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Measuring Changes in Alaska's Labor Markets: Hours Worked Versus People Employed

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The purpose of this paper is to draw attention to the difference between using "persons employed" versus "hours of labor worked" to measure labor market and other economic changes in Alaska. Although this distinction may at first seem academic, we will show that it is fundamental both for understanding patterns of labor demand and analyzing the structure of Alaska's economy. To do this, we compare the actual employment of workers reported by the Alaska Department of Labor for the years 1978 through 1981 with the employment of full-time equivalent (FTE) workers over the same period. The estimates of FTE workers were derived by multiplying the actual number of workers employed by the average hours worked per week and dividing by forty. This was done separately for each industry and for each quarter of the years in question. The FTE workers consequently represent the number of persons who would have been employed in each industry if they all had worked a full-time, forty-hour week.

Before discussing the data, however, we should keep in mind the conceptual as well as the computational differences between an FTE worker and an actual worker. The Alaska Department of Labor publishes two estimates of actual employment. One estimate is called "Nonagricultural Wage and Salary Employment," and it is derived primarily from the quarterly reports of employers subject to state and federal unemployment insurance laws. This estimate is actually a job count since the same person will be counted twice if he or she has two jobs. The second estimate is called "Resident Employment," and it is derived from a sample of employer establishments in Alaska, adjusted to the total employment estimate obtained from the *Current Population Survey.* [1]

Because the quarterly employer reports are used to derive the estimates of average hours worked per week, the actual employment estimates used in this discussion are those reported in the "Nonagricultural Wage and Salary Employment" series. This series, although a job count, is usually considered an appropriate measure of the demand for labor in the state. In fact, this is true only if the relation-

[1]For a discussion of the different employment definitions and sources, see: *Alaska Annual Planning Information: 1982* (Alaska Dept. of Labor, Research and Analysis Section), Chapter IV, pp. 22-23.

ship between average hours worked and persons employed remains constant. If, for example, a business adopted a system of job sharing, its total number of persons employed would rise sharply, even though its demand for labor (and number of FTE workers) remained unchanged. Conversely, a business that increased its production by having its employees work overtime would increase its demand for labor (and number of FTE workers) even though its number of actual workers remained the same.

In terms of economic theory, FTE workers are clearly the appropriate way to measure labor demand. Instead of demanding a particular number of employees, an employer demands a number (i.e., a flow) of manhours in order to produce the end product. Making the usual simplifying assumptions of economic theory (i.e.: [1] hourly wages are the only costs to the employer of hiring a worker, and [2] the length of the workday or workweek does not affect worker productivity), then "the quantity of labor demanded [is] expressed in employee hours."[2]

A more interesting question perhaps is whether Alaska's policymakers should be concerned with what economists call labor demand or whether they should be more appropriately concerned with changes in total employment.[3] The answer to this question depends upon what policymakers want to know. If they are concerned with having an indicator of how income and output in the Alaska economy are changing, "FTE workers" is a clearly superior unit of measurement to "persons employed." As discussed above, changing work rules could cause significant changes in the number of persons employed, while the state's actual income and output levels remained unchanged, or even declined. FTE employment is also superior for use in planning state expenditures on manpower training and related interventions in the labor market. A particular type of business may be expanding rapidly and employing many additional persons, but if most of those persons are employed part-time or for only a few months out of the year, the increased earnings from state manpower training expenditures would probably be quite low and have a questionable benefit-cost ratio.

On the other hand, where the state's major concern is the measurement of impacts from a proposed project, neither FTE workers nor persons employed constitute an adequate measure in themselves. A labor market impact assessment requires a knowledge

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[2]Albert Rees, *The Economics of Work and Pay* (New York: Harper-Row, 1979), pg. 55.

[3]This issue was raised by Professor Matt Berman, ISER.

of FTE workers employed, number of jobs created, and types of jobs created. The interaction of these three aspects of labor demand determines both a local labor market's response to a proposed project and any resulting population immigration.

The unique structure of Alaska's economy makes the potential divergence between hours worked and persons employed both more and less important than elsewhere in the United States for understanding changes in the demand for labor. Government (federal, state, and local) employment in Alaska is large, accounting for about one-third (32.3 percent) of total average monthly wage and salary employment in 1981. It is also seasonally very stable. The difference between average monthly wage and salary employment in the highest and lowest quarters of 1981 was only 4 percent. When combined with a set of personnel practices that discourages the use of overtime and part-time workers, this stability implies that changes in wage and salary employment are a good measure of changes in government's total demand for labor.

