Developing Rural Knowledge Indicators

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Overview and Methodology

The purpose of this memo is to describe and illustrate a range of possible indicators of the presence of knowledge workers and knowledge-based industry clusters in rural communities. In general we propose that the analysis of rural economies should follow a three-step process. First, we should assess level of knowledge in a rural economy, second, identify candidate knowledge related specializations or industries, and third, assess the relative strength of those knowledge specializations. We should consider aggregate generalized measures of knowledge-related activity, including a mix of demographic, economic and other factors. Once generalized data have indicated the presence of candidate instances of knowledge creation in particular industries, there are some industry-specific measures we can use to test the relative importance of these candidates.

Until now, the study of knowledge-based industries has focused primarily on relatively large industry clusters, composed of many firms, and employing thousands of workers in large metropolitan areas. These large industry clusters, like Silicon Valley, are extremely visible and it is difficult to miss their existence and economic importance.

Detecting and documenting the presence of knowledge-based industry clusters in rural areas is more difficult because their scale is so much smaller. An economically significant cluster in a rural economy may consist of only a handful of firms, employ only a hundred (or few hundred people) and may escape attention, unless we have some particular reason to know of its existence. The availability of economic statistics also hinders our ability to detect these smaller industry clusters—data for individual firms is unavailable, and in rural areas, data on economically significant groups of firms may be aggregated into larger industry groupings that make them almost invisible.

We define rural industry clusters in almost an inverse fashion. We mean groups of businesses (as opposed to single firms) not located in a metropolitan area and not depending primarily on the simple existence of a local natural resource as a source of competitive advantage. Some knowledge-based industries may start as resource based industries, but may develop further, creating and applying specialized knowledge that then becomes a source of advantage. For example, the California wine grape industry may have initially owed its establishment primarily or solely to the existence of favorable climate and soils for grape cultivation, but has subsequently developed a sophisticated knowledge base and skills involving grape cultivation, wine making, marketing and a host of related fields.

Our primary focus is on traded sectors of the economy, those businesses that sell their goods and services in competition with firms in other locations. Some businesses may start out as exclusively local economic activity (i.e. selling all of their output to local consumers), but then move to production for sale outside their community, state or nation. Many microbreweries for example started as brewpubs (or homebrewers) serving only a local demand, but then grew to serve much larger markets.

The first two steps in our process are to identify the overall **level** of knowledge creation in a rural economy, and then to identify **candidate specializations** or industries in which knowledge is being created.

We have developed an extensive list of candidate indicators, which are generally neutral with regard to industry, i.e. they measure knowledge creation without regard to whether it is particular to one industry or not. Some of our indicators are appropriate only to the first question—the overall level of knowledge creation—while others can be used both to assess overall knowledge creation and identify candidate clusters. For example, the fraction of the population with a four-year college degree is a good overall indicator of the level of knowledge (question 1), but doesn't tell us anything about the specialization of knowledge in particular industries. By contrast, patent data can help us identify places with a relatively high amount of knowledge creation (patents per capita) as well as identify particular technological specializations that suggest candidate industry clusters for further analysis.

The third step in our process is to test the relative strength of these candidate specializations by considering a range of **industry specific measures** of knowledge-creating activity. There are many possible indicators that are specific to the presence of particular industries, such as tabulations of listings in industry trade directories and databases. For example, in earlier work, we developed a series of nationwide indicators of biotechnology industry activity by tabulated databases of medical research spending and firm listings. Additionally, because these indicators are idiosyncratic to particular industries, we will focus most of our attention on the process for identifying data sources, rather than on specific data sources.

For each indicator, a four-part analysis has been developed. First, we consider why each indicator might be conceptually useful in identifying and measuring the extent of knowledge-related activity in a particular geographic area. Second, the sources of data for this indicator are identified. Third, we describe how this indicator could be analyzed, and what the most useful statistics or threshold values would be for identifying industries. Fourth, where available, we provide a quick summary of the metro/non-metro division in this indicator, and a summary of national trends in this indicator. In the appendix to this memorandum, we provide tables with illustrative data for selected rural counties, using Oregon and Minnesota as test cases.

Economic Indicators

Employment Concentrations & Growth

Why this is important: The key characteristic of an industry cluster is specialization—that is, a higher than usual concentration of some productive activity is found in a particular location. A first step in the identification of industry clusters is to identify places with unusual concentrations of certain kinds of activity.

Data Sources: Detailed information on industry employment is available from state labor market information agencies. The most comprehensive and comparable series nationally is the Covered Employment and Wages (CEW) series, also known as ES-202 data. Nationwide data is

available on-line through the Bureau of Labor Statistics Website (www.bls.gov/CEW), but there are considerable data suppressions in counties with small populations. Alternatively, some data can be obtained directly from state labor market agencies.

Analytical Approach/Descriptive Statistics: We can use location quotients to determine the relative concentration of certain industries in rural areas relative to statewide or national averages. Our analytical approach is to examine publicly available data at the lowest possible level of aggregation or to obtain confidential firm level data.

Metro/Non-Metro Results, National Trends Analysis: The location quotient is a basic measure used to identify localized concentrations of economic activity. It allows us to compare a local economy and a reference economy. Perhaps the best way to understand the usefulness of the location quotient approach is with a practical example. In this case, we are interested in comparing the concentration of economic activity in Northwest Minnesota with three different reference points: the US economy as a whole; the Minnesota state economy; and the Minnesota state economy minus the Twin Cities metro area. The use of different reference points is important because it allows us to see the differences in economic specialization between the reference economy and the rest of the nation, the rest of the state and Greater Minnesota. Having various reference points give us a more complete picture of the local economy and is meant to help us avoid making incorrect assumptions about how it functions.

The location quotient is defined as the ratio of the share of an industry's employment in the local region to the share of that industry's employment in the reference region. For example, if a particular industry represents 2 percent of the Northwest Minnesota economy but only 1 percent of the Minnesota economy, then its location quotient is 2.0 (2.0% ÷ 1.0% = 2.0). The location quotient measures the relative concentration of an industry in a local area compared to the reference area. A location quotient greater than 1.0 indicates that a local area has a relatively greater concentration of an industry than the reference area, while a location quotient of less than 1.0 indicates that an industry is relatively less concentrated in an area.

In general, an LQ greater than 1.0 is taken as an indication that some portion of the particular economic activity is part of the traded sector, sometimes referred to as basic, which means that the extent of its market encompasses more than local demand conditions alone. The key assumption here is that an activity considered to be basic is thought to be an important economic engine in the local economy; to strengthen and grow the local economy, one ought to develop the basic activity. Further, an activity identified as basic may indicate a concentration of specialized knowledge and thus may be a candidate for a rural knowledge cluster.

So, we begin by looking for LQs greater than 1.0 at the highest level of aggregation in the North American Industry Classification System (NAICS). The most general level of classification is the two-digit level, which identifies what are understood to be sectors; NAICS encompasses twenty sectors in all. The following table shows the location quotients for Northwest Minnesota[1] in comparison with the three reference economies, at the two-digit level. We can see from the

[1] Northwest Minnesota was defined to include Beltrami, Clearwater, Hubbard, Kittson, Lake of the Woods, Mahnomen, Marshall, Norman, Pennington, Polk, Red Lake, and Roseau counties.

table that there are several sectors that LQs greater than 1.0: Agriculture, Forestry, Fishing & Hunting; Manufacturing; Wholesale Trade; Retail Trade; Healthcare & Social Assistance; Accommodation & Food Services.

