per capita income in Crook County increased at about two-thirds the rate of Oregon and the U.S. (Figure 6).

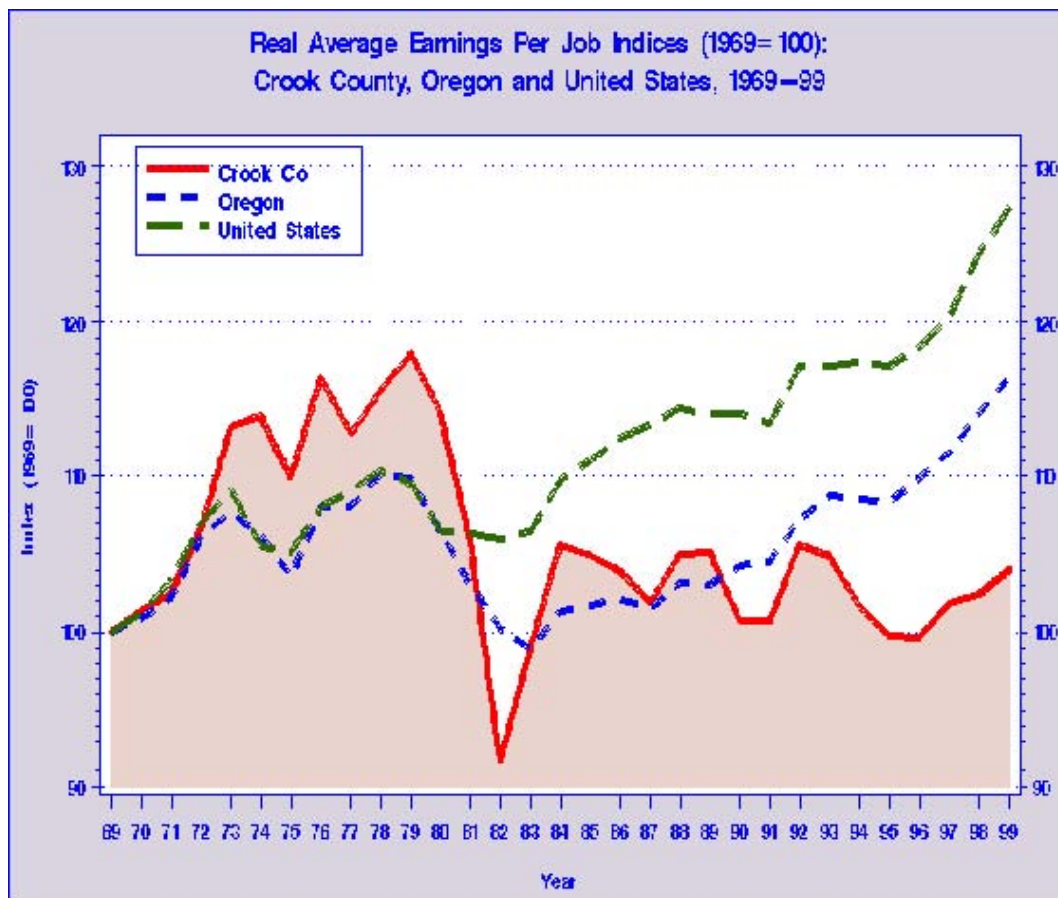
Figure 6. Real Per Capita Income Indices (1969 = 100): Crook County, Oregon, and the United States, 1969–99.



Source: Smith, Gary W. 2001. Oregon Regional Economic Analysis Project Web page (<http://www.pnreap.org/Oregon>).

Essentially, Crook County's average real earnings per job have remained constant, with only a 4.1 percent increase for the past 30 years. Still, that is higher than nonmetro Oregon generally, which experienced a 1.9 percent decline (Smith 2001). However, during the same time, the Oregon average real earnings per job increased 16.6 percent and the U.S. average real earnings per job increased 27.3 percent (Figure 7).

Figure 7. Real Average Earnings Per Job Indices (1969 = 100): Crook County, Oregon, and the United States, 1969–99.



Source: Smith, Gary W. 2001. Oregon Regional Economic Analysis Project Web page (<http://www.pnreap.org/Oregon>).

Sectoral Employment and Location Quotients

Comparing employment changes on a sectoral basis between Crook County and Oregon can indicate how the county has adjusted to the different economic shocks it has experienced over the past 30 years and where it might be heading in relation to statewide trends.

Crook County's economy is more similar to Oregon's today than it was 30 years ago, with some noted exceptions. As proportions of their economies, Oregon and Crook County both have experienced some areas of increase, including proprietors' employment, private employment, agricultural and related services, construction, retail trade, finance, insurance and real estate, and services. Oregon and Crook County both have also experienced declines in the proportions of their employment that engaged in farming and manufacturing.

The notable exceptions where Oregon's and Crook County's employment profiles differ include the significant growth of the wholesale trade sector in Crook County, which is largely due to the Les Schwab Plant. The plant is primarily a distributor of tires and does some manufacturing, particularly of retread tires. Oregon and Crook County also differ in terms of the slower rate of increase for services in Crook County, which has been discussed above, and the slower rate of percentage decrease in total government employment, due to a slight percentage increase in state and local government employment in Crook County.

The Crook County economy seems to have adjusted to percentage declines in agricultural and timber-based manufacturing by shifting employment toward construction, wholesale trade, and services.

However, that means the economic diversity of the county has declined and the county has increased its reliance on one business, the Les Schwab Plant. This increased economic dependency on a single industry can make the county significantly more vulnerable to market fluctuations.

An examination of the current proportion of employment in each sector in Crook County compared to the proportion of those sectors in Oregon can supplement the previous discussion of sectoral changes over time. Location quotients (LQs) can be used to make comparisons among sectors within Crook County and to index those changes to a larger economy, in this case Oregon. LQs are calculated by taking the percentage of employment a sector represents in Crook County and dividing it by the percentage of employment the same sector represents in Oregon. LQs indicate where Crook County is relatively more specialized than Oregon and where Crook County may be presumed to have a comparative advantage—or at least did at some time in the past—in relation to Oregon. If the percentages of employment for a sector are the same for Crook County and for Oregon, the location quotient will be 1.0. If Crook County is less specialized in a sector than Oregon, the LQ will be less than 1.0; if it is more specialized than Oregon, the LQ will be greater than 1.0.