When we turn to Alaska's private employers, a very different picture emerges. The use of overtime and part-time workers is prevalent, and seasonal instability is a characteristic of many industries. Figure 1 shows average manufacturing employment for actual and FTE workers, by quarter, for the years 1978 through 1981. In four of the five seasonal troughs, there were fewer FTE workers than actual workers. In all four of the seasonal peaks, FTE workers were greater than actual workers. Because on average the FTE troughs are lower and the peaks higher than those of actual workers, the seasonal fluctuation of labor demand in manufacturing is greater than that implied by the changes in actual wage and salary employment. This is documented in Table 1, which presents estimated peak-to-trough fluctuations for actual and FTE workers, as well as the ratios of actual workers to FTE workers. In three of the four years, peak quarter employment was barely double trough quarter employment for actual workers. For FTE workers, peak quarter employment averaged about two-and-one-half times trough quarter employment.

Over all, Table 1 indicates that about 15 percent of the seasonal change in manufacturing's labor demand is supplied by alterations in average hours worked, while the remaining eighty-five percent is supplied by the employment of additional persons. Using actual wage and salary employment to measure manufacturing's seasonal fluctuation in labor demand will consequently produce underestimates of about 15 percent in the magnitude of the seasonal swing from peak to trough.

In addition to underestimating manufacturing's seasonal fluctu-

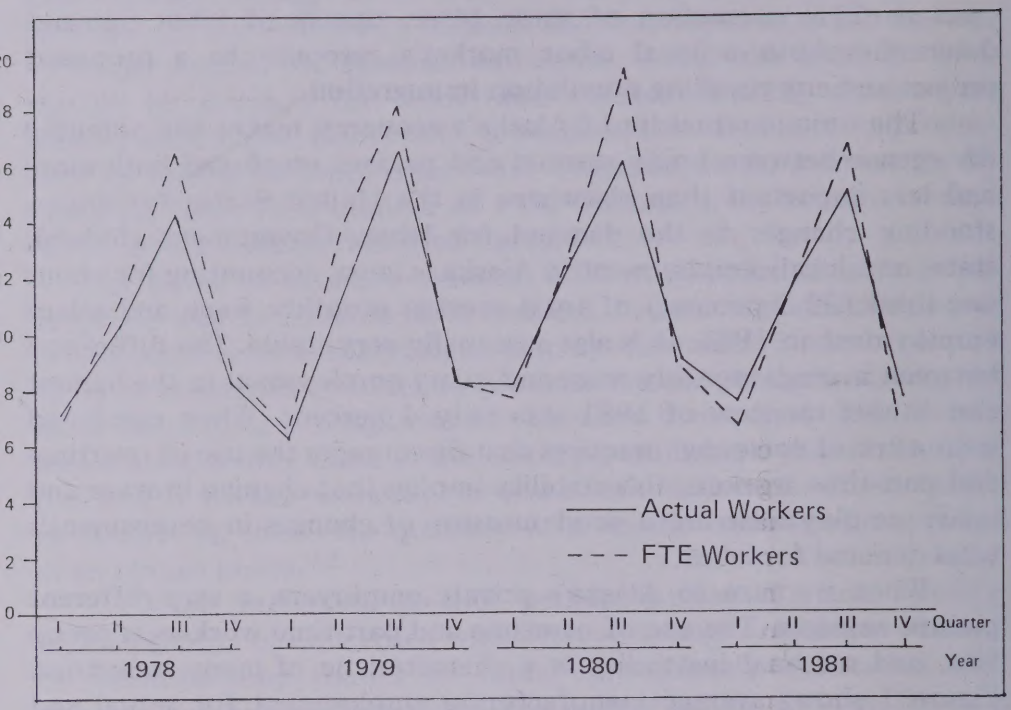

Figure 1. Manufacturing Employment

Table 1

Manufacturing Peak Quarterly Employment Divided by Trough Quarterly Employment

Year	Actual	FTE	Actual ÷ FTE
1978	198.1%	237.8%	83.3%
1979	262.5	278.4	94.2
1980	196.5	248.7	79.0
1981	196.9	247.0	79.7
Average	213.5%	253.0%	84.1%

Source: See Table 4, pp. 12-13.

ation in labor demand, the use of actual wage and salary workers also can result in misleading estimates of the demand for labor through time. Table 2 presents the average annual rate of change in employment for actual and FTE workers between 1978 and 1981 for total manufacturing and each of its major industries. The rate of change in the employment of FTE workers both grew more rapidly and declined more precipitously than did changes in actual employment.