Location Quotients: Two-Digit Industry Groups in Northwest Minnesota, 2001

		Location Quotients		
NAICS	**Description**	**Base = US**	**Base = MN**	**Base = MN (minus TC metro)**
0	Total, All Industries	1	1	1
11	Agriculture, Forestry, Fishing & Hunting	2.29	3.56	1.63
21	Mining	0.32	0.58	0.23
22	Utilities	1.30	1.28	0.93
23	Construction	0.87	0.99	0.92
31	Manufacturing	1.62	1.44	1.19
42	Wholesale Trade	1.26	1.14	1.18
44	Retail Trade	1.14	1.16	1.00
48	Transportation and Warehousing	0.63	0.65	0.84
51	Information	0.62	0.65	0.89
52	Finance and Insurance	0.62	0.55	0.90
53	Real Estate and Rental and Leasing	0.34	0.38	0.62
54	Professional and Technical Services	0.29	0.33	0.63
62	Health Care and Social Assistance	1.38	1.26	0.99
72	Accommodation and Food Services	1.10	1.19	1.06
81	Other Services, Ex. Public Admin	1.20	1.17	1.19

We now have to decide which sectors are candidates for further exploration. Not every sector with an LQ over 1.0 should be considered an engine of economic growth, nor does it always indicate a concentration of specialized knowledge. We have to use the LQ in combination with other practical knowledge about the local economy to make these kinds of evaluations.[2]

[2] A detailed profile of the region and results of the industry cluster study are available in Munnich, L. W., Bau, M. M., Skelton, R. A., Warner, J. P., & Muesing, B. J. (1998). *Northwest Minnesota industry cluster study.* State and Local Policy Program and Minnesota Extension Service.

In 2001, the LQs for manufacturing in Northwest Minnesota, taking account of each reference economy, suggest that this sector is a vital part of the regional economy. Accordingly, we chose to "drill down" into the manufacturing sector. In drilling down, we are moving from the general to the specific (from two-digit categories to 4-5-or-6 digit categories). In so doing, we are examining activity that is increasingly specific in its means of production. NAICS should be thought of as a "nested" hierarchy. It classifies the relative activity of businesses at increasingly detailed levels, moving from two-digit activities all the way down to six-digit activities.

The NAICS codes for manufacturing are 31-33; this means the classification code for every type of economic activity related to manufacturing begins with 31, 32 or 33. For example, one of the industries known to exhibit a high degree of specialization in Northwest Minnesota is the transportation equipment manufacturing industry, for which the NAICS code is 336. One can see that the three-digit code for this industry "rolls up" into the general, two-digit category of manufacturing. Another example of an industry known to exhibit specialization is the engineered woods products industry, for which the NAICS code is 3212 and which rolls up into the more general category of wood product manufacturing (NAICS 321). Again, this is an example of how the "nested" hierarchy of NAICS categories functions.

It is important to remember that publicly available data often suppresses details about specific industries to protect the confidentiality of individual firms. The following table describes all of the LQs, using our three reference points, for manufacturing industries in Northwest Minnesota for which there is publicly available data. We can see that the high LQ associated with manufacturing is attributable to strengths in several industries with high degrees of concentration. The high location quotients show that it is wood product manufacturing, particularly in veneer and engineered wood products and miscellaneous wood products that are the most concentrated in Northwest Minnesota. Other particularly strong concentrations are apparent in commercial refrigeration and transportation equipment.

Location Quotients: Selected Manufacturing Industries in Northwest Minnesota, 2001

NAICS	*Description*	**Location Quotients**		
		Base = US	**Base = MN**	**Base = MN (minus TC metro)**
31	Manufacturing	1.62	1.44	1.19
321	Wood Product Manufacturing	2.89	2.08	1.29
3211	Sawmills and Wood Preservation	1.58	5.64	2.44
32111	Sawmills and Wood Preservation	1.58	5.64	2.44
3212	Veneer and Engineered Wood Products	9.67	7.86	3.38
32121	Veneer and Engineered Wood	9.67	7.86	3.38

	Products			
32199	All Other Wood Product Manufacturing	1.89	1.91	0.71
321999	Miscellaneous Wood Product Manufacturing	4.68	3.20	1.19
3327	Machine Shops and Threaded Products	1.19	0.63	0.65
3331	Ag., Construction, and Mining Machinery	1.49	0.85	0.46
3334	HVAC and Commercial Refrigeration Equip	2.55	1.47	2.10
33341	HVAC and Commercial Refrigeration Equip	2.55	1.47	2.10
336	Transportation Equipment Manufacturing	4.61	10.77	5.38

Self-Employment Concentrations

Why this is important: One important clue to the presence of knowledge industry clusters in rural areas may be the number of self-employed persons in related industries. Due to the relatively smaller scale of rural economic activity, self-employment may be more common in rural clusters. Many of the enterprises that might support larger firms in an urban market may consist of a single person firm in a rural area.

Data sources: There are a variety of sources of data on self-employment, but the most useful for our purposes is the Non-Employer series published by the Census Bureau. The Census Bureau uses Internal Revenue Service tax returns to identify businesses with no payroll employment. Generally, these firms are business establishments that file taxes but are not connected to any other business entity that pays payroll taxes. There are more than 16 million non-employers with total receipts of more than $700 billion. About three-quarters of all businesses are non-employers but they only account for about 3% of all business receipts.

Non-employer establishments can be any type of business ownership—sole proprietorship, partnership or corporation—and many non-employer businesses represent part-time business activities. The non-employer data series is particularly valuable because it is reported by county and by NAICS (North American Industrial Classification System) industry code. Because there are many more firms in the non-employer category than the employer category, the non-employer data is far less likely to be suppressed to protect individual firm confidentiality in less populated rural counties. These data are published on an annual basis; the most recent data are for the year 2000. Data are available on the Census website at:
http://www.census.gov/epcd/nonemployer/

Analytical Approach/Descriptive Statistics: We use the same general approach to analyzing non-employer data as we do in looking at employment data. Rather than look for concentrations of employment, however, we look for concentrations of establishments, i.e. non-employer firms, which we generally equate to self-employed individuals. We can use these data to estimate location quotients for numbers of self-employed individuals in different counties.

Metro/Non-Metro Results, National Trends Analysis: National level tabulations of this data series for metropolitan and non-metropolitan areas are not available from the Census Bureau. The importance of non-employer establishments varies substantially by industry, as national statistics illustrate. Non-employers are relatively unimportant in manufacturing industries, accounting for less than one half of one percent of all receipts. In contrast, they are quite important in real estate, professional services, education services, and arts, entertainment and recreation.

Establishments and Receipts, All Businesses and Non-Employers by NAICS Sector, 2000, United States

		Total	Nonemployers		Total	Nonemployers	
NAICS	**Sector**	**000's**	**000's**	**Pct**	**$Bill.**	**$Bill.**	**Pct**
0	All industries	N/A	15,440	N/A	N/A	586	N/A
11	Forestry, fishing & hunting, & ag support services	N/A	240	N/A	N/A	9	N/A
21	Mining	117	92	78.7	179	5	2.8
22	Utilities	31	16	50.6	412	1	0.1
23	Construction	2,547	1,890	74.2	946	87	9.2
31-33	Manufacturing	667	303	45.4	3854	12	0.3
42	Wholesale trade	859	406	47.2	N/A	31	N/A
44-45	Retail trade	2,950	1,831	62.1	2530	69	2.7
48-49	Transportation & warehousing	824	646	78.4	348	29	8.5
51	Information	289	174	60.3	629	6	0.9
52	Finance & insurance	1,074	679	63.2	2235	37	1.7
53	Real estate & rental & leasing	1,685	1,397	82.9	343	102	29.7
54	Professional, scientific, & technical services	3,265	2,650	81.2	661	81	12.3
56	Administrative & support & waste mgmt & remediation serv	1,169	892	76.4	313	17	5.4
61	Educational services	269	235	87.4	18	3	15.8
62	Health care & social assistance	1,699	1,168	68.7	450	31	6.9
71	Arts, entertainment, & recreation	773	693	89.7	99	14	14.4

72	Accommodation & foodservices	736	191	26	359	9	2.5
81	Other services (except public administration)	2,357	1,936	82.1	206	43	21

Wage Levels

Why this is important: Firms generally pay higher wages to higher skilled workers. The higher wages reflect their higher productivity, greater level of human capital, and may compensate them for the maintenance of firm-specific skills. In knowledge-based industries, we would expect average payroll per employee to be higher than industry-wide averages, reflecting these knowledge-differentials. Alternatively, average wage levels may reflect firms with a different occupational mix—i.e. more high wage occupations as a fraction of their labor force. Differences in human capital productivity in cities have been shown to explain the observed wage premium for workers in urban areas (Rauch, 1993).