“LQs can be used as an indicator of economic diversity; having several sectors with LQs greater than 1.0 indicates multiple specializations that are the key to economic diversity” (Weber, Sorte, and Holland 2002, 9). “Location quotients are [also] quite useful as rough approximations of the local economic base” (Maki and Lichty 2000, 198).

Crook County’s LQs are calculated in Table 2. The sectoral breakdown in that table is more detailed than the Standard Industrial Classification (SIC) one-digit level used in Table 1. Table 2’s categories are based on the North American Industrial Classification System (NAICS). The NAICS is replacing the SIC over the next 4 years, and its sectors are more representative of today’s economy than those of the SIC. For comparisons with prior periods (e.g., 1969–1999), the SIC has been used to ensure the sectors are comparable. Current estimates and projections are based on the NAICS aggregation. A more detailed discussion of the NAICS is provided in Appendix 1.

From the LQs in Table 2, one can see that Crook County is a natural resource (Agriculture, etc.—2.68, and Manufacturing Wood, etc.—4.39), trade center (Transportation and Warehousing—1.27, and Wholesale Trade—1.69), and government services (Public Administration—1.24) -based economy.

Table 2. Crook County Location Quotients. $LQ_i = (\text{County}_i / \text{County}_t) / (\text{Oregon}_i / \text{Oregon}_t)$, 1998.

Industry	Crook County		Oregon		LQ
	Jobs	%	Jobs	%	
Agriculture, Fishing & Related	1,042	11.5	87,894	4.3	2.68
Forestry & Logging	20	0.2	10,463	0.5	0.43
Mining	16	0.2	2,665	0.1	1.37
Construction	482	5.3	135,683	6.6	0.80
Manufacturing - Food, Beverages, Textiles & Related	79	0.9	30,828	1.5	0.58
Manufacturing - Wood Products, Paper, Furniture & Related	1,331	14.7	68,517	3.3	4.39
Manufacturing - High Tech. & Related	0	0.0	40,980	2.0	0.00
Manufacturing - Other	224	2.5	112,832	5.5	0.45
Transportation & Warehousing	411	4.5	73,380	3.6	1.27
Utilities	29	0.3	17,008	0.8	0.39
Wholesale Trade	774	8.5	103,842	5.1	1.69
Retail Trade	784	8.6	235,381	11.5	0.75
Accommodation & Food Services	591	6.5	137,941	6.7	0.97
Finance & Insurance	146	1.6	83,355	4.1	0.40
Real Estate & Rental & Leasing	238	2.6	67,508	3.3	0.80
Other Services	514	5.7	125,958	6.1	0.92
Information	74	0.8	54,480	2.7	0.31
Admin. & Support & Waste Management & Remed. Servs.	200	2.2	87,458	4.3	0.52
Arts, Entertainment & Recreation	87	1.0	36,730	1.8	0.53
Health Care and Social Assistance	584	6.4	165,502	8.1	0.80
Professional, Scientific, and Technical Services	119	1.3	87,838	4.3	0.31
Educational Services	603	6.7	153,947	7.5	0.89
Public Administration	712	7.9	129,546	6.3	1.24
Total	9,062	100.0	2,049,737	100.0	

Source: Regional Economic Information Service—Geospatial & Statistical Data Center (geostat).

While LQs can provide some indication of the county's economic structure, "...location quotients are imperfect indicators of the economic base. The economic base of a region is better captured with an input-output model, which directly estimates exports from each industry and, using multipliers for each sector, generates estimates of the dependence of a regional economy on exports from each sector" (Cornelius et al. 2000, 14).

Input/Output Modeling and Ground Truthing

At the local level, thousands of decisions are made regularly by public officials and by businessmen [people]. In the aggregate, these decisions have a great impact on economic growth and the quality of living standards of the American people. Yet, such decisions are usually based on much less detailed economic information than is available at the national level. A regular flow of sound economic information about each local economy and its economic base would contribute to the quality of decisions made at the local level by public officials and business leaders. (Tiebout 1962, 11–12)

Input-output analysis provides an effective way of organizing and using the detailed economic information, for which Tiebout was advocating. After the tables and matrices of an I-O model are constructed, an economic event can be introduced into the economy and a set of impacts projected.

Francois Quesnay first described inter-industry relationships in 1758. Wassily Leontief developed the concept of multipliers from input-output tables and received a Nobel Prize in 1973 for his work. Input-output analysis is a means of examining relationships within an economy both between businesses and between businesses and final consumers.

It captures all monetary transactions for consumption in a given time period (MIG, Inc. 1999, 95). Leontief specifically described an I-O model as one that

...comprises many sets of figures of which the largest and in a sense the most important is organized in terms of a so-called input-output table. This table describes the actual flow of commodities and services among all the different parts of the American economy. Specifically, it shows how each one of our manufacturing industries, each branch of agriculture, each kind of transportation and distribution—in short, each sector of the American economy—depends upon every other sector. A single column of an input-output table shows, for example, how many steel...products automobile manufactures buy from the steel industry [as well all the products from other industries and labor from households, etc.]...Similarly, the ‘steel industry’ column of the same table describes the various kinds of inputs, such as coal, ore, and so on, which the steel industry must obtain from other sectors of the economy...The table contains as many columns as there are separate industries [528 in IMPLAN] so that it presents each link connecting any two sections of the economy. (Leontief 1986, 67)

When considering the estimates of impacts provided in this report, the reader needs to remember that an I-O model has limitations. It is dependent on its assumptions of how things are produced or their production functions, the price of inputs, and the percentage of purchases made within the study area. An I-O model is static and linear. It does not account for major changes in markets and technological conditions. It assumes that industries can and do continue to produce goods and services in the same manner without regard to how much they produce.

Even with these limitations, I-O models can be very useful for estimating economic impacts and understanding how they ripple throughout an economy from the backward (supplier) and forward (customer) linkages among industries.

To develop a more detailed profile of the Crook County economy and conduct the economic impact analysis necessary to study the institutional and organizational structures, an input-output model of Crook County was constructed. First, the IMPLAN (Impact analysis for PLANning) software I-O model and database was used to construct a basic I-O model for Crook County. In the past, these I-O models were very labor intensive and expensive to develop because primary data needed to be gathered by interviewing a large number of individual businesses within the area being modeled. The resulting models were still not comprehensive and could become quickly outdated. Beginning in the late 1970s, the U.S. Forest Service in cooperation with FEMA, BLM, the University of Minnesota, and eventually a private

company, the Minnesota IMPLAN Group (MIG, Inc.), created and refined a computer program to synthesize more than 30 databases into an I-O modeling structure that can create individual, geographically specific I-O models. The software is now called IMPLAN Professional and comes with a number of database options (Weber et al. 2002, 16).