Over the four-year period, total manufacturing employment increased at an average annual rate of slightly over 2 percent when measured in actual wage and salary workers employed. When adjusted to FTE workers, or hours worked per week, however, total manufacturing employment experienced an average annual decline of about three-tenths of 1 percent per year.

Table 2 clearly shows that the food products industry exhibited the largest difference between actual and FTE workers employed. Dominated by the harvesting of salmon, this industry's annual production cycle is both highly seasonal and difficult to predict. The salmon runs may be early or late by several weeks, and the size of the runs have managed to regularly confound the annual predictions of Alaska Department of Fish and Game. With so much uncertainty in the production process, the industry's employers have a strong incentive to retain a stable workforce and increase or decrease their work hours as required. This approach becomes essential to ensuring an adequate supply of labor to meet an employer's changing labor demands where the local population is incapable of supplying enough labor to meet a plant's peak labor requirements, a situation which is particularly true for processing plants located in isolated areas.

In general, the unpredictability of a firm's demand for labor combined with the inability of a local population to supply peak labor demands are the key factors motivating employers to vary the employee hours instead of the number of employees. This, in turn, causes the greatest difference between actual and FTE workers employed. This is illustrated by the employment patterns in two of Alaska's nonmanufacturing basic industries.[4] Mining industries are often located in remote areas where the local population has little ability to supply workers. However, the industry shows little seasonal fluctuation in employment (the difference between annual peak and trough quarter employment averaged only about 15 percent

[4]Basic industries are those whose primary markets are outside the State of Alaska. For a discussion of this concept, see "The Demand for Labor in Alaska," *Alaska Review of Social and Economic Conditions* 19 (May 1982).

Table 2

Annual Average Percentage Rates of Change in Manufacturing Employment

Year	Total Mfg.		Food Products		Wood Products		Other Mfg.	
	Actual	FTE	Actual	FTE	Actual	FTE	Actual	FTE
1978	—	—	—	—	—	—	—	—
1979	6.47	8.05	7.52	10.87	11.73	9.35	–5.08	–4.41
1980	7.81	4.92	5.27	1.94	12.44	10.63	9.02	6.27
1981	–8.01	–13.82	–12.25	–20.98	–16.94	–19.48	24.42	27.20
4-year Avg.	2.09	–0.28	0.18	–2.72	2.41	0.17	9.45	9.69

Source: See Table 4, pp. 12-13.

during the 4-year period 1978 through 1981), and its annual labor demands are generally predictable. As a result, the average difference between peak and trough quarter employment when measured by FTE and actual workers was less than half a percentage point between 1978 and 1981; the difference between FTE and actual average annual rates of employment change was less than 2 percentage points over the 4-year period.

In contrast to mining, the construction industry exhibits large seasonal swings in its employment. Between 1978 and 1981, the average annual difference between peak quarter and trough quarter employment was about 100 percent. However, excluding major resource development projects (such as construction of the trans-Alaska pipeline), most construction activity occurs in areas with populations capable of supplying adequate labor to meet most industry needs. In 1981, for example, over two-thirds of total average monthly construction employment in Alaska occurred in the Anchorage and Fairbanks areas. The divergence between FTE and actual worker employment in the construction industry was consequently larger than that in mining but still fairly small. The average difference between peak quarter and trough quarter employment when measured in FTE and actual workers was about 6 percent between 1978 and 1981; and the average annual rates of employment growth using the two measures differed by less than two-and-one-half percentage points.

From the data available for the 4-year, post-pipeline period, 1978 through 1981, seasonal fluctuation appears to be more important than isolation in causing a divergence between actual and FTE workers. Where an industry's employment is seasonally volatile, and it normally operates in areas isolated from the state's population centers, the divergence can be both large and significant (i.e., cause a reversal in the direction of the observed change). In such instances, the exclusive use of actual wage and salary workers can produce erroneous estimates of changes in the demand for labor.