Data Sources: Detailed wage data are available from state labor market information agencies. Again, the most comprehensive and comparable series nationally is the Covered Employment and Wages (CEW) series, also known as ES-202 data. Nationwide data is available on-line through the Bureau of Labor Statistics Website (www.bls.gov/CEW), but of course, there are considerable data suppressions in counties with small populations. Alternatively, some data can be obtained directly from state labor market agencies.

Analytical Approach/Descriptive Statistics: Our objective here is to find industries with wage levels significantly above the national average for that industry. Our analytical approach is to examine publicly available data at the lowest possible level of aggregation (2 or 3 digit SIC classification) or to obtain confidential firm level data at the three or four digit level.

To demonstrate this methodology, we have examined covered employment and payroll data for industries in Oregon, and used a ten percent wage premium threshold to identify high wage industries (i.e. wages in Oregon must be at least ten percent above the national average for that industry in order to be selected.

Our analysis shows that 73 reportable 4-digit industries (out of a total of 850 four digit industries) had average wages at least 10 percent higher than the national average four their industry in 2000. Of 263 **3-digit** industries, 37 had average wages at least ten percent above the national average for their industry. The following table shows those 3-digit industries with at least 3,000 employees statewide in 2000, ranked by industry employment, with average wages of more than $30,000 per year that had average annual wages at least 10 percent above the national average for their industry. They are for the most part manufacturing and wholesale segments of the regional economy. (Three construction sectors—electrical, plumbing and heavy construction also appear on the list but have location quotients of approximately one, indicating they are not unusually concentrated in the region).

Oregon's high wage, traded sector industries are concentrated in electronics and instruments, wood products and the metals industry. One other industry (apparel wholesaling) includes the state's only Fortune 500 company, Nike. The electrical utility industry also shows up as a well paid sector of the economy

SIC	Description	Jobs	LQ	Average Wage	Percent
367	Electronic components and accessories	33,290	4.0	89,884	138%
243	Millwork, plywood and structural members	19,747	4.8	34,326	114%
242	Sawmills and planing mills	14,339	6.4	37,664	126%
173	Electrical work	11,925	1.1	48,597	118%
171	Plumbing, heating, air-conditioning	11,769	1.0	44,041	118%
241	Logging	7,869	8.3	33,827	122%
162	Heavy construction, except highway	6,973	0.9	45,229	112%
513	Apparel piece goods and notions	6,703	2.5	72,150	156%
382	Measuring and controlling devices	6,056	1.6	74,880	119%
491	Electric services	6,041	1.4	87,691	135%
503	Lumber and construction materials	5,536	1.5	51,535	127%
249	Miscellaneous wood products	3,694	3.6	36,720	126%
332	Iron and steel foundries	3,393	2.2	47,263	113%
336	Nonferrous foundries (castings)	2,072	1.8	38,843	110%

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Occupational Composition

Why this is important: Occupations may be a useful alternative means of characterizing the structure and development opportunities of a regional economy (Markusen & Schrock, 2001). Certain occupations are more likely to be involved in creating new knowledge than are others. In his book, *The Rise of the Creative Class*, Richard Florida argues that a segment of such occupations, primarily in the professional, managerial, and technical categories, account for the bulk of creative work in the economy (Florida, 2002).

Data Sources: Detailed occupational data for counties are collected as a part of the Decennial Census. Table P-50 of Summary Tape File 3 (STF 3) lists the number of employed males and females in six broad occupational groups—managers, professionals service workers, sales workers, construction workers and production workers—and further subdivides these groups into nearly 40 different occupational categories. These data are available at the county level through American Fact Finder (the Census bureau's interactive, web-based data access tool.)

Analytical Approach/Descriptive Statistics: Our objective here is to find areas with unusually high concentrations of creative class individuals. Florida divides the creative class into two groups: the super-creative core and creative professionals.

Super-Creative Core

- Computer and mathematical occupations
- Architecture and engineering occupations
- Life, physical and social science occupations
- Education, training and library occupations
- Arts, design, entertainment, sports and media occupations

Creative Professionals

- Management occupations
- Business and financial operations occupations
- Legal occupations
- Healthcare practitioners and technical occupations
- High-end sales and sales management

For each of these groups, we can compute the proportion of the employed population that is either super-creative core or creative professionals. Counties with particularly high levels of creative class membership may be more likely to be centers of knowledge-related economic activity. In more rural communities, the numbers of persons in the super-creative core may be significantly influenced by the presence (or absence) of institutions of higher education, as a large number of college employees will be counted among the education, training and library occupations.

Metro/Non-Metro Results, National Trends Analysis: Nationally, creative occupations are much more likely to be found in metropolitan compared with non-metropolitan areas. About a third of the workers in metro areas, on average, are members of the creative class, as opposed to less than a quarter of the workers in non-metropolitan areas.

Creative Class for Metro and Non-Metro Areas, United States

Number	Metro	Non-Metro	Total
Super Creative Core	14,504,605	2,348,060	16,852,665
Creative Professionals	20,811,062	3,256,602	24,067,664
Creative Class	35,315,667	5,604,662	40,920,329
Total Workforce	105,526,814	24,194,698	129,721,512
Percent in Each Group	Metro	Non-Metro	Total
Super Creative Core	13.7%	9.7%	13.0%
Creative Professionals	19.7%	13.5%	18.6%
Creative Class	33.5%	23.2%	31.5%

Source: U.S. Census Bureau, Census 2000 Summary File 3, Table P-50

Particularly creative rural counties might have concentrations of employment in creative class occupations comparable to those in metropolitan areas. Using the nationwide metropolitan averages—14 percent for the super creative core and 20 percent for creative professionals—as thresholds, we can examine the data for Oregon counties (see Appendix). No rural Oregon counties have 14 percent or more super creative workers, and only two counties, Gilliam and Sherman, have 20 percent or more in the creative professions.

The table below shows the creative class occupational composition for Northwest Minnesota. We can see that the non-metro areas are very comparable with national averages, while the concentrations in metropolitan areas are somewhat higher.

Creative Class for Metro and Non-Metro Areas, Minnesota

Number	Metro	Non-Metro	Total
Super Creative Core	276,255	71,004	347,259
Creative Professionals	396,437	97,680	494,117
Creative Class	672,692	168,684	841,376
Total Workforce	1,857,171	722,875	2,580,046
Percent in Each Group	Metro	Non-Metro	Total
Super Creative Core	14.9%	9.8%	13.5%
Creative Professionals	21.3%	13.5%	19.2%
Creative Class	36.2%	23.3%	32.6%

Source: U.S. Census Bureau, Census 2000 Summary File 3, Table P-50

New Business Formation

Why this is important: One key measure of vitality of particular industries is the establishment of new firms. An above average rate of new firm formation, particularly in traded sectors may be an indication of the flourishing of a knowledge-based activity.