IMPLAN is an effective tool that is being used across the U.S. and is regularly being tested and improved. The IMPLAN system can be used to construct an I-O model at the national, state, county, or zip code levels, or any combination of those study areas (e.g., multi-county). The data for the IMPLAN system is updated on a regular basis (Ibid). It takes approximately 3 years for data to become available. This report used the 1998 IMPLAN database.

Once the IMPLAN out-of-the-box model was built, it was customized, or ground-truthed, to provide a more accurate representation of the Crook County economy. “Before any attempt is made to use IMPLAN to identify development opportunities for a community, the IMPLAN model used must accurately reflect the local economy” (Holland, Geier, Schuster 1997, 5).

Through a number of steps, other statewide (e.g., Oregon Agricultural Information Network) and national (e.g., Regional Economic Information Service) data were compared to and used to guide changes to the IMPLAN out-of-the-box model. Next, Bruce Sorte or Claudia Campbell (research assistant, Central Oregon Agricultural Research and Extension Center) personally interviewed 15 businesses in Crook and Jefferson counties that were large employers, fast growing, or representative of a major portion of the counties’ economic bases. Businesses also were chosen if their methods of production might be different from a typical business of that type nationally. IMPLAN uses national production functions for each of its sectors, so when local businesses have unique production techniques or environments, the IMPLAN production functions need to be modified.

Since Crook and Jefferson counties are neighbors and they have a similar number of jobs, similar environments, and similar economic structures, it was decided that information from interviews within either county could be applied to the other county. The interviews included a bank, a hospital, a wood products manufacturer, a confederated tribe, a rancher, a government agency, a wholesale distributor, and others. Then the results of all the ground-truthing steps were combined in a single spreadsheet and the edits were finalized. Finally, the edits were applied to the IMPLAN out-of-the-box model and detailed and aggregated models were constructed.

The Crook County I-O model’s basic Output, Value Added, and Employment table is 6 (variables) X 109 (industries) = 654 cells. One hundred fifty-five of those cells, or 24 percent of the total number of cells, were changed. The heaviest editing was done to match the agricultural sectors with the Oregon Agricultural Information Network’s data and the information provided by the producers interviewed. After the study area edits are made and the model is constructed, the production function edits to the gross absorption coefficients (how much of each input is required), and the regional purchase coefficients (what portion of each input is purchased locally) can be made.

The editing process needs to be ongoing, as people make suggestions and raise questions through individual communications and during presentations of the model. Other sources (e.g., *Atlas of Oregon*) also were used, though more generally, to check the model for reasonableness.

When the I-O model was finished, a fairly detailed economic profile of Crook County could be produced. Crook County is about a \$700 million economy (Table 3) in terms of output. Approximately half (\$359.146 million) of that output comes from value (employee compensation, proprietor income, other property income, and indirect business taxes) that is added within the county. The remainder

(\$336.449 million) is from the intermediate goods and services used to produce the output.

Table 3. Crook County Industry Output, Employment, and Value Added, 1998.

Industry	Industry Output*	Employment	Total Value Added*
Agriculture, Fishing & Related	36.815	1,042	23.616
Forestry & Logging	4.730	20	2.371
Mining	1.765	16	1.173
Construction	46.841	482	17.265
Manufacturing - Food, Beverages, Textiles & Related	43.213	79	2.076
Manufacturing - Wood Products, Paper, Furniture & Related	179.574	1,331	72.151
Manufacturing - High Tech. & Related	0.000	0	0.000
Manufacturing - Other	34.968	224	9.881
Transportation & Warehousing	45.597	411	20.940
Utilities	6.143	29	3.586
Wholesale Trade	77.538	774	53.074
Retail Trade	26.529	784	23.478
Accommodation & Food Services	18.873	591	10.123
Finance & Insurance	12.644	146	9.679
Real Estate & Rental & Leasing	40.484	238	29.157
Other Services	26.846	514	7.558
Information	6.807	74	2.972
Administrative and Support Services, etc.	4.983	200	4.378
Arts, Entertainment & Recreation	1.499	87	0.810
Health Care and Social Assistance	26.766	584	15.643
Professional, Scientific, and Technical Services	5.236	119	3.395
Educational Services	18.813	603	16.897
Public Administration	28.932	712	28.922
Total	695.595	9,062	359.146

*Millions of dollars

Source: MIG 2001.

Considering just the output information in Table 3, four industries or eight sectors produce 70 percent of the county's output as follows; 1) 26.5 percent—Timber (Forestry & Logging and Manufacturing—Wood Products, etc.), 2) 17.7 percent—Trade (Wholesale Trade and Transportation & Warehousing), 3) 14.4 percent—Housing (Construction, Finance, etc., and Real Estate, etc.), and 4) 11.5 percent—Agriculture (Agriculture, etc., and Manufacturing—Food, etc.).

Output is not the best measure for describing an economy or an economic impact. Output estimates often include significant double counting. As an example, when a farmer grows and sells mint, the sale of that mint is added to the Agricultural sector; however, if a local distiller buys that mint and uses it to produce mint oil, the value of the mint is once again added to output, this time as an intermediate input component of the output in the Manufacturing—Food, Beverages, Textiles, & Related sector.

Value added is a better measure because it includes only the net additions to the output, which are provided within each production process. The four industries or eight sectors whose outputs were described above comprise 64.2 percent of the county's value-added production: 1) 20.8 percent—Timber (Forestry & Logging and Manufacturing—Wood Products, etc.); 2) 20.6 percent—Trade (Wholesale Trade and Transportation & Warehousing); 3) 15.6 percent—Housing (Construction, Finance, etc., and Real Estate, etc.); and 4) 7.2 percent—Agriculture (Agriculture, etc., and Manufacturing—Food, etc.).

Employment is also a useful measure of economic activity and how changes impact an area. Employment has the added benefit that it does not need to be inflated or deflated to compare it across time periods. The way IMPLAN calculates employment is by using output per worker estimates from national

surveys, which are sector specific, and dividing total industrial output by output per worker to approximate the number of jobs that were needed to produce a particular level of output. As mentioned previously, these are full- and part-time jobs.