Another area in which the use of FTE versus actual workers can produce different research findings is in the analysis of an economy's structural relationships. One of the most widely used concepts in regional economies is the economic base model.[5] This type of model classifies a region's industries as belonging to either the basic

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[5]For example, see Scott Goldsmith, *Analyzing Economic Impact in Alaska* (Anchorage: Institute of Social and Economic Research, 1981), Chapter 1; or Theodore Lane et al., *A Forecast of Industrial and Occupational Employment in Alaska* (Fairbanks: Institute of Social and Economic Research, 1974), Part II.

or nonbasic (i.e. support) sector. Basic sector industries change in response to market forces operating outside the region being studied, while nonbasic (or support) industries change in response to basic sector changes. In a recent economic base analysis for Southeast Alaska, George Rogers summarized the workings of this model as follows: "When employment expands in a basic industry, it is assumed that this will induce increased employment in the support industries of the economy. In other words, change in the total regional or local economy is determined through the familiar multiplier process from the basic change. . . . Through a further extension of this process, change in total employment is assumed to change total population."[6] The familiar multiplier process to which George Rogers refers is the economic base multiplier which is calculated as either (a) total employment divided by basic employment or (b) nonbasic (support) employment divided by basic employment. The first ratio shows the total employment change produced by a change in basic employment. The second ratio shows the change in nonbasic (or support) employment caused by a change in basic employment.

The average weekly hours data published by the Alaska Department of Labor do not include all industries. Using the available data, we will classify mining, construction, food processing, forest products, and other manufacturing as basic industries; and retail trade, wholesale trade, transportation, communications, and utilities as nonbasic industries. The average monthly employment for these basic and nonbasic industries for the years 1978 through 1981 are reported in Table 3, along with nonbasic/basic employment multipliers. Over the 4-year period, the nonbasic-to-basic employment multiplier averaged 1.10 for FTE workers and 1.37 for actual workers. This implies that the use of actual wage and salary workers to estimate induced nonbasic worker impacts can cause overestimates of about 25 percent. If these worker estimates are multiplied by average family size (or the ratio of total population to total employment) to derive population impacts, even larger overestimates can occur.

The reason for the large difference between the FTE-derived multiplier and actual worker-derived multiplier stems from the structure and personnel practices of the basic and nonbasic sectors. As discussed earlier, employment in most of Alaska's basic industries fluctuates seasonally, and many manufacturing establishments are isolated from the state's population centers. Under these conditions,

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[6]George W. Rogers, "Economics and the Southeast Alaska Region," paper delivered to the Forest Practices Training Project (Alaska Department of Natural Resources), April 27, 1982.

Table 3

Basic and Nonbasic Average Monthly Employment of Actual and FTE Workers

Year	Basic Employment		Nonbasic Employment		Nonbasic/Basic Multiplier	
	FTE Workers	Actual Workers	FTE Workers	Actual Workers	FTE Workers	Actual Workers
1978	26,318	23,591	28,441	31,784	1.081	1.347
1979	24,302	21,947	27,611	31,128	1.136	1.418
1980	25,915	23,242	28,503	32,256	1.100	1.388
1981	28,631	25,628	31,119	34,344	1.089	1.340
4-year Avg.	26,292	23,602	28,918	32,378	1.100	1.372

employers have a strong incentive to vary employee work time to meet changing labor requirements, rather than hire additional workers. This results in FTE basic workers having a higher monthly average employment (and a larger seasonal swing from peak to trough) than actual wage and salary workers.

Just the opposite occurs in the nonbasic sector. Such industries as retail trade are normally concentrated around population centers and regularly use part-time and temporary workers to adjust their work forces to seasonal fluctuations in labor demand. This results in actual wage and salary workers having higher average monthly employment than the FTE workers. The combination of actual wage and salary worker estimates being lower than the FTE estimates in the basic sector and higher in the nonbasic (support) sector causes the basic employment multipliers derived from actual worker data to regularly overestimate the secondary employment impacts induced by a change in basic employment.

Some of these induced nonbasic sector jobs will be filled by temporary or part-time workers, and it is probable that they will be filled by secondary income earners from households within the existing population. If these workers are counted as part of the induced employment increase resulting from a change in basic sector employment, the population impacts derived from an economic base analysis will produce even larger overestimates.

Although the FTE and actual worker multiplier estimates of induced impacts will be different, it can be argued that they will provide equally reliable forecasts of changes in economic activity. [7] That is, even though the use of a multiplier based on actual workers employed overestimates changes in labor demand (in the FTE worker sense), it will still generate reliable forecasts so long as the structure of a labor market is unchanged. Essentially, this argument says that for forecasting purposes it doesn't matter if your analytical model is wrong. So long as it is consistantly wrong, it can still provide reliable forecasts. While this argument is true for the forecasting of large national economic aggregates, I think it misses the point when applied to Alaska.