Data Sources: While there have been a number of efforts to collect and tabulate this data at the national, state and metropolitan levels, relatively few states have set up their own systems for reporting this information at the county level. Minnesota is one of the leaders in this area, having published its business tracking statistics for a number of years. This annual report calculates the number of new business startups (as well as expansions, contractions and closures) at the county level, for the entire state of Minnesota (Venegas, 2001).

Additionally, estimates of the number of new business starts in each county in the US are available from BizMiner.com for a fee. Using a proprietary database of 11 million US businesses, Bizminer estimates the number of new businesses established in the past year in each of 2,850 US counties. It then computes a "startup rate"—the number of new businesses started in the past year divided by the total number of businesses in operation in the prior year. http://www.bizminer.com/

Analytical Approach/Descriptive Statistics: Consistent with the notion that knowledge centers lead to more new business formations we focus on business startup data to identify counties with a high business startup rate. The Minnesota business tracking data report two annual (year over year) rates of changes for small business formations: the rate of growth in establishments (i.e. the startup rate), and the percentage increase in county-wide employment associated with startup firms.

Metro/Non-Metro Results, National Trends Analysis: We did not have access to national data for this report, and consequently are unable to analyze national trends in this indicator. Data for Minnesota show that seven counties had double-digit rates of new firm formation during 2000—Becker, Blue Earth, Chippewa, Crow Wing, Dodge, Scott and Sherburne.

Demographic Indicators

Educational Attainment

Why this is important: Educational attainment is one of the most broadly based measures of human capital available to us. Increasingly there are strong correlations between educational attainment and individual earnings, as well as between educational attainment and community prosperity (Gottlieb & Fogarty, 1999). There are also strong indications of agglomeration economies in well-educated people: people with higher levels of education tend to live in the same areas, work in the same kinds of firms, and marry one another (Costa & Kahn, 2000).

Educational attainment is influenced by a variety of factors, including the local education system, the types of jobs available locally, and patterns on in-migration and out-migration. Some rural communities may have particularly high levels of educational attainment because of the presence of local institutions of higher education—colleges have the positive effect of creating well-educated adults and by employing relatively well-educated workers. Migration also plays an important role in shaping educational attainment rates. Rural communities may experience a net out-migration of well-educated workers (brain drain) or can attract well-educated workers from other locations.

Data Sources: County level data on educational attainment of the adult population (persons aged 25 years old and older) is reported by the in the decennial census. Data on educational attainment between decennial Census years is difficult to obtain; some data are available by using pooled data estimates from the American Community Survey.

Analytical Approach/Descriptive Statistics: Census data report the number of persons having completed various amounts of schooling, ranging from a few years of elementary schooling, high school completion, some college or an associate degree, 4 years of college and graduate and professional degrees. For simplicity, we focus on the widely used benchmark of the fraction of the adult population 25 years old and older that has completed a four-year degree or higher level of education.

Metro/Non-Metro Results, National Trends Analysis: Nationally, educational attainment is systematically higher in metropolitan areas than in non-metropolitan areas. The fraction of the population aged 25 years and older with a four-year degree is almost double in the nation's metropolitan area the level found in non-metropolitan areas. The rate of college completion in metropolitan areas rose from 25 percent in 1990 to almost 30 percent in 2000.

Educational Attainment: Percent of Adults (Aged 25 and older) with 4 years of college or more. (United States 1990 and 2000)

Geography	1990	2000	Change
Metropolitan	25.1%	29.9%	4.8%
Non-Metropolitan	12.9%	15.9%	3.0%

Source: U.S. Census Bureau, Census 2000 Summary File 3, Matrices P19, P36, P37, P38, PCT24, and PCT25
(*Note: These data are un-adjusted for changes in metropolitan area boundaries between 1990 and 2000; some areas that were classified as non-metro in 1990 were reclassified as part of metropolitan areas in Census 2000 tabulations).*

We can use educational attainment data to identify counties that might have a strong knowledge concentration. In Oregon for example, five of the state's 26 rural counties have more than 20 percent of their population with a four-year degree or higher level of education—Deschutes, Hood River, Sherman, Union and Wheeler. These counties would be immediate candidates for having strong knowledge concentrations.

The following table outlines the metro/non-metro concentration of adults aged 25 years and older in Northwest Minnesota. In the case of both metro and non-metro areas, the change in the fraction of the adult population aged 25 and over holding at least a four-year degree is somewhat higher compared with the national average.

Educational Attainment: Percent of Adults (Aged 25 and older) with 4 years of college or more. (Northwest Minnesota 1990 and 2000)

Geography	1990	2000	Change
Metropolitan	25.9 %	32.1%	6.2%
Non-Metropolitan	13.2%	16.9%	3.7%

Source: U.S. Census Bureau, Census 2000 Summary File 3, P37
(Note: These data are un-adjusted for changes in metropolitan area boundaries between 1990 and 2000; some areas that were classified as non-metro in 1990 were reclassified as part of metropolitan areas in Census 2000 tabulations).

Net In-Migration of Young Adults

Why this is important: Young adults, aged 25 to 34 are the most mobile segment of the population. They are also the most likely to be in the workforce (measured by the employment ratio), have the most recent education, and the smallest wage premium for experience (Peri, 2001). There are nearly four million fewer 25 to 34 year olds in the US in 2000 that there were in 1990.

Data Sources: County level data on population by age group are available on-line from the 1990 and 2000 censuses through American Fact Finder for Census 2000, as well as through a data lookup function for the 1990 Census.

Analytical Approach/Descriptive Statistics: Census data report the number of persons by age residing in each county in both 1990 and 2000. We obtain these data for each county and compute the change in the number of persons in the 25 to 34 age group, between the two decennial censuses.

Metro/Non-Metro Results, National Trends Analysis: The population aged 25 to 34 has become increasingly concentrated in the nation's metropolitan areas in the past decade. Due to the aging of the Baby Boom generation, the number of persons in the 25-34 demographic group has declined by nearly 3.9 million. The decline has been most pronounced in non-metropolitan areas, which have seen a 21 percent decline in this age group, compared to a 6 percent decline in metropolitan areas.

Total Population 25 to 34				
	1990	2000	Change	Percent Change
US	43,467,034	39,577,357	-3,889,677	-9%
Metro	34,940,825	32,864,383	-2,076,442	-6%
Non-Metro	8,526,209	6,712,974	-1,813,235	-21%

Source: U.S. Census Bureau, Census 2000 Summary File 3, Matrices P19, P36, P37, P38, PCT24, and PCT25 *(Note: These data are un-adjusted for changes in metropolitan area boundaries between 1990 and 2000; some areas that were classified as non-metro in 1990 were reclassified as part of metropolitan areas in Census 2000 tabulations).*

A growth, or even a less than average decline in the number of 25 to 34 year olds may be a useful flag for identifying candidate metro economies with a knowledge concentration. Between 1990 and 2000, just four of Oregon's 26 rural counties recorded an increase in the population aged 25 to 34: Morrow, Crook, Deschutes and Jefferson.

Second Homes

Why this is important: Second homes are a potentially useful indicator for two reasons. First, they may be a way of measuring the presence of amenities and second, they may be an indicator of longer term trends in attracting population. Amenities have been understood to be an important factor in flows of population. Communities with a significant number of second homes are in many cases also places with high amenity values. Second homes are typically owned by well-educated, high income individuals who may ultimately relocate to their second home and serve as entrepreneurs in rural communities.