A rural community's resilience is often measured first in terms of jobs. Throughout the rest of the report, jobs are used as the primary impact variable in the analyses. As would be expected, there can be significant differences among sectors as to the value-added dollars per job (e.g., Agriculture, etc.— $\$23.616\text{M}/1,042 = \$22,664$; Manufacturing—Wood Products, etc.— $\$72.151\text{M}/1,331 = \$54,208$; and Wholesale Trade— $\$53.074\text{M}/774 = \$68,571$). While the value-added or some component of value-added (e.g., employee compensation) per job calculation is easy to make, it is more difficult to estimate the non-pecuniary benefits of just having any job, even without considering the finer points or qualitative features of each job. The utility of a job to an individual will then have pecuniary and non-pecuniary components. In addition to jobs, rough estimates of the population impacts are also included in the analyses that follow.

With the addition of the ground-truthed model information, the economic profile of Crook County is more precise as output, jobs, and value-added estimates have been added to the previous discussion of LQs. Calculating the export-base of the county's economy will round out the picture by explaining the "engines" or sectors that drive the economy.

Crook County's Export Base

"Central to the study of regional economies is a region's economic base, commonly represented by its exports to markets outside the region" (Maki and Lichty 2000, 15).

The term "exports" is used here to include any activities that bring dollars into the Crook County economy, which means that items such as tourism or federal transfer payments are considered part of the export base (Weber et al. 2002, 9).

The Crook County input-output model can directly estimate exports from each industry and, using the multipliers for each sector, generate estimates of the dependence of a regional economy on exports from each sector. A sector's contribution to a regional economy is determined by the exogenous demand of that sector and the subsequent responding associated with meeting that demand. The contribution of that industry to the region's employment is the number of employees in all industries whose jobs are dependent directly, indirectly (through interindustry linkages), and through household spending (induced effects) on the exports of that industry (Cornelius et al. 2000, 14; Weber et al. 2002, 13).

Specifically, the procedure followed to calculate Crook County's export base was to remove individually each sector's exports as a separate event within the IMPLAN I-O model and note the job impact as that event ripples throughout the economy (Waters, Weber, and Holland 1999). These impacts are summarized in a spreadsheet, which shows the jobs that are dependent on the exports from each sector or the "dependency index" (Ibid.).

However, by just removing the exports from the industrial sectors, the resulting estimate of the number of jobs in the economy will be less than the total jobs in the economy. The model will not "close" (Ibid). The key missing elements are federal and state transfer payments to households and exogenous household income (e.g., dividends and interest). Using a Social Accounting Matrix (SAM), "...an extension of traditional input-output accounts...[which includes]...information on non-market financial flows (MIG, Inc., 263)," these elements can be estimated and removed to determine the jobs within the county that rely on external payments to households. In Crook County, those payments totaled \$148.1 million. They were 44 percent federal, 21 percent state, and 35 percent private.

These dollar estimates were translated into jobs by removing \$148.1 million in personal consumption expenditures (PCE), and again, by dividing the dollar impact in each sector by the average output per worker in that sector, the jobs that are dependent on the payments to households were estimated.

Table 4 shows export dependency by sector and compares the sectoral employment with the

export base-dependent employment for each sector. As noted above, the export-dependent jobs for each sector include all the jobs across all the sectors that are dependent on the particular sector's exported products. For example, the Manufacturing—Food, Beverages, & Related sector has 671 export-dependent jobs. Included in the 671 jobs are 280 in Agriculture, etc.; 8 in Construction; 78 in Manufacturing—Food, Beverages, & Related; 17 in Manufacturing—Wood Products, etc.; 24 in Retail Trade; 17 in Health Care, etc.; and 247 in all the other sectors.

Table 4. Crook County Sectoral and Export-Base Dependent Employment, 1998.

Sector	Sectoral		Export-Dependent	
	Jobs	%	Jobs	%
Agriculture, Fishing & Related	1,042	11.5	745	8.2
Forestry & Logging	20	0.2	63	0.7
Mining	16	0.2	22	0.2
Construction	482	5.3	707	7.8
Manufacturing - Food, Beverages, & Related	79	0.9	671	7.4
Manufacturing - Wood Products, Paper, Furniture & Related	1,331	14.7	2,167	23.9
Manufacturing - High Tech. & Related	0	0.0	0	0.0
Manufacturing - Other (e.g. Sheet Metal Products)	224	2.5	283	3.1
Transportation & Warehousing	411	4.5	264	2.9
Utilities	29	0.3	3	0.0
Wholesale Trade	774	8.5	563	6.2
Retail Trade	784	8.6	55	0.6
Accommodation & Food Services	591	6.5	30	0.3
Finance & Insurance	146	1.6	13	0.1
Real Estate & Rental & Leasing	238	2.6	28	0.3
Other Services	514	5.7	126	1.4
Information	74	0.8	10	0.1
Administrative and Support Services, etc.	200	2.2	7	0.1
Arts, Entertainment & Recreation	87	1.0	0	0.0
Health Care and Social Assistance	584	6.4	3	0.0
Professional, Scientific, and Technical Services	119	1.3	13	0.1
Educational Services	603	6.7	498	5.5
Public Administration	712	7.9	948	10.5
Households (e.g. Social Security)			1,846	20.4
Total	9,062	100.0	9,062	100.0

By reviewing this export dependency information, one can distinguish the significant basic or

exporting industries, particularly those with higher positive percentages in the last column such as Manufacturing—Wood Products, etc., and the non-basic or service industries, those with no or lower positive percentages in the last column such as the Health Care and Social Assistance sector, which has minimal export activity and has 581 of its 584 jobs dependent on providing service to the sectors that produce the exports (204 jobs) or to the households that receive external payments (377 jobs).

Though Crook County's dependence on natural resources for production purposes (e.g., timber for lumber mills) has declined over the past half century, it is still very dependent on natural resources. That dependency has in a sense diversified and intensified, depending on how broadly "natural resource-based" is defined. This diversification and intensification is due to the expanding uses of natural resources as amenities as well as production inputs. These amenity uses of natural resources range from short-term tourism activities to long-term construction activities driven by retirees locating in Crook County to enjoy its environment as well as the social aspects of the community. In addition to the initial impacts (e.g., construction) of retirees locating in Crook County, the retirees receive transfer payments from government and private retirement plans or investments, a portion of which they spend in Crook County. Without the natural resources or the amenity uses of those natural resources in Crook County, the average retiree would be no more likely to choose Crook County than any other community with similar social and political attributes.