The key to forecasting economic activity in Alaska (particularly in sub-state regions or smaller areas) is recognizing that the behavior of local labor markets will probably change as a result of any significant impact. Because most regional and small area economies in Alaska are very "thin," the addition of a new major employer will not only change its level of activity, it also will change the structure of the local (or regional) economy. A major new employer that creates year-round employment opportunities in an area which previously had only highly seasonal basic industries will cause a significant change in the annual income and purchasing power generated per worker in the economy. This will cause a response from the local economy's trade and service sectors different from that observed historically. While no body of historical data can capture structural changes that will occur in the future, the relationship between income and purchasing power with FTE workers is more stable than it is with actual persons employed. Changes in the structure of a local labor market caused by a change in the historical relationship between income earned and persons employed is therefore more capable of being captured by use of a multiplier based on estimated FTE workers than by one estimated from actual persons employed.

One final point needs to be made on the use of estimated FTE workers and actual persons employed. Probably no statistics are used more widely by policymakers in Alaska than are labor market statistics. Changes in total employment are regularly used as the best estimate of how the state's economy is growing or declining. Yet, these data can be misleading since the number of total persons employed can change as much from structural alterations in the labor market as they can from changes in the state's level of economic activity. A

[7] This point was made by Professors Scott Goldsmith and Matt Berman of ISER, and Professor Brad Tuck, University of Alaska in Anchorage.

better understanding of how the Alaska economy is performing could be gained if FTE worker estimates were available on the same regular, monthly basis that estimates of total persons employed are now made. Such a procedure might also give Alaska a useful leading indicator of short-term changes in labor demand. In the national economy, we know that an increase in the ratio of FTE workers to actual persons employed for several months usually means that total employment and earned income will be going up in the near future. A fall in this ratio usually means a fall in total employment and earned income is on its way. After some experience had been gained on how this ratio operates in Alaska's economy, it could become our best leading indicator of short-term economic fluctuations.

The findings in this research paper on differences between hours worked (as expressed by FTE workers) and people employed are far from exhaustive. Including all industries in the economy and using a longer time series might uncover trends which would add to or modify them. Nevertheless, the following conclusions appear warranted: (1) seasonal fluctuations in labor demand among Alaska's manufacturing industries are understated by about 15 percent when they are measured by actual wage and salary workers employed; (2) estimates of changing patterns of labor demand in the state, either by industry or in total, based on actual wage and salary workers employed will often err in magnitude and will occasionally even err in direction; (3) economic base models using actual wage and salary workers will regularly overestimate the nonbasic (or support) employment impacts induced by basic sector change, and (4) estimates of population impacts based on economic base models using actual wage and salary workers employed will regularly overstate the magnitude of the impacts.

Given these conclusions, it would behoove researchers in Alaska to regularly make estimates of labor demand based on average hours worked as well as persons employed. The use of FTE-adjusted worker estimates may be critical for the accuracy of the analysis, particularly when one is trying to estimate impacts in the more isolated regions of the state. Finally, we recommend that the Alaska Department of Labor (ADOL) begin developing and publishing FTE worker estimates on a monthly basis for all industries for which data are now available. We also recommend that ADOL investigate the feasibility of developing and publishing a series of total FTE worker estimates, by industry, in the future.

Table 4

Full-Time Equivalent (FTE) and Actual Wage and Salary Workers: Selected Industries, 1978-1981