Data Sources: The housing portion of the decennial census has produced some statistics on the number of second homes in each county in the United States. Although the exact definition has varied from year to year, reasonably comparable data from the 1940 through 1990 Decennial Censuses, by state is available from:
http://www.census.gov/hhes/www/housing/census/historic/vacation.html

Analytical Approach/Descriptive Statistics: The simplest test statistic is to compute the portion of an area's housing stock that was composed of second homes. Counties that have more than the national average of about 3 percent of the housing stock in second homes are likely to be candidates for further investigation.

Metro/Non-Metro Results, National Trends Analysis: Second homes are much more likely to be found in some states that in others. Second homes are particularly common in the Northeast (Maine, Vermont and New Hampshire lead the list, and in sunnier climates (Florida and Arizona have the highest proportion of second homes among states with a million or more housing units).

Ten States With the Highest Percentage of Seasonal, Recreational, or Occasional Use Homes: 2000

Area	Total Housing Units	For seasonal, recreational or occasional use	Percent
United States	**115,904,641**	**3,578,718**	**3.1**
Maine	651,901	101,470	15.6
Vermont	294,382	43,060	14.6
New Hampshire	547,024	56,413	10.3
Alaska	260,978	21,474	8.2
Delaware	343,072	25,977	7.6
Florida	7,302,947	482,944	6.6
Arizona	2,189,189	141,965	6.5
Wisconsin	2,321,144	142,313	6.1
Montana	412,633	24,213	5.9
Hawaii	460,542	25,584	5.6

Source: U.S. Census Bureau, Census 2000 Summary File 1.

Knowledge Creation

Why this is important: Ideally, we search for direct measures of innovation, such as companies that produce new products, develop more efficient processes, or find new ways of satisfying customer needs. We have few direct measures of the creation of new knowledge. Innovation processes are not reported in the same fashion as the number of jobs, or tabulations of different types of establishments.

Data Sources: Patent data provide a number of interesting insights into the process of invention and innovation. They have begun to be widely used by economists in the study of industrial and regional economic dynamics. Patent data come in two forms. The patent office produces aggregate statistics on patent activity by county and year. Additionally, the National Bureau of Economic Research has taken raw patent data and geocoded it and cross-referenced patent citations, making it possible to study the linkages between patents across time and space. Unlike public sector employment data, the identifying information in patents is a public record, making it possible to identify by name particular firms. Data are available at: http://www.nber.org/patents/

Analytical Approach/Descriptive Statistics: There are two distinct levels to the analysis of patent data. First, the analyst can use patent statistics, either from the USPTO or NBER databases to compute the number of patents in a county (or the number of patents per capita). Rankings of these variables can identify which counties are more or less innovative than others. The second step is for the analyst to use patents to determine whether there are any particular knowledge specializations implied by the patent activity. The analyst can pursue either a

quantitative approach (by counting the number of patents in each of the different patent classifications) or, in counties with relatively few patents, by inspecting patent records to determine the identity of the patent holder and the character of the technology in question.

The US Patent and Trademark Office classifies patents into one of several hundred technology classifications, and it is possible to determine in which technologies a region is most specialized by examining tabulations of data according to patent classification.

(The technology classifications can be found at:
http://www.uspto.gov/web/offices/ac/ido/oeip/taf/tecstc/classes.htm

Metro/Non-Metro Results, National Trends Analysis: Patenting tends to be highly concentrated in metropolitan areas. In the past decade about 92 to 93 percent of all US patents have been issued to inventors in metropolitan areas. In 1999, nearly 6,000 patents were issued to inventors in non-metropolitan areas of the US.

Total US Origin Utility Patents, Selected Years, 1990-1999

Geography	1990	1995	1999
Metropolitan	43,693	51,413	78,128
Non-Metropolitan	3,804	4,423	5,901
Percent Metropolitan	92.0%	92.1%	93.0%
Total US	47,497	55,836	84,029

Data for individual states is summarized at the county level (see Appendix). The patent rate, expressed as the number of patents issued over the past decade per 10,000 population, is a useful measure of the overall level of innovative activity. In Oregon, three counties (Clatsop, Deschutes and Jefferson) stand out as having the highest rural patent rates.

Data for Oregon (see Appendix) show that two companies located in Clatsop County, Ag-Bag International and Versa Corporation, each have five or more patents in the past five years. Each of these companies specializes in manufacturing equipment and supplies for storing silage. In addition, a third Clatsop County company, Carruthers Equipment, manages food processing machinery. The large number of patents in these related fields may indicate the possible presence of a knowledge-based industry cluster.

Other Indicators

There are a number of other promising indicators of knowledge related economic activity in rural areas. Not all of these potential indicators met our criteria for inclusion in this memo because data were lacking at the appropriate level of geography or because data are reflective of knowledge only in a particular industry.

Exports

Data on exports, particularly of value-added products, would be one potentially useful indicator of rural knowledge creation. However, data for rural areas are difficult to obtain. Export data at the state and metropolitan level are generated by the US Department of Commerce from Shipper's Export Declarations. While much of the original data for this purpose are coded by ZIP code, tabulations of data at less than a statewide level are difficult to obtain. Data are not available at the County level. See Miser export data at http://www1.miser.umass.edu/trade/statex.html

Research & Development Expenditures

Private sector research and development expenditures are another useful indicator of knowledge-creation. Again, while state level data are available, county level data generally are not. The National Science Foundation surveys private businesses about their research and development expenditures, but these data are generally only reported at the state level. In a research project for the U.S. Economic Development Administration on the dynamics of technology development and transfer, Dr. Andrew Reamer developed a database of about 1,900 public R&D organizations (universities, federal laboratories, and nonprofit research institutes). For each institution, the database provides zipcode, metro area (if appropriate), and known R&D expenditures by year, as available. For more information contact Dr. Reamer directly at: reamer@thecia.net.

Industry Specific Indicators

Industry Associations

Why this is important: A key element of the cluster concept is that there is some kind of connection among firms. They either serve a common market, use similar technology or worker skills, or are one another's customers and suppliers. Often when there are groups of such firms, they self-organize into trade or industry associations to provide a venue for networking and joint action on issues of common interest. The boundaries of trade association membership, and the lists of association members can be useful tools in describing and measuring industry clusters.

Data Sources: By their very nature, industry association data are idiosyncratic. Some associations regard their membership lists as proprietary or confidential, while others publish them freely on the web. The quality and detail on membership data varies substantially among industries. In some cases, the data can include valuable information about segmentation within the industry—which firms produce what kind of products, who the principal suppliers are, and so on.

Nationally, there are more than 35,000 associations, according to one proprietary listing (http://www.associationscentral.com). Associations include a wide variety of organizations, such as chambers of commerce, interest groups, artists, hobbyists, certain professions, and various industries. Often the easiest way to find specific associations is to do a web search. One excellent resource is the searchable directory of the American Society of Association Executives,

http://info.asaenet.org/gateway/OnlineAssocSlist.html, which provides links to the websites of more that 6,500 associations.

A typical example is the National Sporting Goods Association (NSGA) which consists of manufacturers, distributors and retailers of sporting goods. Their website (www.nsga.org) lists more than 8,000 manufacturers of sporting goods products. Company listings are divided into more than 70 major categories and also contain listings of sales agents, wholesalers, industry buying groups and retail business services.

Analytical Approach/Descriptive Statistics: Our approach here varies depending on the number of firms or establishments in the industry. Where there are large numbers of firms, it makes sense to use statistical measures like location quotients to describe the concentration or dispersion of economic activity. In the case of finely described industry segments, it may be more appropriate to identify the actual count of firms in different locations.

Trade Directories

Why this is important: Trade directories are much like industry association data and can be used in similar ways.

Data Sources: There are a wide variety of published industry directories, ranging from yellow page listings that encompass all (or nearly all) of the businesses in a particular geographic area, to much more focused industry directories that include only firms in a particular industry.