Major portions of the jobs that are export dependent on Agriculture, etc. at 8.2 percent; Forestry & Logging at .7 percent; Manufacturing—Food, etc. at 7.4 percent; and Manufacturing—Wood, etc. at 23.9 percent are natural resource-based production activities. Natural resource-based amenity activities include portions of Construction (e.g., vacation and retirement residences) at 7.8 percent, and Household (e.g., Social Security payments) at 20.4 percent.

Additionally, a portion of the community's dependence (10.5 percent) on the Public Administration sector may be natural resource-based to both help manage the production (e.g., harvests from and restoration of public lands) and amenity (e.g., recreational activities on public lands) uses of the natural resource. Potentially, 79 percent of the county's economy could be considered dependent on its stock of natural capital for either production or amenity purposes.

Most of nonmetro Oregon has an export dependency profile similar to Crook County's, with three exceptions: 1) Crook County is approximately twice as dependent on Manufacturing—Wood Products, etc. as nonmetro Oregon generally; 2) most of nonmetro Oregon does no exporting of wholesale trade, and in most rural counties it is a service sector (however, in Crook County, the Les Schwab Plant makes the county a wholesale trading center); and 3) most of nonmetro Oregon is more dependent, at 26 percent, on transfer payments and exogenous income to Households than is Crook County, at 20.4 percent.

Analysis

Introduction

Crook County's economy has been regularly shocked over the past 3 decades. One example, demonstrated by recent mill closures, is the declining harvests in Oregon's timber industry, which went from an annual average statewide harvest of 8,362,900,000 board feet during 1970–1980 to 4,815,666,000 board feet during 1990–1998 (Loy 2001, 92).

Due primarily to the policy changes of the early 1990s, "in the future most of Oregon's greatly reduced timber harvest, estimated at approximately 4 billion board feet per year, will come from private

land in Western Oregon (Ibid).”

This contraction of the timber industry has been a serious shock that is just now being fully realized as sawmills close in Crook County. This report includes only the beginning of the transitions occurring as a significant portion of Crook County’s export base is eliminated.

The report describes a county that is more than 40 percent dependent on the agricultural and timber industries. A significant portion of the county’s land base on which those industries depend can be quickly affected by policy decisions over which the county has minimal influence. Twenty-seven percent of the land in the county is managed by the Bureau of Land Management; 22 percent by the U.S. Forest Service (Ibid, 84).

This transition away from timber will leave the Les Schwab Plant as the primary component of the county’s export base. To demonstrate how the county’s I-O model works and can be used to project economic impacts, hypothetical changes at the Plant are considered.

Economic Impact Scenario

Hypothetical Scenario: Wholesale Trade Reductions

In this scenario, the impacts of a hypothetical shock of a similar magnitude to a mill closure are estimated. An existing business that was not directly part of the timber industry was chosen so that ideas may be gleaned from the analysis that may not have been considered in the extensive and prolonged reviews of the timber industry’s restructuring.

Again, this is only a simulation based on a purely hypothetical shock of reducing operations at the Les Schwab Tire Company’s plant (Plant) in Prineville. The Plant is family owned, and the family has made it very clear that they intend to continue operating from Crook County.

This section considers the impacts of reducing operations of the Plant based on affected employees’ and businesses’ market-based reactions. Later, a number of private and public organizational responses are discussed that could mitigate or cushion some of the market-based responses. Developing the capacity for these types of organizational responses may significantly increase the county’s economic resilience.

Specifically, the hypothetical shock for this scenario is a reduction of 700 jobs at the Plant. The Plant currently has 1,020 jobs (OECD, 2002; 4), so this would mean more than two-thirds of the jobs at the Plant would be removed. When the information in this report is provided for a single business or a sector with a few businesses, public information, rather than information gained from the ground-truthing interviews, is used to avoid jeopardizing the confidentiality of the ground-truthing process that was used to develop the Crook County I-O Model.

Under this hypothetical scenario, the Plant indicates that, because traffic has increased so much on Highways 26 and 126 that the cost of an interstate highway-to-factory trip has doubled over just the past 3 years. To reduce these costs, the Plant would lease a distribution warehouse in Albany, Oregon. The costs of the warehouse would be higher than the Plant’s current warehouse facilities, and labor costs will also be higher; however, the more direct access to markets would reduce transportation costs, particularly driver time, which would more than offset the other higher costs. The Plant would move the wholesale portion of the operations, which includes 675 trade workers and 25 managers and office workers, to that Albany facility over a 2-month period. For the time being, the remaining production line and associated managers and companywide managers would remain in Crook County. It is the Plant’s hope that long-sought highway improvements could now be made and allow them to at least retain the reduced operations in Crook County. Further, the Plant indicates that Prineville is central to many of its Northwest outlets, and with sufficient improvements it may consider reestablishing some of the wholesale operations back in Crook County. This reduction, and possible responses to the reduction, are summarized in Table

Table 5. Negative Economic Impact Scenario: Plant Reduction.

Initial Economic Shock and Reactions	<i>Employment - Full & Part-Time Jobs</i>	
	Residents (80%)	Commuters (20%)
<i>Shock:</i>		
Close Distribution Operations (700 jobs)	560	140
<i>How Laid-Off Workers Respond in the first 6-12 mos</i>		
Find New Local Job (560X27%)	153	
Manufacturing - Other	50	
Wholesale Trade	40	
Retail Trade - Existing Businesses	20	
Information	13	
Arts, Entertainment, and Recreation	20	
Health Care and Social Assistance	10	
Early Retirement and Remain in County (560X2.5%)	14	
Business Start-Up (560X4%)	23	
Retail	8	
Real Estate and Rental and Leasing	5	
Other Services (e.g. Domestic Services)	10	
Receive Unemployment Payments (560X30%)	168	
Find Jobs Outside and Commute from County (560X10%)	56	
Move Out of the County (560X26%)	146	

This report is concerned with measuring the impacts within Crook County. The major portion of the impacts from economic shocks on a per-worker basis will affect the communities in which the workers live. Most of the impacts of job losses for people who commute to Crook County will affect the counties in which the commuters reside.

The first step was then to estimate the proportion of jobs held by commuters. Outgoing commuter data is available from the U.S. Census Bureau, and a recent check with the Oregon Employment Department indicated that they rely on the same data. Current Incoming commuter data needs to be inferred using outgoing commuter data from surrounding counties. Eventually the U.S. Census Bureau and the Minnesota Implan Group, Inc., expect to provide and incorporate incoming commuter data from gravity models to make their databases and models more precise.

This report has used 20 percent for the estimated percentage of the county's workforce that commutes in to Crook County from surrounding counties. For a specific economic impact analysis of an actual event using this I-O model, additional precision could be achieved if the affected businesses would share the percentage of employees that commute in from outside the county.