	1978		1981	
	FTE Workers	Actual Workers	FTE Workers	Actual Workers
Quarter I				
Mining	5,005	4,085	4,731	3,628
Construction	8,557	7,681	4,916	5,016
Manuf. (Total)	6,940	7,201	6,494	6,302
Food	3,264	3,777	3,350	3,120
Wood	2,199	1,932	1,783	1,749
Other Mfg.	1,477	1,492	1,361	1,433
TCU*	11,227	12,412	11,426	12,572
Trade (Total)	14,944	17,539	14,496	17,083
Wholesale	4,261	4,449	4,119	4,281
Retail	10,683	13,090	10,377	12,802
FIRE**	0	7,019	0	6,018
Quarter II				
Mining	5,038	4,431	4,919	3,836
Construction	10,491	9,537	7,934	7,567
Manuf. (Total)	11,002	10,159	13,663	11,355
Food	5,868	5,406	8,320	6,428
Wood	3,367	3,034	3,585	3,255
Other Mfg.	1,766	1,719	1,758	1,671
TCU*	12,297	13,461	12,268	13,550
Trade (Total)	15,638	18,398	15,575	17,615
Wholesale	4,538	4,655	4,226	4,363
Retail	11,100	13,743	11,349	13,253
FIRE**	N/A	6,573	N/A	5,785
Quarter III				
Mining	5,092	4,200	4,707	3,596
Construction	13,866	12,021	11,261	10,251
Manuf. (Total)	16,501	14,266	18,082	16,544
Food	11,187	9,130	12,427	11,262
Wood	3,389	3,194	3,798	3,469
Other Mfg.	1,925	1,941	1,857	1,813
TCU*	14,523	15,504	13,635	14,533
Trade	17,306	19,309	16,037	18,174
Wholesale	4,836	4,983	4,615	4,696
Retail	12,471	14,326	11,422	13,478
FIRE**	0	6,767	0	5,744
Quarter IV				
Mining	4,457	3,802	4,503	3,510
Construction	9,602	8,671	7,596	7,867
Manuf. (Total)	8,722	8,309	8,402	8,317
Food	4,788	4,508	3,739	3,728
Wood	2,297	2,176	3,136	3,076
Other Mfg.	1,636	1,625	1,527	1,514
TCU*	11,662	12,686	11,890	13,391
Trade	16,166	18,825	15,115	17,595
Wholesale	4,299	4,482	4,088	4,278
Retail	11,867	14,343	11,027	13,317
FIRE**	0	5,943	0	5,397

	1980		1981	
	FTE Workers	Actual Workers	FTE Workers	Actual Workers
Quarter I				
Mining	5,081	3,968	6,085	4,892
Construction	5,133	4,978	7,137	6,024
Manuf. (Total)	7,878	8,168	6,756	7,664
Food	3,543	3,942	2,748	3,550
Wood	2,905	2,787	2,256	2,276
Other Manuf.	1,430	1,438	1,753	1,838
TCU*	11,358	12,957	12,489	13,203
Trade (Total)	14,874	17,140	15,545	18,547
Wholesale	4,160	4,292	4,369	4,627
Retail	10,714	12,848	11,176	13,920
FIRE**	0	5,822	0	5,957
Quarter II				
Mining	5,410	4,170	7,507	5,860
Construction	7,391	7,029	10,653	8,995
Manuf. (Total)	12,470	12,406	11,650	11,587
Food	6,695	6,899	5,720	5,908
Wood	4,086	3,789	3,644	3,486
Other Mfg.	1,689	1,719	2,287	2,193
TCU*	12,055	14,130	14,608	14,638
Trade (Total)	15,772	18,382	16,653	19,505
Wholesale	4,438	4,590	4,730	5,115
Retail	11,334	13,792	11,924	14,391
FIRE**	0	6,026	0	6,327
Quarter III				
Mining	5,728	4,547	6,912	5,388
Construction	10,922	9,736	15,318	13,064
Manuf. (Total)	19,593	16,085	16,689	15,088
Food	13,500	10,279	11,223	9,707
Wood	3,996	3,759	2,914	2,901
Other Mfg.	2,097	2,047	2,552	2,480
TCU*	14,120	15,002	16,239	16,213
Trade (Total)	16,553	19,124	17,916	20,518
Wholesale	4,789	4,943	5,170	5,474
Retail	11,764	14,181	12,746	15,044
FIRE**	0	6,409	0	6,538
Quarter IV				
Mining	5,554	4,435	6,556	5,096
Construction	9,508	8,283	12,182	11,024
Manuf. (Total)	8,993	9,164	7,078	7,829
Food	4,675	4,708	2,731	3,498
Wood	2,624	2,647	2,146	2,119
Other Mfg.	1,694	1,809	2,200	2,212
TCU*	12,668	13,215	13,492	14,393
Trade (Total)	16,611	19,073	17,532	20,361
Wholesale	4,489	4,447	5,103	5,471
Retail	12,123	14,626	12,429	14,890
FIRE**	0	6,326	0	6,572

*TCU means Transportation, Communication, and Utilities.
**FIRE means Finance, Insurance, and Real Estate.

Source: Alaska Department of Labor, Research and Analysis Section (FTE worker estimate developed by Jim Kerr, ISER).