National yellow page style business directories are available from a variety of sources, and data can be extracted from them by tabulating the number of listings in a particular geographic area (zip codes or combinations of zip codes are convenient for data with mailing addresses). The challenge with these general directories is to select subject headings or industry classification codes that coincide with the industry cluster one is interested in. One of the easiest to use business directories is the Superpages, published by Verizon at www.superpages.com. You can search by category (through a drill-down list of business categories) and by geography, including town names and by geographic radius.

More focused directories that target a particular industry or industry segment solve part of the analysts problem. Because they are targeted at a particular audience, they automatically include only those firms that see themselves as part of a single industry. As with industry associations, this kind of third-party selection, in this case by the editors and advertisers in such directories, automatically filters data into an economically relevant grouping.

Analytical Approach/Descriptive Statistics: Trade directory data typically comes in the form of listings of individual firms. Counts of numbers of establishments and lists of firms are the best approach to the use of this data.

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Appendix: Sample Data

7.1 Economic Indicators

Location Quotients for Sporting Goods Manufacturing, Wholesaling & Retailing, Hood River County, Oregon

		Number of		Share of		
NAICS	Description	Hood River	United States	Hood River	United States	Location Quotient
33992	Sporting & Athletic Goods Mfg.					
	Employers					
	Establishments	7	2,486	0.90%	0.04%	25.5
	Employees	259	68,072	3.37%	0.41%	8.2

42191	Sporting Goods Wholesaling					
	Employers					
	Establishments	4	6,221	0.51%	0.09%	5.8
	Employees	75	57,625	0.98%	0.35%	2.8
	Non-Employers					

	Establishments	12	11,948	0.90%	0.07%	12.5
	Receipts	618	766,000	1.45%	0.11%	13.3

45111	Sporting Goods Retailing					
	Employers					
	Establishments	13	22,611	1.66%	0.32%	5.2
	Employees	64	184,964	0.83%	1.12%	0.7
	Non-Employers					
	Establishments	15	96,373	1.13%	0.58%	1.9
	Receipts	419	3,761,000	0.98%	0.53%	1.8

7.2 Demographic Indicators

Demographic Indicators for Oregon Counties

		Creative Class		
County	College Attainment	Super Creative	Creative Professionals	Change in 25-34s
	2000	2000	2000	1990-2000
Baker	16.4	10%	19%	-27%
Benton	47.4	26%	19%	-11%
Clackamas	28.4	12%	22%	-2%
Clatsop	19.1	9%	16%	-24%
Columbia	14	10%	15%	-7%
Coos	15	11%	16%	-28%
Crook	12.6	9%	14%	13%
Curry	16.4	10%	15%	-31%
Deschutes	25	10%	19%	29%
Douglas	13.3	9%	14%	-24%
Gilliam	13.4	6%	20%	-28%
Grant	15.7	13%	18%	-34%
Harney	11.9	10%	21%	-24%
Hood River	23.1	12%	19%	-3%
Jackson	22.3	12%	17%	0%
Jefferson	13.7	9%	15%	14%
Josephine	14.1	10%	15%	-6%
Klamath	15.9	10%	16%	-12%
Lake	15.5	11%	18%	-28%
Lane	25.5	13%	17%	-5%
Lincoln	20.8	10%	16%	-16%
Linn	13.4	10%	14%	-7%

Malheur	11.1	8%	16%	22%
Marion	19.8	10%	17%	8%
Morrow	11	8%	16%	23%
Multnomah	30.7	14%	19%	7%
Polk	25.3	13%	18%	4%
Sherman	19	10%	23%	-46%
Tillamook	17.6	9%	17%	-15%
Umatilla	16	9%	14%	0%
Union	21.8	13%	17%	-20%
Wallowa	20.3	12%	19%	-39%
Wasco	15.7	9%	16%	-14%
Washington	34.5	17%	21%	30%
Wheeler	14.3	13%	19%	-11%
Yamhill	20.6	10%	16%	10%

Source: Census 2000, 1990 Census, Impresa Calculations

7.3 Knowledge Indicators

Utility Patent Grants By State, County, And County Equivalents, United States And U.S. Possessions, 1990-1999
MINNESOTA

Code	Name	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
001	Aitkin	1	2	1	0	0	1	1	1	3	0
003	Anoka	61	68	64	84	112	85	84	104	118	138
005	Becker	3	0	2	2	2	1	1	0	1	2
007	Beltrami	2	3	1	3	3	1	0	0	3	6
009	Benton	2	4	3	5	5	4	3	3	9	4
011	Big_Stone	0	0	0	0	0	0	0	0	0	0
013	Blue_Earth	3	6	4	6	7	8	10	4	13	5
015	Brown	0	2	1	1	0	1	2	2	1	0
017	Carlton	3	2	1	2	2	1	3	1	2	0
019	Carver	15	12	13	25	26	18	21	26	41	41
021	Cass	1	1	2	0	1	4	2	3	3	9
023	Chippewa	0	2	2	0	0	1	3	3	1	3
025	Chisago	5	7	6	5	10	7	7	7	16	15
027	Clay	2	4	6	5	1	9	7	5	6	4
029	Clearwater	1	0	0	0	0	0	1	0	0	0
031	Cook	0	1	0	0	0	0	0	0	0	0
033	Cottonwood	0	0	0	0	1	2	1	0	0	1
035	Crow_Wing	7	7	2	4	7	10	5	10	10	13
037	Dakota	99	93	83	124	117	139	141	111	180	170
039	Dodge	4	5	10	3	1	5	5	2	12	11
041	Douglas	6	4	5	8	5	9	3	5	5	8
043	Faribault	2	2	0	1	4	2	0	1	2	2
045	Fillmore	2	1	2	5	4	2	2	4	3	4
047	Freeborn	4	3	2	2	3	1	3	3	2	0
049	Goodhue	10	2	13	13	8	8	10	19	9	15
051	Grant	0	1	1	1	0	0	2	0	2	0
053	Hennepin	492	471	494	526	569	487	570	594	771	863
055	Houston	3	6	1	4	3	2	3	5	7	6
057	Hubbard	0	1	0	2	1	0	0	0	0	0
059	Isanti	6	5	6	3	2	3	3	2	3	3
061	Itasca	1	7	6	6	2	2	1	3	3	1
063	Jackson	1	0	0	1	0	0	0	1	2	4
065	Kanabec	3	4	1	2	0	0	2	2	2	3
067	Kandiyohi	7	2	5	1	5	9	6	4	4	10
069	Kittson	0	0	1	0	0	0	1	0	0	0
071	Koochiching	1	2	1	0	0	0	0	0	1	1
073	Lac_qui_Parle	0	0	0	1	0	0	0	1	0	1
075	Lake	3	3	2	1	1	2	1	1	1	0
077	Lake_of_the_Woods	1	0	0	1	0	1	0	0	0	0
079	Le_Sueur	6	4	5	5	7	4	9	9	11	10
081	Lincoln	1	1	2	0	0	0	0	0	0	0
083	Lyon	2	0	0	1	0	0	1	3	1	0
085	McLeod	0	4	8	4	4	14	4	9	15	31
087	Mahnomen	0	0	0	0	0	0	2	0	0	0
089	Marshall	2	2	1	3	0	1	1	0	0	1
091	Martin	1	0	4	5	2	3	2	2	2	3