In this hypothetical case, if the reader wishes to adjust the commuting percentage, since the model is linear, she or he can do so with a proportionate adjustment across all impacted sectors. When the number of commuters was estimated at 20 percent for this hypothetical case, the commuters were removed and the analysis was focused on the 80 percent, or the 560 jobs, that were assumed to be held by Crook County residents. The negative economic event of losing 560 jobs then could be applied to the Wholesale Trade sector of the Crook County I-O model. The analysis could have stopped at this point and reported the negative impacts. However, the 560 jobs is only the initial direct effect of the reduction at the Plant. People are resourceful, and when they experience an economic event they take actions to mitigate

negative impacts. If the reduced production and exports from the Plant can be offset by additional economic activity within other sectors in the community, which will require sufficient additional demand, then impact analysis can be more useful if it tries to estimate those additional economic activities or responses.

For this analysis, those short-term mitigating actions are projected and applied to the model along with the initial 560-job reduction. This addition introduces another set of changes that may occur in reaction to the changes in the Wholesale sector, under this hypothetical scenario.

To begin with, the mitigating actions may include a significant number of workers (27 percent) finding alternative work in existing businesses within Crook County. There were 48 manufacturing companies in the county in 1998 (OECD 2002, 3). Early retirement also may be an option for some of the workers (2.5 percent), and this can be modeled by estimating a monthly disposable income (\$2,500) and applying it as a personal consumption expenditure (PCE).

Presumably the interests of some of the workers, and eventually, “unemployment desperation,” will motivate a portion of the workers to start new businesses. Those start-ups were modeled by estimating three workers per business (the owner and two employees). A certain number of laid-off workers (30 percent) may use unemployment compensation (\$400 per week of disposable income) for 26 weeks, to at least partially support them during the transition to the next job.

Workers (10 percent) may find jobs outside the county in Madras, Redmond, Sisters, Bend, or other places and commute to those work sites from Crook County. Though work outside the county does not add to the export base, it can generate income that is often expended in the person’s county of residence. This income was included and applied to the model as \$1,500 of personal consumption expenditure per job.

A significant percentage of workers (26 percent) are likely to move out of the county so they can remain with the Plant and work in Albany or to pursue opportunities elsewhere.

The indirect and induced employment impacts of the Plant reduction have been added to the direct impacts described above and are summarized in Table 6.

Table 6. Scenario: Plant Reduction—Direct, Indirect, and Induced Effects on Employment. Wholesale Trade Impact Analysis of Reduction of 560 Jobs.

Industry	Direct*	Indirect*	Induced*	Total*
Agriculture, Fishing & Related	0.0	-0.6	-2.5	-3.1
Forestry & Logging	0.0	0.0	0.0	0.0
Mining	0.0	0.0	0.0	0.0
Construction	0.0	-1.8	-1.1	-2.9
Manufacturing - Food, Beverages, Textiles & Related	0.0	0.0	0.0	0.0
Manufacturing - Wood Products, Paper, Furniture & Related	0.0	-3.0	-1.1	-4.1
Manufacturing - High Tech. & Related	0.0	0.0	0.0	0.0
Manufacturing - Other	50.0	0.7	-1.1	49.6
Transportation & Warehousing	0.0	-6.0	-3.4	-9.4
Utilities	0.0	-0.4	-0.5	-0.9
Wholesale Trade	-520.0	-7.8	-4.9	-532.7
Retail Trade	28.0	-1.4	-22.8	3.8
Accommodation & Food Services	0.0	-9.2	-15.8	-25.0
Finance & Insurance	0.0	-2.4	-3.8	-6.2
Real Estate & Rental & Leasing	5.0	-5.2	-6.0	-6.2
Other Services	10.0	-28.1	-8.2	-26.3
Information	13.0	-6.4	-1.3	5.4
Administrative and Support Services, etc.	0.0	-25.6	-2.7	-28.4
Arts, Entertainment & Recreation	20.0	0.5	-2.9	17.6
Health Care and Social Assistance	10.0	0.1	-17.8	-7.7
Professional, Scientific, and Technical Services	0.0	-8.1	-1.6	-9.6
Educational Services	0.0	0.5	-6.5	-6.0
Public Administration	0.0	0.0	0.0	0.0
Total	-384.0	-104.3	-104.0	-592.3

*Number of Jobs

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Even with a number of mitigating private actions, as described above, the total decline in jobs (592.3) is greater than the jobs (560) that were lost directly through the reduction. The indirect and induced effects are strongly negative, even with the impact of the personal consumption expenditures (PCE) that would follow from the 30 percent claim rate for unemployment insurance. The PCE affects just the short term and would decline as workers' eligibilities are exhausted. Conservatively estimating that each employee who leaves the county takes at least one more family member along, the 146 jobs that are lost in the county would cause a decline in population of 292, or 1.5 percent of the total 2000 Census population of Crook County (19,182). The private mitigating actions in this scenario only rebuild the foundation of the economy, which is in the basic industry sectors, to the extent that they add to the businesses in the Manufacturing—Other sector. The rest of the mitigating effects are in the service sectors such as Retail Trade, which do not have as much potential as the basic industries to strengthen the economy, according to the export-base theory of economic development. This point is demonstrated by the lower multiplier effects in the service industries, which are typically less than 1.5 and often a full point lower than multipliers in some of the basic industries.

Community Economic Planning

Business, government, and community partnerships have the potential to reinforce private actions that mitigate economic shocks. Economists and sociologists have provided a theoretical basis and some empirical evidence that working together can be an effective way to build economic resilience. Bringing

community resources to bear in anticipation of and following an economic shock is a proactive approach to addressing problems. Proactive efforts in Crook County would include having a number of vital organizations already active in the county. Those organizations need to obtain, disseminate, and encourage actions on news and data that warn that an economic shock is possible or better define an economic shock that is affecting the county. Some of the vital organizations in the county need to be effective stewards of the natural, human, human-produced, and social capitals in the county. They must be willing to adapt the different types of capital to achieve and meet the needs of a post-shock equilibrium. In addition, well-informed local decision-makers who are effective advocates and coalition builders must organize the vital organizations' efforts so they contribute as much as possible to an economic recovery. Examples from an integrated and proactive approach include:

- Visit regularly with businesses and agencies watching for signs of an economic change, helping the businesses and agencies with administrative or permitting issues.
- Persuade community colleges to broaden or adapt their curricula to help people quickly retrain within the communities that are impacted.
- Recruit organizations and volunteers to care for children while laid-off workers search for work and lobby legislators to extend unemployment benefits, health care, etc.
- Coordinate carpooling or other forms of shared transportation to help workers find and commute to jobs.

Expecting the market and private individuals to carry all the responsibility for addressing an economic shock is more of a reactive approach. A table comparing the economic effects of simulated Proactive and Reactive scenarios for the reductions at the Plant is included as Table 7 (Sorte 2002). The proactive efforts, in this simulated situation, reduced the impact of the Plant Reduction by more than half to 47.5 percent of the impacts of the more reactive scenario.

Table 7. Proactive and Reactive Case Scenarios Compared—Total Effects. Wholesale Trade. Impact Analysis of Reduction of 560 Jobs.

Industry	Proactive	Reactive	Difference
Agriculture, Fishing & Related	69.9	-3.1	73.0
Forestry & Logging	0.0	0.0	0.0
Mining	0.0	0.0	0.0
Construction	1.0	-2.9	3.9
Manufacturing - Food, Beverages, Textiles & Related	20.0	0.0	20.1
Manufacturing - Wood Products, Paper, Furniture & Related	81.8	-4.1	85.9
Manufacturing - High Tech. & Related	0.0	0.0	0.0
Manufacturing - Other	26.8	49.6	-22.8
Transportation & Warehousing	2.5	-9.4	12.0
Utilities	0.0	-0.9	1.0
Wholesale Trade	-510.5	-532.7	22.2
Retail Trade	15.6	3.8	11.8
Accommodation & Food Services	-8.5	-25.0	16.6
Finance & Insurance	-2.4	-6.2	3.8
Real Estate & Rental & Leasing	3.6	-6.2	9.8
Other Services	-6.2	-26.3	20.1
Information	20.2	5.4	14.8
Administrative and Support Services, etc.	-19.2	-28.4	9.2
Arts, Entertainment & Recreation	20.0	17.6	2.3
Health Care and Social Assistance	12.2	-7.7	19.9
Professional, Scientific, and Technical Services	-6.5	-9.6	3.2
Educational Services	-1.8	-6.0	4.2
Public Administration	0.0	0.0	0.0
Total	-281.5	-592.3	310.8

*Number of Jobs

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Limitations

The usefulness of I-O models in general and these types of simulations to make recommendations or to project actual impacts is limited for two basic reasons: 1) the static and linear design of the I-O model, and 2) the narrow basis for the simulation. The design of the simulation was informed by the knowledge summarized above, the author's outreach work with rural communities, and personal experience related to economic shocks. It was designed within the scrutiny of professional peers. Still, the analysis that follows is presented with caution.

Considerations

Economic resilience, or bending with economic shocks and then quickly bouncing back to a similar or new equilibrium, can be a useful concept for Crook County to study and pursue. A key factor determining a community's success in building economic resilience can be how the community plans and prepares for economic changes. This needs to be a coordinated public and private effort that focuses on a number of factors, including how the community manages information, how it develops its capital assets (natural, human, human-produced, and social), and how well it uses adaptive learning and leadership. Effective community organizations, which take responsibility for maintaining community resources and processes, may significantly improve economic resilience.

Specific issues that the City of Prineville, which has primary responsibility for providing services to and working with the businesses and development sites, and Crook County might consider as they

develop and coordinate economic plans are:

Information, both descriptive and predictive, that is unbiased, regularly monitored and analyzed, and presented in clear and concise ways will be essential to focus and evaluate the community's economic planning efforts. Clear, credible, and timely information is also very important to present convincing ideas or recommendations to decision makers at all levels of government. Developing information of this quality often requires the specific assignment of this responsibility for the community (with accompanying resources) to an individual or at least an organization, some technical background by the people involved, computer software and hardware sufficient to gather and work with the data, and certainly a community-wide commitment to support and rely on the responsible entity.

As much as 80 percent of the Crook County economy may be natural resource-based, and the flexibility to use those natural resources for production or amenity purposes is very policy dependent. The county may want to consider working with the City of Prineville to develop a "single-point-of-contact" team, which will carry the area's needs forward to partner with other local governments, advocate with state and federal governments, and respond to questions/requests from businesses and agencies.

Crook County has a number of ways to encourage amenity- or lifestyle-based economic activity, such as the construction of individual homes or living facilities for recreation or retirement purposes. Based on transfer payment data, Crook County may be able to increase that activity. It appears that Crook County is capturing proportionately fewer transfer payments (e.g., retirement income), than nonmetro Oregon's average level of transfer payments.

Crook County is 20.4 percent dependent on transfer payments, while nonmetro Oregon is 25.5 percent dependent on transfer payments. That difference may just reflect Crook County's preference for depending more on the other sectors and/or the strong competition for these dollars from nearby counties; yet the difference may warrant some discussion.

The Crook County Economic Model, which has been described and demonstrated in this report, can be a useful tool as the community addresses economic shocks and develops strategic plans. The benefits of using an I-O model are not to be found in the detailed estimates that it produces, but rather in recognizing and exploring the interdependencies among sectors and comparing the options based on the direction and strength of their outcomes. Using an I-O model to estimate the impacts of different types of response scenarios can give a false impression of precision and objectivity. Still, studying resilience and estimating economic impacts using an I-O model with simulated events can inform policy decisions. Many decision-makers are adept at sorting among different interpretations; they just need a richer and more organized set of interpretations to consider. It is hoped that this report has provided an example of how informed imagination matched with a well-developed though limited tool can be used to provide those interpretations and guide efforts towards building economic resilience in rural communities.

Crook County and other nonmetropolitan communities are still more remote, smaller, and have less diverse economies than metropolitan areas, yet they must survive in the same global market with those metropolitan areas that, due to their size, enjoy greater benefits from increasing returns to scale and agglomeration economies than nonmetropolitan communities. Nonmetropolitan communities do have significant and maybe sufficient stocks of human, natural, human-produced, and social capitals to survive and even thrive in a global economy. They need to see as much potential in terms of diversity of products, services, and career paths in the amenity uses of their natural capital as they did 200 years ago in the production uses of that natural capital. To the extent they maintain open social networks to strangers and recruit new members, they will strengthen their human and human-produced capitals and possibly build the trust necessary to increase the use of some of their natural capital for more traditional production uses. With an alert and engaged citizenry, a rich stock of rural capital, and adaptive leaders, Crook County can look forward to the future with confidence in its ability to bounce back quickly from economic shocks.