093	Meeker	2	2	1	2	3	5	3	3	5	7
095	Mille_Lacs	1	2	0	3	3	1	3	0	1	6
097	Morrison	1	0	2	2	0	1	0	0	0	2
099	Mower	3	2	0	1	3	2	2	6	6	6
101	Murray	0	0	0	0	0	1	0	0	0	0
103	Nicollet	4	3	1	5	5	4	5	4	7	3
105	Nobles	1	1	2	4	3	4	1	5	3	2
107	Norman	0	1	0	0	0	0	0	0	0	0
109	Olmsted	51	37	38	64	85	77	102	116	209	229
111	OtterTail	3	0	1	4	4	1	4	7	2	3
113	Pennington	1	6	3	2	0	3	3	3	2	0
115	Pine	0	0	0	0	1	0	1	0	0	1
117	Pipestone	0	0	0	0	0	0	1	0	0	1
119	Polk	3	3	3	2	2	2	3	2	3	1
121	Pope	1	4	1	3	0	2	0	2	3	2
123	Ramsey	288	304	312	298	331	326	319	310	446	426
125	Red_Lake	0	0	3	0	0	0	0	0	0	0
127	Redwood	0	1	0	0	0	1	2	4	3	8
129	Renville	1	1	0	1	0	0	0	0	1	9
131	Rice	2	4	6	4	5	8	12	7	13	9
133	Rock	0	1	0	0	0	0	0	0	0	0
135	Roseau	0	2	4	2	4	2	2	5	2	5
137	St._Louis	10	15	13	15	20	15	17	13	18	26
139	Scott	16	28	31	21	27	30	31	30	35	56
141	Sherburne	5	7	16	15	7	12	12	6	27	20
143	Sibley	0	0	1	0	2	1	1	2	1	2
145	Stearns	5	7	5	5	7	5	9	9	12	9
147	Steele	13	12	16	13	11	16	13	8	26	18
149	Stevens	0	0	1	1	2	0	1	1	2	1
151	Swift	1	0	2	1	3	0	2	0	2	2
153	Todd	2	2	1	0	1	1	2	0	0	0
155	Traverse	0	1	0	2	0	0	3	0	1	0
157	Wabasha	1	1	0	2	2	2	4	7	9	10
159	Wadena	1	2	0	0	1	1	0	1	0	0
161	Waseca	3	7	4	4	2	4	4	8	5	5
163	Washington	117	121	144	183	241	272	275	306	332	362
165	Watonwan	0	0	0	0	1	0	1	0	0	0
167	Wilkin	1	1	0	1	1	0	0	0	2	0
169	Winona	7	6	5	6	9	4	5	5	5	7
171	Wright	15	22	19	21	22	11	9	15	30	28
173	Yellow_Medicine	0	1	1	0	1	1	0	1	0	0
999	UNKNOWN	0	0	0	0	1	0	0	0	1	0
	TOTAL	1322	1351	1397	1552	1725	1662	1775	1836	2479	2654

Source: US Patent & Trademark Office (http://www.uspto.gov/web/offices/ac/ido/oeip/taf/county.pdf)

Utility Patent Grants By State, County, And County Equivalents, United States And U.S. Possessions, 1990-1999
OREGON

Code	Name	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
001	Baker	5	0	1	1	1	0	3	0	1	1
003	Benton	37	55	55	39	36	55	61	65	109	101
005	Clackamas	85	90	77	103	89	104	111	126	197	187
007	Clatsop	2	5	6	6	12	19	5	6	7	8
009	Columbia	3	4	3	7	3	5	4	4	6	6
011	Coos	5	6	4	2	2	3	2	4	4	3
013	Crook	2	1	2	0	0	1	0	1	2	3
015	Curry	2	1	2	1	1	4	6	0	6	0
017	Deschutes	20	24	26	29	18	14	23	18	20	25
019	Douglas	12	6	8	8	9	6	10	6	2	10
021	Gilliam	0	0	0	0	0	0	0	0	0	0
023	Grant	0	1	1	0	0	1	1	0	1	0
025	Harney	0	0	0	0	1	0	2	0	1	1
027	Hood_River	0	2	0	1	3	1	1	3	2	3
029	Jackson	11	21	24	21	27	30	17	13	28	14
031	Jefferson	9	5	7	4	12	8	7	6	7	13
033	Josephine	6	5	6	4	1	8	11	13	9	9
035	Klamath	5	5	2	2	2	1	1	3	5	1
037	Lake	0	0	1	1	0	0	0	0	0	2
039	Lane	45	38	28	47	60	57	61	50	76	59
041	Lincoln	2	4	3	3	2	1	5	5	4	4
043	Linn	4	2	8	7	8	8	8	12	17	11
045	Malheur	3	3	2	4	1	0	3	1	2	2
047	Marion	15	16	14	14	13	15	11	9	19	16
049	Morrow	0	1	0	0	1	1	0	2	0	1
051	Multnomah	62	64	53	71	57	73	78	81	118	129
053	Polk	7	11	10	7	7	7	13	9	18	18
055	Sherman	0	0	0	0	0	0	0	0	0	0
057	Tillamook	2	0	4	5	1	0	2	0	1	0
059	Umatilla	1	2	3	0	1	3	2	4	6	1
061	Union	0	1	0	1	2	2	1	0	0	0
063	Wallowa	0	0	2	0	0	0	1	0	1	0

065	Wasco	0	0	3	1	0	0	3	0	3	4
067	Washington	189	169	145	176	170	254	304	325	481	443
071	Wheeler	0	0	0	0	0	0	0	1	0	0
073	Yamhill	6	9	13	25	18	23	13	24	30	20
999	UNKNOWN	0	0	0	0	0	0	0	0	0	0
	TOTAL	540	551	513	590	558	704	770	791	1183	1095

Source: US Patent & Trademark Office (http://www.uspto.gov/web/offices/ac/ido/oeip/taf/county.pdf)

Patent Rate for Oregon Counties, 1990-1999

County	Patents, 1990	Population, 2000	Patents/10,000 Population
Baker	13	16,729	7.8
Benton	613	78,130	78.5
Clackamas	1169	339,472	34.4
Clatsop	76	35,579	21.4
Columbia	45	43,685	10.3
Coos	35	62,660	5.6
Crook	12	19,354	6.2
Curry	23	21,101	10.9
Deschutes	217	116,580	18.6
Douglas	77	100,494	7.7
Gilliam	0	1,913	0.0
Grant	5	7,893	6.3
Harney	5	7,611	6.6
Hood River	16	20,473	7.8
Jackson	206	181,886	11.3
Jefferson	78	19,104	40.8
Josephine	72	75,907	9.5
Klamath	27	63,909	4.2
Lake	4	7,401	5.4
Lane	521	323,271	16.1
Lincoln	33	44,303	7.4
Linn	85	103,029	8.3
Malheur	21	31,541	6.7
Marion	142	285,461	5.0
Morrow	6	11,070	5.4
Multnomah	786	660,767	11.9
Polk	107	62,623	17.1
Sherman	0	1,921	0.0
Tillamook	15	24,218	6.2
Umatilla	23	70,689	3.3
Union	7	24,546	2.9
Wallowa	4	7,222	5.5
Wasco	14	23,826	5.9
Washington	2656	448,120	59.3
Wheeler	1	1,543	6.5
Yamhill	181	85,262	21.2

Source: US Patent & Trademark Office (http://www.uspto.gov/web/offices/ac/ido/oeip/taf/county.pdf)

Patenting in Metro and Non_metro Areas of the United States, Breakout by Organization
Oregon, Non-Metropolitan Areas

Firm	1995	1996	1997	1998	1999	Total
Bend Research	2	5	3	6	2	18
Versa Corporation	9	1	1	3	3	17
Tektronix	2	3	4	1	2	12
Hewlett Packard	1	0	2	5	4	11
Ag-Bag International	4	2	2	1	1	10
Met One	0	1	4	0	4	9
Caddock Electronics	0	2	2	0	2	6
Carruthers Equipment	3	1	1	1	0	6
Northwest Aluminum	0	2	0	1	3	6
Amtek Research	0	0	2	1	2	5
Teledyne Industries	1	2	1	2	1	5
TFR Technologies	0	0	1	2	2	5

Patenting in Metro and Non_metro Areas of the United States, Breakout by Organization
Minnesota, Non-Metropolitan Areas

	1995	1996	1997	1998	1999	Total
Hutchinson Technology Inc.	8	2	9	16	20	55
International Business Machines Corporation	2	7	7	16	15	45
Riverwood International Corporation	8	3	6	7	8	32
Truth Hardware Corporation	6	6	2	7	4	25
Pioneer Hibred International Inc.	1	6	0	5	9	21
Micron Electronics Inc.	0	1	7	4	6	18
Mcneilus Truck & Manufacturing Co. Inc.	5	1	0	6	4	16
Wenger Corporation	3	3	2	4	4	15
Viratec Thin Films Inc.	3	4	3	4	1	14
Hormel Foods Corporation	1	2	2	3	5	13
Bedford Industries Inc.	3	0	4	3	2	12
Minnesota Mining And Manufacturing Company	4	0	4	2	2	11
Dekalb Genetics Corporation	0	0	0	1	8	9
Holden's Foundation Seeds Inc.	1	2	2	0	4	9
Asgrow Seed Company	0	1	2	4	1	8
Douglas Machine Limited Liability Company	1	2	2	2	1	8
E. F. Johnson Company	2	3	2	2	0	8
Wagner Spray Tech Corporation	0	1	2	2	3	8
Ecoair Corporation	1	1	2	3	0	7
Monsanto Corporation	0	0	0	0	7	7
Sheldahl Inc.	0	2	2	4	1	7
Rosemount Inc.	0	2	2	1	1	6
Scimed Life Systems Inc.	4	2	1	1	0	6

Sl Montevideo Technology Inc.	1	1	2	0	2	6
Adc Telecommunications Inc.	0	0	2	1	2	5
Arctco Inc.	2	2	1	0	0	5
Christian Brothers Inc.	0	1	4	0	0	5
Hussong Manufacturing Co. Inc.	0	0	0	2	3	5
Maywes Manufacturing Inc.	0	1	0	1	3	5
Walker Stainless Equipment Company	0	0	0	1	4	5

Source: US Patent and Trademark Office

7.4 Business Startup Activity

Number of New Firms Started and New Jobs Created, Minnesota, 2001

	Number of Business Establishments		Number of Jobs	
County	Number	Rate	Number	Rate
Aitkin	26	5.9	60	1.6
Anoka	562	9.0	2,008	1.9
Becker	99	11.1	291	2.7
Beltrami	83	8.0	470	2.9
Benton	60	8.2	373	2.9
Bigstone	17	8.3	65	3.8
Blue Earth	131	17.8	803	1.1
Brown	45	5.9	154	1.1
Carlton	42	6.0	277	2.2
Carver	149	9.1	1,044	4.3
Cass	65	8.3	188	2.2
Chippewa	44	10.6	328	6.4
Chisago	86	9.0	505	4.2
Clay	72	6.6	514	3.1
Clearwater	22	9.3	33	1.2
Cook	13	4.9	16	0.7
Cottonwood	16	4.2	9	0.2
Crow wing	153	17.4	804	3.3
Dakota	757	9.1	4,386	3.0
Dodge	41	10.6	80	1.7
Douglas	84	7.6	384	2.6
Faribault	18	3.8	70	1.2
Fillmore	33	5.3	93	1.4
Freeborn	39	4.6	281	2.2
Goodhue	76	6.6	387	1.9
Grant	9	3.9	72	3.5
Hennepin	3,171	8.2	19,565	2.4
Houston	26	6.5	98	2.0
Hubbard	45	8.8	163	2.8
Isanti	46	6.7	265	3.0
Itasca	77	6.7	292	1.9
Jackson	21	6.7	44	1.0
Kanabec	19	6.5	40	1.0
Kandiyohi	71	5.8	285	1.4
Kittson	8	4.0	20	1.4
Koochiching	28	5.8	146	2.6
Lac-Qu--Parle	11	4.7	10	0.4
Lake	24	8.3	136	3.7
Lake_of-the-Woods	D	D	D	D
Le-Sueur	47	7.4	269	3.1
Lincoln	13	6.7	88	5.3
Lyon	39	5.1	206	1.5
Mahnomen	11	8.7	44	2.2
Marshall	19	6.4	29	1.2
Martin	38	5.4	327	3.6
McLeod	59	6.2	439	2.5
Meeker	38	6.9	143	2.2
Mille-Lacs	53	9.3	166	1.8
Morrison	75	9.7	386	3.8
Mower	77	8.9	349	2.3
Murray	14	4.9	60	2.3
Nicollet	28	4.7	267	2.0
Nobles	42	6.6	281	3.1
Norman	10	4.5	21	1.1
Olmsted	272	9.6	2,188	2.8
Ottertail	101	6.5	373	1.8
Pennington	24	6.0	144	1.8
Pine	40	7.0	143	1.9
Pipestone	9	2.6	22	0.6

Polk	70	7.6	349	2.9
Pope	20	6.3	26	0.8
Ramsey	1,002	7.4	5,551	1.7
Red-Lake	D	D	D	D
Redwood	34	6.1	64	0.9
Renville	34	5.8	135	2.2
Rice	83	6.5	390	1.8
Rock	13	4.9	118	4.0
Roseau	28	7.1	89	1.0
Scott	233	11.5	1,256	4.0
Sherburne	185	14.0	875	5.0
Sibley	30	8.1	114	3.0
St.-Louis	359	6.7	2,048	2.2
Stearns	265	7.3	1,505	2.0
Steele	67	7.7	646	3.4
Stevens	13	3.8	82	1.8
Swift	20	5.8	74	1.9
Todd	31	6.0	115	1.9
Traverse	8	6.3	29	2.6
Wabasha	39	7.2	121	1.7
Wadena	38	9.0	179	3.1
Waseca	32	6.7	112	1.4
Washington	406	9.5	2,112	3.3
Watonwan	21	6.3	57	1.2
Wilkin	5	2.6	12	0.6
Winona	75	6.4	350	1.4
Wright	207	9.8	1,213	4.6
Yellow-Medicine	18	5.1	118	2.8

Source: Minnesota Employment Security Department

7.5 Industry Specific Data

Hood River Sporting Goods Retailers/Wholesalers Listed in Business Directory, 2003

Firm	Street Address	City	State	Zip
Bob Kendall		Hood River	OR	97031
Boolacoc	4705 Highway 35	Hood River	OR	97031
Deportes Morelia 2	1205 B Street	Hood River	OR	97031
Hood River Outfitters	1020 Wasco Street	Hood River	OR	97031
Gorge Fly Shop	201 Oak Street	Hood River	OR	97031
Sportsman's Den	201 Oak Street	Hood River	OR	97031
2nd Wind Sports Consignment	210 Oak Street	Hood River	OR	97031
Windy River Archery Center	2680 Dock Road	Hood River	OR	97031
Miller Medical Equipment	151 East Jewett Boulevard	White Salmon	WA	98672

Source: SuperPages.Com

Sample Knowledge Indicators

- Academic / Professional qualifications
- Internal / External appointments
- Honours conferred
- Memberships in professional organizations
- Professional expertise

- General interests
- Bibliography (published and internal material)
- Reviews given
- Research projects (alone and in cooperation)
- Innovation
- Knowledge transfers
- Recognition
- Leadership
- Significant liaisons
- Courses taught
- Individuals taught / mentored
- Special presentations made
- Peer evaluations
- Client service
- Service to individuals / groups
- Committees / Advisory boards
- Departmental service
- Conference service
- Community service
- Continuing education activities