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Appendix

North American Industry Classification Sector Descriptions

Agriculture, Fishing & Related: Growing crops, raising animals, harvesting fish and other animals, and services that support natural resource-based production. Note: in the Standard Industrial Classification sectoring scheme, which is also used herein, the crop production sectors and services sectors are separated. This NAICS sectoring scheme purposely combines those sectors to obtain a cumulative estimate of all agricultural and fisheries-based activities.

Forestry & Logging: Farm production of stumpage, pulpwood, fuel wood, Christmas trees, and fence posts. Operation of timber tracts, tree farms, and forest nurseries plus reforestation.

Mining: Establishments that extract naturally occurring mineral solids, such as coal and ores; liquid minerals, such as crude petroleum; and gases, such as natural gas. The term “mining” is used in the broad sense to include quarrying, well operations, beneficiating (e.g., crushing, screening, washing, and flotation), and other preparation customarily performed at the mine site, or as a part of mining activity.

Construction: Construction of buildings and other structures, heavy construction (except buildings), additions, alterations, reconstruction, installation, and maintenance and repairs. Establishments engaged in demolition or wrecking of buildings and other structures, clearing of building sites, and sale of materials from demolished structures are also included. This sector also includes those establishments engaged in blasting, test drilling, landfill, leveling, earthmoving, excavating, land drainage, and other land preparation.

Manufacturing—(Food—Wood Products—High Tech. -Other): the mechanical, physical, or chemical transformation of materials, substances, or components into new products. The assembling of component parts of manufactured products is considered manufacturing, except in cases where the activity is appropriately classified in Construction.

Transportation & Warehousing: Providing transportation of passengers and cargo, warehousing and storing goods, scenic and sightseeing transportation, and supporting these activities.

Utilities: Provision of the following utility services: electric power, natural gas, steam supply, water supply, and sewage removal. Within this sector, the specific activities associated with the utility services provided vary by utility: electric power includes generation, transmission, and distribution; natural gas includes distribution; steam supply includes provision and/or distribution; water supply includes treatment and distribution; and sewage removal includes collection, treatment, and disposal of waste through sewer systems and sewage treatment facilities.

Wholesale Trade: Establishments engaged in wholesaling merchandise, generally without transformation, and rendering services incidental to the sale of merchandise.

Retail Trade: Establishments engaged in retailing merchandise, generally without transformation, and rendering services incidental to the sale of merchandise.

Accommodation & Food Services: Lodging and/or prepared meals, snacks, and beverages for immediate consumption.

Finance & Insurance: Firms with payroll primarily engaged in financial transactions (transactions involving the creation, liquidation, or change in ownership of financial assets) and/or in facilitating financial transactions, pooling risk, or underwriting insurance and annuities.

Real Estate & Rental & Leasing: Renting, leasing, or otherwise allowing the use of tangible assets (e.g., real estate and equipment), intangible assets (e.g., patents and trademarks), and establishments providing related services (e.g., establishments primarily engaged in managing real estate for others, selling, renting and/or buying real estate for others, and appraising real estate).

Other Services: Services not specifically provided for elsewhere in the North American Industry Classification System (NAICS). Establishments in this sector are primarily engaged in activities such as repair and maintenance of equipment and machinery; personal and laundry services; and religious, grant making, civic, professional, and similar organizations. Establishments providing death care services, pet care services, photo-finishing services, temporary parking services, and dating services are also included. Private households that employ workers on or about the premises in activities primarily concerned with the operation of the household are included in this sector.

Information: Establishments engaged in the following processes: (a) producing and distributing information and cultural products, (b) providing the means to transmit or distribute these products as well as data or communications, and (c) processing data. The main components of this sector are the publishing industries, including software publishing, the motion picture and sound recording industries, the broadcasting and telecommunications industries, and the information services and data-processing services industries.

Administrative and Support Services, etc.: Routine support activities for the day-to-day operations of other organizations. These essential activities are often undertaken in-house by establishments in many sectors of the economy. The establishments in this sector specialize in one or more of these support activities and provide these services to clients in a variety of industries and, in some cases, to households. Activities performed include: office administration, hiring and placing of personnel, document preparation and similar clerical services, solicitation, collection, security and surveillance services, cleaning, and waste disposal services.

Arts, Entertainment & Recreation: Establishments that operate facilities or provide services to meet varied cultural, entertainment, and recreational interests of their patrons. This sector comprises (1) establishments that are involved in producing, promoting, or participating in live performances, events, or exhibits intended for public viewing; (2) establishments that preserve and exhibit objects and sites of historical, cultural, or educational interest; and (3) establishments that operate facilities or provide services that enable patrons to participate in recreational activities or pursue amusement, hobby, and leisure-time interests.

Health Care and Social Assistance: Providing health care and social assistance for individuals. The services are delivered by trained professionals. All industries in the sector share this commonality of process, namely, labor inputs of health practitioners or social workers with the requisite expertise. Many of the industries in the sector are defined based on the educational degree held by the practitioners included in the industry.

Professional, Scientific, and Technical Services: Establishments that specialize in performing professional, scientific, and technical activities for others. These activities require a high degree of expertise and training. The establishments in this sector specialize according to expertise and provide services to clients in a variety of industries and, in some cases, to households. Activities performed include: legal advice and representation; accounting, bookkeeping, and payroll services; architectural, engineering, and specialized design services; computer services; consulting services; research services; advertising services; photographic services; translation and interpretation services; veterinary services; and other professional, scientific, and technical services.

Educational Services: Instruction and training in a wide variety of subjects. This instruction and training is provided by specialized establishments, such as schools, colleges, universities, and training centers. These establishments may be privately owned and operated for profit or not for profit, or they may be publicly owned and operated. They also may offer food and accommodation services to their students. Educational services usually are delivered by teachers or instructors that explain, tell, demonstrate, supervise, and direct learning. Instruction is imparted in diverse settings, such as educational institutions, the workplace, or the home through correspondence, television, or other means. It can be adapted to the particular needs of the students, for example sign language can replace verbal language for teaching students with hearing impairments. All industries in the sector share this commonality of process, namely, labor inputs of instructors with the requisite subject-matter expertise and teaching ability.

Public Administration: Administration, management, and oversight of public programs by Federal, State, and local governments.

Source: U.S. Executive Office of the President/Office of Management and Budget (OMB) 1999. North American Industry Classification System. Indianapolis: Jist Works, Inc.

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